

SECTION 3 MANUAL OPERATION FUNCTIONS

The following manual operation is possible when the MANUAL is selected in the MODE selection keys on the NC operation panel or when manual intervention mode is selected in the AUTO or MDI mode.

- (1) Manual axis feed operation (rapid, jog, pulse handle)
- (2) Spindle operation (CW/CCW, stop, release orientation)

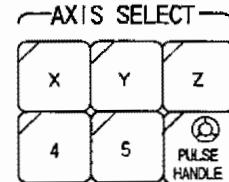
1. Manual Axis Feed Functions

1-1. Manual Rapid Feed

After selecting the axis to feed using the AXIS SELECT switches on the machine operation panel, press the manual rapid feed switch corresponding to the direction in which the axis should move, and the selected axis moves in the required direction at the predetermined rapid feedrate. The RAPID OVERRIDE rotary switch is used to adjust the rapid feedrate.

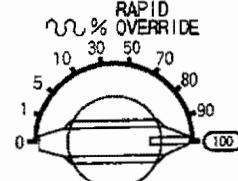
Operation procedure:

- (1) Select the axis to feed by the AXIS SELECT switch.



- (2) Select the override rate by the RAPID OVERRIDE rotary switch.

This switch is operative while an axis is being fed.



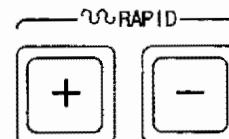
- (3) Press the manual rapid feed switch.

Press the RAPID/+ switch to feed the axis in the plus direction.

Press the RAPID/- switch to feed the axis in the minus direction.

The axis moves only as long as these switches are pressed down.

When they are released, axis motion stops.

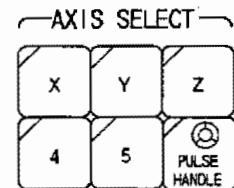


1-2. Manual Cutting (Jog) Feed

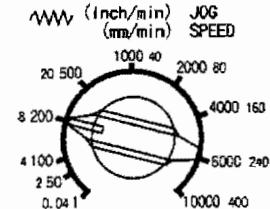
After selecting the axis to feed with the AXIS SELECT switches on the machine operation panel, press the manual cutting (JOG) feed switch corresponding to the direction in which the axis should move, and the selected axis moves in the required direction at the feedrate set with the jog feedrate rotary switch.

Operation procedure:

- (1) Select the axis to feed by the AXIS SELECT switch.



- (2) Select the jog feedrate by the jog feedrate selector switch. This rotary switch is operative even during axis feed.

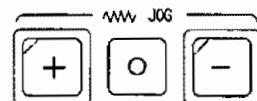


- (3) Press the manual cutting feed switch.

Press the JOG/+ switch to feed the axis in the plus direction.

Press the JOG/- switch to feed the axis in the minus direction.

Pressing these switches once will activate the axis feed until the JOG OFF switch is pressed.



- (4) When the JOG OFF switch is pressed, the axis feed is stopped.

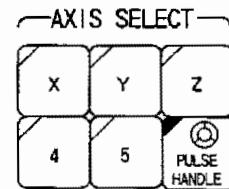
1-3. Manual Pulse Feed

After selecting the PULSE HANDLE in the AXIS SELECT switches, select the axis to feed with the PULSE HANDLE AXIS SELECT switch and turn the pulse handle. The selected axis is moved in response to the rotation of the pulse handle in the direction the pulse handle is turned.

The magnification factor switch is used to select the axis feed distance per pulse.

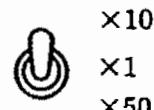
Operation procedure:

- (1) Select the PULSE HANDLE from AXIS SELECT.



- (2) Select the axis feed distance per pulse with the magnification factor switch.

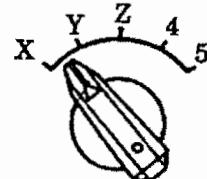
1 The selected axis is fed 0.001 mm (0.00004 in.).



10 The selected axis is fed 0.01 mm (0.0004 in.).

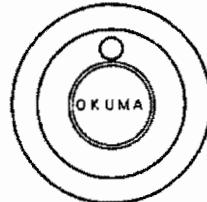
50 The selected axis is fed 0.05 mm (0.002 in.).

- (3) Select the axis to be fed with the PULSE HANDLE AXIS SELECT switch.



- (4) Turn the pulse handle.

