

A. ATC first menu


No.	Function name	Description
1	ATC ARM BASE POSITION	This function moves the ATC arm to its stand-by position. Conditions: Shifter at ATC position, retraction in Z-axis direction, X-/Y-axis at ATC position, Z-axis at zero-point position, milling head and B-axis clamped, milling spindle at orientation position, milling spindle clamped, and tool clamped.
2	ATC ARM SWING	This function swings the ATC arm in for a gripping of the tools in both the milling head and the shifter. Conditions: Same as for item 1 above.
3	ATC ARM TURN	This function rotates and extends/retracts the ATC arm for a tool change. Conditions: ATC arm swinging-in completed and tool unclamped.
4	MILL ATC ORIENT	This function turns the milling spindle to its ATC position. To perform ATC operations, clamp the milling spindle at this position.
5	ATC ARM JOG CW	The function described in the menu item No. 6 is executed in series in reverse order. Conditions: Same as for items 1, 2, and 3 above.
6	ATC ARM JOG CCW	The function described in the above menu items Nos. 1, 2, and 3 is executed in series in this order. This menu key is used during centering or other machine adjustments to move the ATC arm at the restricted jogging speed. Conditions: Same as for items 1, 2, and 3 above.
7	ATC ARM HOME SET MODE	This menu key functions for setting the reference position only and is usually not used. This menu function sets the ATC arm zero-point position setting mode.
8	ATC ARM HOME SET	This menu key functions for setting the reference position only and is usually not used. This menu function initializes the ATC arm to its reference position.
9	AXIS ATC POS.	This function moves the X-axis, Z-axis, and Y-axis to an ATC-enabling position. (Yt-axis at ATC position, X-axis at ATC position, and Z-axis at ATC position.) Conditions: No interference must occur during axis movement.
10	ATC INT-LOCK CANCEL	Various interlocks are employed for each ATC operation for safety purpose. This function neglects interlocks.(Pressing the menu key lights up this menu item display.)


* On completion of operation, the menu items will be highlighted.

B. ATC second menu

No.	Function name	Description
11	SHIFTER EXIT	This function extracts the tool shifter to grasp the tool in the gripper. Conditions: Stopped at magazine indexed position, shifter on magazine or ATC side
12	SHIFTER RETRACT	This function retracts the tool shifter to return the tool to the gripper. Conditions: Shifter on magazine or ATC side.
13	SHIFTER ATC SIDE	This function moves the tool shifter to the ATC side. Conditions: Shifter extracted, ATC arm stopped at reference position.
14	SHIFTER MAG. SIDE	This function moves the tool shifter to the magazine side. Conditions: Shifter extracted, no tool present in indexed gripper.
16	GRIPPER UNCLAMP	This function unclamps the magazine and makes it rotatable.
17	MAGAZINE HOME SET MODE	This menu key functions for setting the reference position only and is usually not used. This menu function sets the magazine zero-point position setting mode.
18	MAGAZINE HOME SET	This menu key functions for setting the reference position only and is usually not used. This menu function initializes the magazine to its reference position.

3. Setting tool number

After a manual tool change operation, follow the procedure below as required to set the number of the tool currently mounted on the upper turret in the MDI mode .

- (1) Press the MDI key  [21] to change the mode to MDI.

TOOL SELECT	TOOL CHANGE	M CODE			T MSR AUTO	T MSR SEMIAUTO	MSR UNIT IN	MSR UNIT OUT
----------------	----------------	--------	--	--	---------------	-------------------	----------------	-----------------

- (2) When the following is displayed, press the menu selector key [4] to display the following menu.

◀ [] [] [] [] [] [] [] [] [] ▶

↓

							SP. TOOL No. SET	NXT TOOL No. SET
--	--	--	--	--	--	--	---------------------	---------------------

↑

- (3) Press the [SP. TOOL No. SET] menu key. The message **TOOL NUMBER?** will be displayed. Input the number of the tool currently mounted on the upper turret.

5-5 Useful Information

This section gives useful information about the operations that should be understood for the optimum use of the machine and an enhanced productive efficiency, together with a description of the relevant NC functions.