Turning the handle in the clockwise direction feeds the axis in the positive (plus) direction.



Turning the handle in the counterclockwise direction feeds the axis in the negative (minus) direction.

[Supplement] When a high pulse feed ratio is selected for the magnification, the axis feeds almost as fast as rapid feedrate. In this case, the alarm sometimes occurs.

2. Spindle Operation

It is possible to rotate the spindle using the switches on the machine operation panel.

After setting the spindle speed, in the MDI mode operation for example, press the spindle start (CW, CCW) switch on the machine operation panel, and the spindle rotates at the set speed. Pressing the spindle stop switch stops spindle rotation.

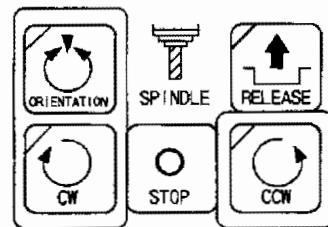
The set spindle can be adjusted using the spindle speed override switch.

Procedure:

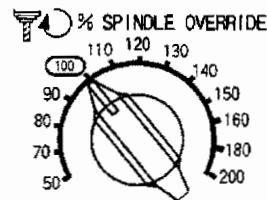
2-1. Spindle Rotation

Enter the desired spindle speed (S command) in the MDI mode. This automatically selects the spindle drive gear range. Note that an S command cannot be given in the manual mode.

Switch to the manual mode, select the spindle rotation direction either CW or CCW, then press the key selected while holding down INTERLOCK RELEASE button.



The spindle starts rotation at a commanded speed. When the spindle speed override rotary switch is set at other than 100%, the spindle rotates at the overridden speed.



2-2. Spindle Stop

Press the SPINDLE STOP button to stop the spindle.

2-3. Spindle Release

Press the SPINDLE RELEASE button to put the spindle gear into the release (neutral) position. This button is operative only while the spindle stays at rest (SPINDLE STOP button pressed). This release state permits manual spindle rotation.

Pressing the CW/CCW button while the spindle is in the release state starts the spindle at a commanded speed after the gear range previously selected has been selected again. The spindle release cannot be canceled in any other way.

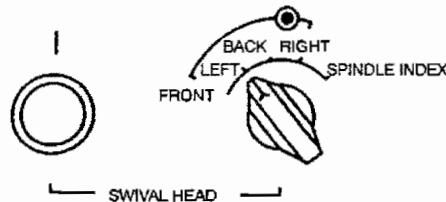
2-4. Spindle Orientation

Press the SPINDLE ORIENTATION button while holding down INTERLOCK RELEASE button to stop the spindle at a definite angular position. This ORIENTATION button is operative while the spindle is rotating. Pressing the ORIENTATION button simultaneously initiates spindle orientation and triggers the button's indicator lamp.

Upon completion of the orientation, the lamp stops flashing and remains illuminated. Rotating the spindle cancels the orientation state. The orientation position and speed are set by machine system parameters.

3. Indexing Swivel Head (Indexing Attachment)

The swivel head (attachment) can be indexed to the required position by pressing the swivel head (attachment) indexing start button after selecting the required position (FR/RH/RR/LH) by the index position selecting switch. For the swivel head (attachment) indexing operation, following conditions must be met.



Conditions for the operation:

- (1) Spindle is stopped.
- (2) Tool is clamped (both for vertical and horizontal spindles).
- (3) Tool change arm is retracted.
- (4) Swivel head in indexable range indicating lamp is illuminated.
- (5) Swivel head index pin is extracted. (only for MCM)
- (6) Spindle orientation pin is not extracted.
(Swivel head index command includes the orientation pin extraction.)
- (7) Not in alarm A occurrence
- (8) ATC operation sequence number is within 1 to 19, 50 to 66. (only for MCM)

- [Supplement]
1. In completely automated operation including ATC, the swivel head is automatically indexed for automatic tool change operation after Z-axis is moved up to the tool change position. (only for MCM)
 - RR position for vertical spindle
 - FR position for horizontal spindle
 2. Usually, the swivel head (attachment) is rotated in the clockwise direction. In the M17 mode, it is rotated in the counterclockwise direction.