5-5-1 ATC STOP function

This menu function refers to a stop of the automatic operation just before an ATC cycle, or a milling head indexing for changing the application direction of the tool. Upon completion of the preparatory axis movement of the milling head to the tool change position, the operation will come to a stop to suspend the ATC cycle or milling head indexing.

If the **[ATC STOP]** menu function is already selected, the machine will stop before ATC cycle or milling head indexing.


1. Machine actions to be held up

The ATC STOP function allows the following action to be held up in the flow of operation:

ATC cycle

The ATC cycle here refers to changing the current tool on the upper turret for a tool to be used in the next machining process. In addition to the main action of tool change by the ATC arm, an ATC cycle includes the indexing of the upper turret, if required, from position V to position H and vice versa.

2. Operating procedure

Press the MDI key  on the NC operating panel to display the MDI menu.

TOOL SELECT	TOOL CHANGE	M CODE			T MSR AUTO	T MSR SEMIAUTO	MSR UNIT IN	MSR UNIT OUT	
----------------	----------------	--------	--	--	---------------	-------------------	----------------	-----------------	--

(1) Press the menu selector key [4] 2 times.

MST LOCK	ATC STOP	Z AXIS CANCEL	UPPERTUR OPTIONAL STOP	DRYRUN	MACHINE LOCK	WORK LIGHT			
-------------	-------------	------------------	------------------------------	--------	-----------------	---------------	--	--	--



1. Pressing the **[ATC STOP]** menu key alternately makes the function valid and invalid. The highlighted display of the menu item refers to the validation.
2. Upon completion of the axis movement of the upper turret to the tool change position, the automatic operation comes to a stop with the message **238: AUTO TOOL CHANGE STOP** displayed on the screen. The cycle start lamp is not turned off by this stop.
3. Press the **[ATC STOP]** menu key (to cancel the highlighted display) and then press the cycle start button to resume running the machine. The above-mentioned message will disappear and the automatic operation will be restarted from the suspended ATC cycle.

5-5-2 Recovery from an ATC operation halfway stopped

This subsection describes the recovery of normal status from an ATC-related operation halfway stopped by an NC resetting, an emergency stop, a power failure, an alarm, etc.

First see Item 1 and confirm the particular abortion position of the ATC operation by visual checking and by displaying the ATC menus.

Next, confirm the reference positions of the 20/40-tool magazine in Item 2 or those of the 80/120-tool magazine in Item 4, and recover normal conditions as directed in Item 3 or Item 5.

Refer to Section 4-9, "ATC", for the details of the respective menu functions.



CAUTION

- Pay special careful attention to safety and interference.

1. Abortion positions of the ATC operation



WARNING

- After recovering ATC conditions in manual operation mode, confirm the corresponding tool data and the actual magazine pocket number and tool number. Failure to perform the confirmation leads to a serious accident.

A. Recovering the 20/40-tool magazine

- Halfway stop of the shifter pocket during motion on the ATC side
- Halfway stop of the shifter pocket during motion on the magazine side
- Halfway stop of the shifter pocket during motion between magazine and ATC
- Halfway stop of the ATC arm during swing
- Halfway stop of the ATC arm during rotation
- Halfway stop of the ATC arm during return to stand-by position

B. Recovering the 80/120-tool magazine

- Halfway stop of the carrier motion
- Halfway stop of the shifter motion
- Halfway stop of the ATC arm during swing
- Halfway stop of the ATC arm during rotation
- Halfway stop of the ATC arm during return to stand-by position