4. ATC

4-1. ATC Operations

4-1-1. Establishment of Correspondence between Toolpot Numbers and Tool Numbers by Manual Tool Change Operation

In the memory-random ATC system the tool in the spindle is returned to the toolpot in which the tool to be set in the spindle next is held. Therefore, the correspondence between the toolpot numbers and the tool numbers changes each time the automatic tool change cycle is carried out. This means that the initial correspondence between toolpot numbers and tool numbers must be set and stored in the memory before starting the ATC operation.

For setting this correspondence, there are two ways as follows:

- (a) The table listing the correspondence between the toolpot numbers and tool numbers is made in advance, the correspondence table is established on the screen and individual tools are stored in the corresponding toolpots according to the established correspondence.
- (b) A tool is manually set in the spindle and is returned to the toolpot specified or to an empty pot, automatically selected by the manual tool change operation.

In this section the procedure for (b) is explained. Refer to III. DATA OPERATION, Section 1, 5-2. "ATC Pot No./Tool No. Table" for the procedure for (a).

(1) Setting procedure

- (a) Switch the mode to "manual" by pressing the **MANUAL** key.

The display is possible in the automatic and MDI modes also. However, the setting is effective only in the manual mode.

- (b) Press function key [F8] (EXTEND) to change function key guide message. Then press function key [F2] (TOOL SET).
- (c) The *ATC TOOL SET (POT REF) * page is displayed.

AUTO OPERATION				N 1
				97/07/15 14:10:00
* ATC TOOL SET (POT REF) *				
POT TOOL NO. NO.	POT TOOL NO. NO.	POT TOOL NO. NO.	POT TOOL NO. NO.	
1 001	11 011			:SPCY POT NA
2 002	12 012			:ACT TOOL 020
3 003	13 013			:NXT TOOL 007
4 004	14 014			:MAGAZINE 10
5 005	15 015			
6 006	16 016			
7 007	17 017			
8 008	18 018			
9 009	19 019			
10 010	20 NA			

SET			POT SEARCH	TOOL SEARCH		QUIT
-----	--	--	---------------	----------------	--	------

F1	F2	F3	F4	F5	F6	F7	F8
----	----	----	----	----	----	----	----

Note that POT NO. and TOOL NO. at the left hand column are only for display purpose and setting them is impossible.

(2) Symbols on the display pages are as follows

→ : Indicates the next tool.

>> : Indicates the toolpot number which is located at the position where a tool can be manually removed from or inserted into the toolpot.

(3) The data to be set

(a) SPCY POT

This is used for specifying the toolpot to which the active tool is to be returned, if necessary.

- [Supplement]
1. The maximum number is the number of toolpots in the magazine.
 2. If another tool number has already been assigned to the specified toolpot number, an error occurs.
 3. When specifying a toolpot number for returning a large-diameter tool," the adjacent toolpots should have a dummy tool or they should be left empty. Otherwise, an error occurs.

(b) ACT TOOL

This indicates the tool number of the tool set in the spindle.

- [Supplement]
1. The maximum tool number is the same as the number of tool offsets. (50 in standard)
 2. In case the set tool number has already been assigned to another toolpot number, an error occurs. Although a large-diameter tool (XX, L) can be set, setting of a dummy tool (D) is impossible. In case the pot number has already been specified in the SPCY POT column, and when a large-diameter tool is specified, the adjacent toolpots should have no tool data or be assigned with dummy tool (D). Otherwise, an alarm occurs.
 3. Setting of a large-diameter tool (XX, L) is possible but the setting of a dummy tool (D) is impossible.
 4. In case a large-diameter tool is specified with pot number entered in the SPCY POT, an error will occur if no tool or a dummy tool (D) is not assigned with the pots prior/next to the SPCY POT.
 5. In case a large-diameter tool is specified with no pot number entered in the SPCY POT data location, an error will occur if there are no three empty pots arranged in succession or no two empty pots in succession next to the pot assigned with a dummy tool (D).

(c) NXT TOOL

This indicates the tool number to be set in the spindle next. No data is entered for the first tool returning cycle.

- [Supplement]
1. The maximum number is the same as the active tool.
 2. In case there is a mismatch between the tool number specified and the toolpot number, an error occurs.
 3. Setting of a large-diameter tool (,L) and dummy tool (D) is impossible.
 4. An error will occur when pot number is specified in the SPCY POT data location.

(4) Returning a tool to the magazine

When returning a tool to the magazine pot, there are two methods such as (a) specifying the toolpot number; and (b) returning the tool to an empty pot automatically. These two methods are detailed below. For the procedure to set a tool on the spindle manually, refer to the section covering the manual tool change procedure.