2. Reference position of the 20/40-tool magazine

A. Schematic diagram of ATC cycle

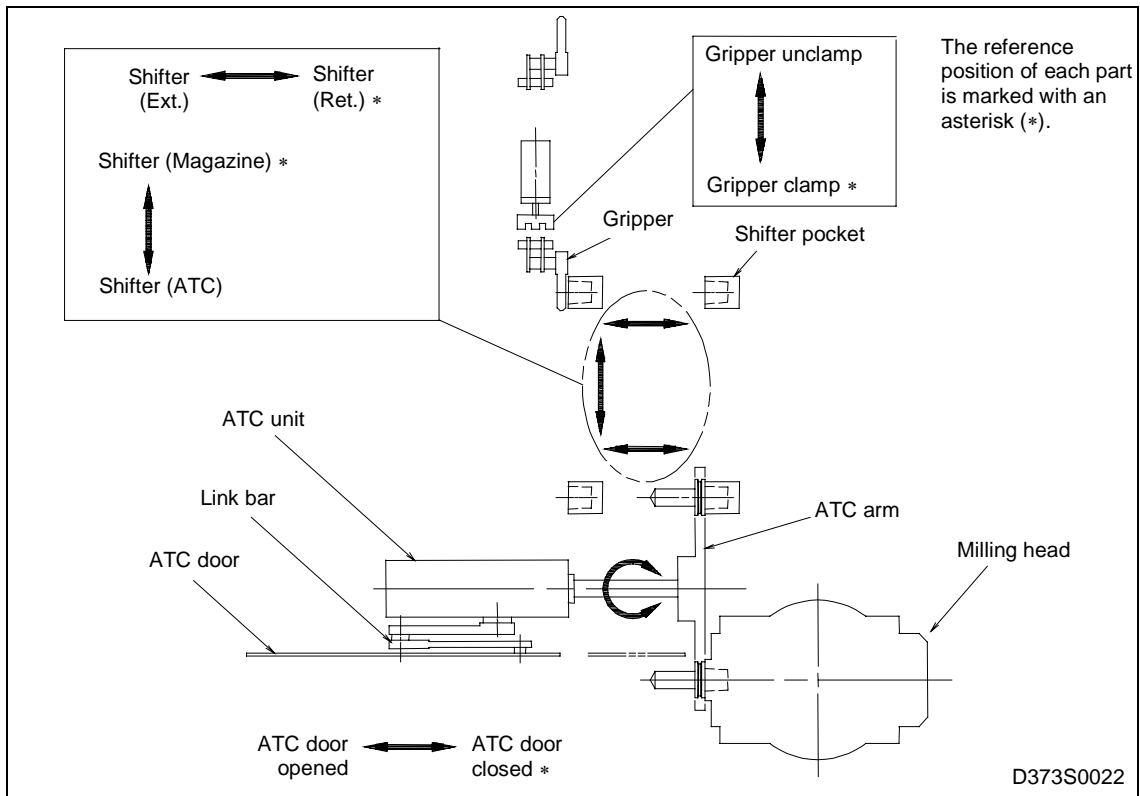



Fig. 5-13 Schematic diagram of ATC cycle

B. ATC menus

The asterisk (*) mark signifies the reference position.

Press the machine menu key  on the NC operating panel in manual operation mode and press the display selector key [3]. The following menu will be displayed.



ATC SHIFTER MAGAZINE	80/120 TOOL MAGAZINE	B AXIS & TAIL HOME SET	LOWER-TR MODE						
----------------------	----------------------	------------------------	---------------	--	--	--	--	--	--

Select the **[ATC SHIFTER MAGAZINE]** item to display the following menu for manual ATC operation.

<ATC first menu>

ATC ARM BASE POSITION	ATC ARM SWING	ATC ARM TURN	MILL ATC ORIENT	ATC ARM JOG CW	ATC ARM JOG CCW	ATC ARM HOME SET MODE	ATC ARM HOME SET	AXIS POS	ATC INT-LOCK CANCEL
*			*						







Press the menu selector key [4] from the ATC first menu to display the following ATC second menu.

<ATC second menu>

SHIFTER EXIT	SHIFTER RETRACT	SHIFTER ATC SIDE	SHIFTER MAG.SIDE		GRIPPER UNCLAMP	MAGAZINE HOME SET MODE	MAGAZINE HOME SET		
	*		*						