(a) Tool return cycle with pot number specified:

- 1) Position the cursor on the SPCY POT data location.

Key in the return pot number and press the WRITE key.

- 2) Set a tool in the spindle.

- 3) Position the cursor on the ACT TOOL data location.

After keying in the active tool number, press the WRITE key. In this case, the data of NXT TOOL should be NA. If a tool number has been entered, key in "*" after locating the cursor on NXT TOOL, to clear the data.

- 4) Press the 1 CYCLE START key.

The tool in the spindle is returned to the specified pot and the correspondence between the toolpot number and the tool number is set and stored.

If this operation is intended for the pot which is assigned with another tool number, an error occurs and tool return cycle is not started.

(b) Tool return cycle without pot number specified:

- 1) Clear the data of the SPCY POT by entering as asterisk (*).

- 2) Set a tool in the spindle.

- 3) Enter the active tool number for ACT TOOL.

In this data entry, the NXT TOOL data must be NA.

- 4) Press the 1 CYCLE START key.

The empty pot located nearest to the presently indexed pot is automatically selected and the tool return cycle is started.

- [Supplement]
1. Pressing the 1 CYCLE START key with the next tool number specified, initiates the normal tool change cycle.
 2. The SPCY POT data is automatically cleared after the execution of "1 cycle start" command.
 3. The SPCY POT data is only for tool return cycle. Therefore, if this data and the NXT TOOL data have both been entered when the 1 CYCLE START key is pressed, an error occurs.
 4. In the automatic empty pot selection, the empty pot is looked for in the magazine clockwise direction rotation. If there is no empty pot, an error occurs and no return cycle is carried out.
 5. When entering a large-diameter tool, enter ",L" following the tool number.