3. Recovering the 20/40-tool magazine

A. For halfway stop of the shifter pocket during motion on the ATC side

- (1) Press the emergency stop button, turn it in the direction of arrow and then press the RESET  key.
- (2) Press the zero-point return  key.
- (3) Display the ATC menu by pressing the machine menu  key and the display selector key [3] in succession. Select the **[ATC SHIFTER MAGAZINE]** item and press the menu selector key [4].
- (4) Highlight the **[SHIFTER RETRACT]** item of the ATC second menu by pressing the menu key.
- (5) Check the tool number of the tool in the shifter pocket and, if required, rotate the magazine (using the forward or reverse button on the magazine operating panel) to index the magazine pocket for that tool.
- (6) Make the **[GRIPPER UNCLAMP]** item display of the ATC second menu in normal status by pressing the menu key.
- (7) Highlight the **[SHIFTER EXIT]** item of the ATC second menu by pressing the menu key.
- (8) Highlight the **[SHIFTER MAG. SIDE]** item of the ATC second menu by pressing the menu key.
- (9) Highlight the **[SHIFTER RETRACT]** item of the ATC second menu by pressing the menu key.
- (10) Perform zero-point return operation for the X- and Y-axes.
Check the B-axis indication on the **POSITION** display whether it is 0° as appropriate, and perform the required B-axis positioning by pressing the tool on the upper turret selector button [38].
If the **MAGZN PK No.** on the **POSITION** display is "0" (magazine rotation stopped halfway), index the magazine to a correct position and make sure that the **MAGZN PK No.** indication corresponds with the currently indexed pocket.
- (11) Verify that the menu items of the reference positions in the ATC menu are highlighted.
- (12) Close the menu by pressing the  key.
- (13) Make sure that the **TNo.** (tool number) on the **POSITION** display and the current tool match. If they mismatch, correct the tool number referring to Section 4-9.
- (14) Make sure that the **NEXT TOOL No.** on the **POSITION** display is "0". If not, press the MDI  key, and enter "0" by using the **[NXT TOOL No. SET]** item.
- (15) Press the zero-point return  key.

B. For halfway stop of the shifter pocket during motion on the magazine side

- (1) Perform steps (1) to (3) of the procedure described above under A.
- (2) Perform steps (9) to (15) of the procedure described above under A.



C. For halfway stop of the shifter pocket during motion between magazine and ATC

- (1) Perform steps (1) to (3) of the procedure laid down in Item A above.
- (2) Highlight the **[SHIFTER ATC SIDE]** item of the ATC second menu by pressing the menu key.
- (3) Perform steps (4) to (15) of the procedure laid down in Item A above.

D. For halfway stop of the ATC arm during swing

- (1) Perform steps (1) to (3) of the procedure described above under A.
- (2) Highlight the **[ATC ARM HOME SET]** item of the ATC menu by pressing the menu key. Use the **[ATC INT-LOCK CANCEL]** menu function as required to carry out this step.
- (3) Perform steps (5) to (15) of the procedure described above under A.

E. For halfway stop of the ATC arm during rotation

- (1) Perform steps (1) to (3) of the procedure described above under A.
- (2) Press the **[ATC INT-LOCK CANCEL]** menu key of the ATC first menu and then set the tool clamp/unclamp switch [42] on the operating panel to the  position.
- (3) Highlight the **[ATC ARM TURN]** item of the ATC first menu by pressing the menu key.
- (4) Set the tool clamp/unclamp switch [42] on the operating panel to the  position.
- (5) Highlight the **[ATC ARM HOME SET]** item of the ATC first menu by pressing the menu key.
- (6) Since the tool number of the mounted tool is not correct, be sure to correct the **TNo.** on the **POSITION** display as follows.
- (7) Perform steps (5) to (15) of the procedure described above under A.

F. For halfway stop of the ATC arm during return to stand-by position

- (1) Perform steps (1) to (3) of the procedure described above under A.
- (2) Highlight the **[ATC ARM HOME SET]** item of the ATC first menu by pressing the menu key. Use the **[ATC INT-LOCK CANCEL]** menu function as required to carry out this step.
- (3) Since the tool number of the mounted tool is not correct, be sure to correct the **TNo.** on the **POSITION** display as follows.
- (4) Perform steps (5) to (15) of the procedure described above under A.

4. Reference position of the 80/120-tool magazine

A. Schematic diagram of ATC cycle

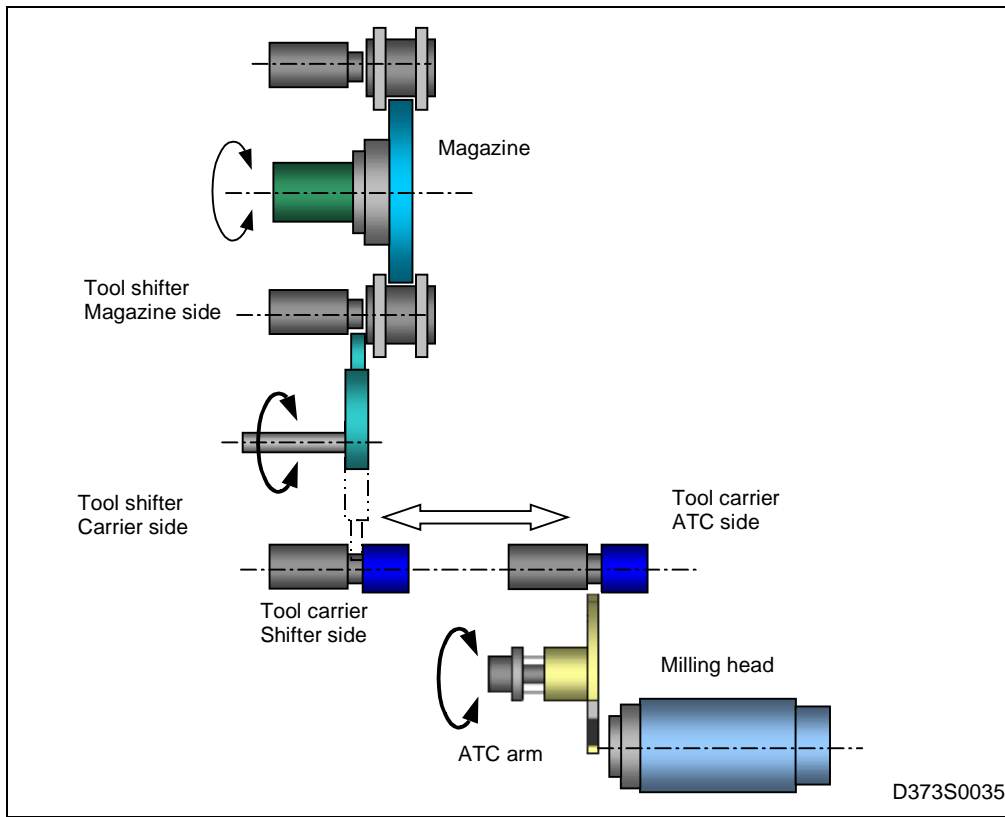

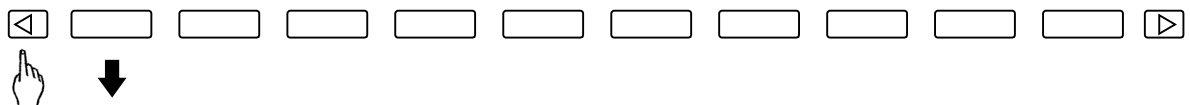


Fig. 5-14 Schematic diagram of ATC cycle

B. ATC menus

The asterisk (*) mark signifies the reference position.

Press the machine menu key  on the NC operating panel in manual operation mode and press the display selector key [3]. The following menu will be displayed.



ATC SHIFTER MAGAZINE	80/120 TOOL MAGAZINE		B AXIS & TAIL HOME SET	LOWER-TR MODE							
----------------------	----------------------	--	------------------------	---------------	--	--	--	--	--	--	--

Select the **[ATC SHIFTER MAGAZINE]** item to display the following menu for manual ATC operation.

<ATC first menu>

ATC ARM BASE POSITION	ATC ARM SWING	ATC ARM TURN	MILL ATC ORIENT	ATC ARM JOG CW	ATC ARM JOG CCW	ATC ARM HOME SET MODE	ATC ARM HOME SET	AXIS POS	ATC INT-LOCK CANCEL
-----------------------	---------------	--------------	-----------------	----------------	-----------------	-----------------------	------------------	----------	---------------------

*

*





Press the menu selector key [4] from the ATC first menu to display the following ATC second menu.


<ATC second menu>


SHIFTER EXIT	SHIFTER RETRACT	SHIFTER ATC SIDE	SHIFTER MAG. SIDE		GRIPPER UNCLAMP	MAGAZINE HOME SET MODE	MAGAZINE HOME SET		
	*		*						

5. Recovering the 80/120-tool magazine

A. For halfway stop of the tool carrier motion

- (1) Press the emergency stop button, turn it in the direction of arrow and then press the RESET  key.
- (2) Press the zero-point return  key.
- (3) Display the ATC menu by pressing the machine menu  key and the display selector key [3] in succession. Select the **[ATC SHIFTER MAGAZINE]** item and press the menu selector key [4].
- (4) Set the manual intervention switch [2] of the magazine manual operations box to **I** and then press the CARRIER switch [7] to activate the switch lamp.
- (5) Select station No. 1 (tool carrier stand-by position) using the STATION switch [10] of the magazine manual operations box and then press the START switch [8] to move the tool carrier to its stand-by position (at this time, the shifter must have been located at its stand-by position before the tool carrier can be operated).
- (6) Check the tool number of the tool mounted in the carrier pocket, and if this tool number does not match the magazine number, rotate the magazine by pressing the forward or reverse button ([4] or [5]) of the magazine manual operations box (when rotating the magazine, make sure that the CARRIER switch lamp [7] and the SHIFTER switch lamp [6] are off).
- (7) Press the SHIFTER switch [6] of the magazine manual operations box to turn on the switch lamp.
- (8) Select station No. 4 using the STATION switch [10] of the magazine manual operations box and then press the START switch [8] to return the tool to the magazine.
When station No. 4 is selected, the shifter will continuously perform “tool removal from carrier”, “tool returning to magazine”, “and returning to stand-by position”, in that order.
- (9) Perform zero-point return operation for the X- and Y-axes.
Check the B-axis indication on the **POSITION** display whether it is 0° as appropriate, and perform the required B-axis positioning by pressing the tool on the upper turret selector button [38].
If the **MAGZN PK No.** on the **POSITION** display is “0” (magazine rotation stopped halfway), index the magazine to a correct position and make sure that the **MAGZN PK No.** indication corresponds with the currently indexed pocket.
- (10) Verify that the menu items of the reference positions in the ATC menu are highlighted.
- (11) Close the menu by pressing the  key.
- (12) Make sure that the **TNo.** (tool number) on the **POSITION** display and the current tool match. If they mismatch, correct the tool number referring to Section 4-9.

(13) Make sure that the **NEXT TOOL No.** on the **POSITION** display is "0". If not, press the MDI  key, and enter "0" by using the **[NXT TOOL No. SET]** item.

(14) Press the zero-point return  key.



B. For halfway stop of the shifter motion

- (1) Perform steps (1) and (3) of the procedure described above under A.
- (2) Set the manual intervention switch [2] of the magazine manual operations box to **I** and then press the SHIFTER switch [6] to activate the switch lamp.
- (3) Perform steps (8) to (14) of the procedure described above under A.

C. For halfway stop of the ATC arm during swing

- (1) Perform steps (1) and (3) of the procedure described above under A.
- (2) Highlight the **[ATC ARM HOME SET]** item of the ATC first menu by pressing the menu key. Use the **[ATC INT-LOCK CANCEL]** menu function as required to carry out this step.
- (3) Perform steps (8) to (14) of the procedure described above under A.

D. For halfway stop of the ATC arm during rotation

- (1) Perform steps (1) and (3) of the procedure described above under A.
- (2) Press the **[ATC INT-LOCK CANCEL]** menu key of the ATC first menu and then set the tool clamp/unclamp switch [42] on the operating panel to the  position.
- (3) Highlight the **[ATC ARM TURN]** item of the ATC first menu by pressing the menu key.
- (4) Highlight the **[ATC ARM SWING]** item of the ATC first menu by pressing the menu key.
- (5) Set the tool clamp/unclamp switch [42] on the operating panel to the  position.
- (6) Highlight the **[ATC ARM HOME SET]** item of the ATC first menu by pressing the menu key.
- (7) Since the tool number of the mounted tool is not correct, be sure to correct the **TNo.** on the **POSITION** display as follows.
- (8) Perform steps (8) to (14) of the procedure described above under A.

E. For halfway stop of the ATC arm during return to stand-by position

- (1) Perform steps (1) and (3) of the procedure described above under A.
- (2) Highlight the **[ATC ARM HOME SET]** item of the ATC first menu by pressing the menu key. Use the **[ATC INT-LOCK CANCEL]** menu function as required to carry out this step.
- (3) Since the tool number of the mounted tool is not correct, be sure to correct the **TNo.** on the **POSITION** display as follows.
- (4) Perform steps (8) to (14) of the procedure described above under A.