4-1-2. Operation on ATC Operation Panel

(1) Status indication and operation keys

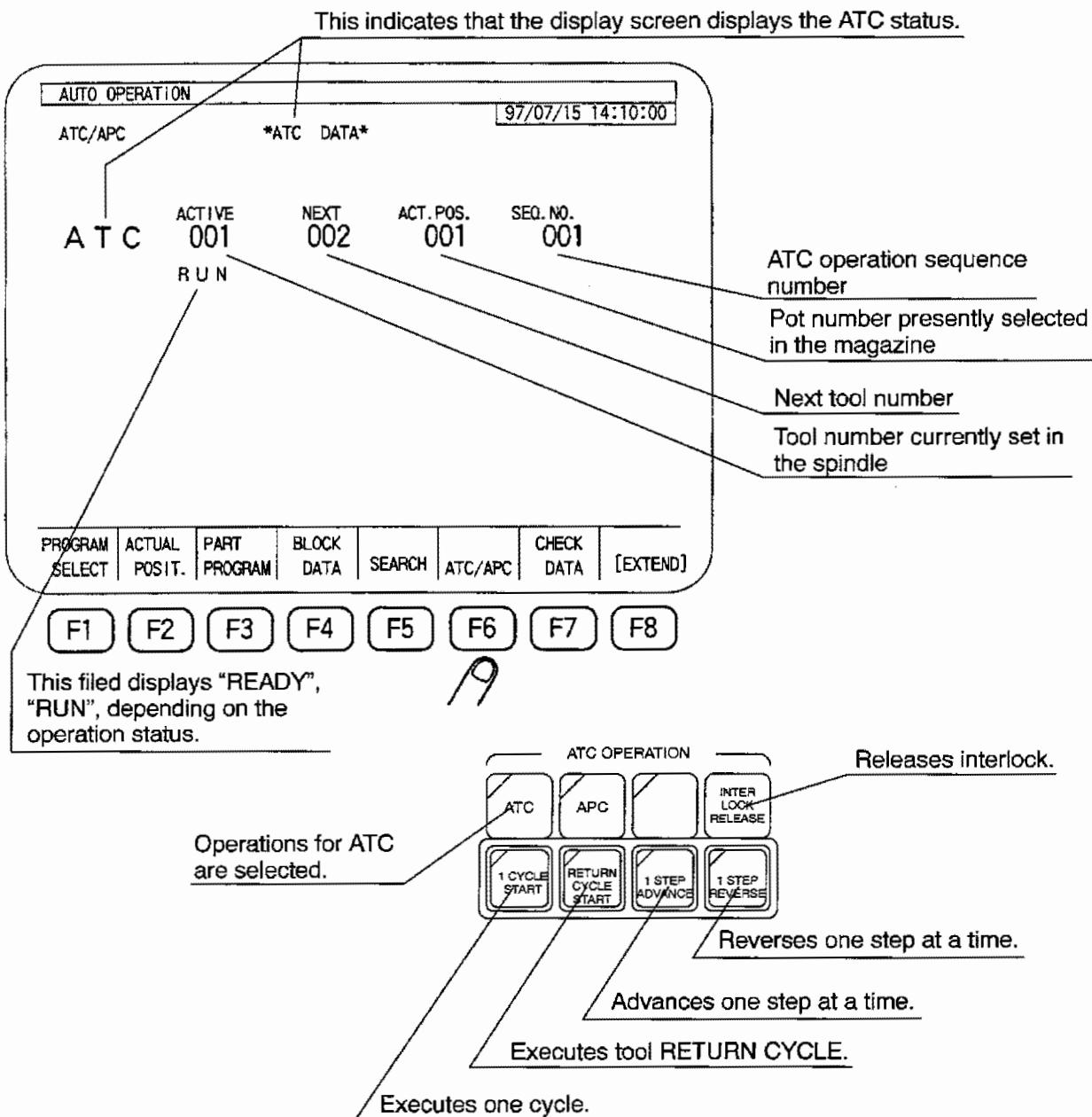


Fig. 3-1 ATC Operation Using Flat Panel

(a) ATC/APC display

In the automatic, MDI or manual mode, press function key [F6] (ATC/APC) to display the ATC/APC screen.

(b) Selection of ATC operation

Press the ATC key at the ATC OPERATION panel. Whether the ATC operation is selected can be checked by the display screen display - *ATC DATA*.

(c) 1 CYCLE START

The "1-cycle start" operation is allowed only when the message "READY" is displayed with the ATC sequence number set at "1". This automatically carries out one complete automatic tool change cycle.

When it is necessary to change the tool numbers of ACTIVE and NEXT, follow the procedure indicated in III DATA OPERATION, Section 1, 5. "Tool Data Set Commands".

(d) RETURN CYCLE START

The return cycle operation is possible from any ATC operation sequence number.

The operations activated by the pressing of the RETURN CYCLE START key depend on the ATC operation sequence where it is pressed. That is, when it is pressed before the tool change arm 180 degree rotation, the tool return cycle immediately starts and no tool change cycle occurs. However, when the RETURN CYCLE START key is pressed after the tool change arm 180 degree rotation sequence, then the automatic tool change cycle is continued.

(e) 1 STEP ADVANCE

ATC operations advance one step at a time. When the cycle does not advance even if this key is pressed, due to presence of unfulfilled conditions for tool change position or spindle orientation, press the 1 STEP ADVANCE key while pressing the INTERLOCK RELEASE key. It will then ignore them and continue operations.

This key is inoperative while the message "RUN" is being displayed on the display screen even if the ATC is not operating. In this case, clear the "RUN" message from the screen by resetting, before pressing the 1 STEP ADVANCE key.

Note that when mechanical conditions are not met, the 1 STEP ADVANCE key is not operative even when the INTERLOCK RELEASE key is pressed since these conditions are not ignored. The message "RUN" remains on the display screen.

(f) 1 STEP REVERSE

This returns the ATC operations one step each time it is pressed. Functions of the 1 STEP RETURN key are the same as the 1 STEP ADVANCE key except that the ATC operations are returned instead of advanced.

(g) INTERLOCK RELEASE

The spindle orientation completion and tool change position conditions are ignored only as long as this key is pressed. It will not ignore other mechanical conditions.

For ATC operation, refer to the maintenance manuals for each models.

(2) ATC restoration

- (a) When the ATC shuts down during the cycle, discover the defect by a diagnosis message, and, after restoring conditions, reset the ATC operation sequence number to 1 with the 1 STEP ADVANCE key.

For diagnosis message, refer to the Maintenance Manual for individual machine models.

- (b) If a disconnection occurs during ATC cycle execution, the spindle orientation completion and the tool change position conditions are erased. To restore, press the 1 STEP ADVANCE key while pressing the INTERLOCK RELEASE key to reset the ATC operation sequence number to "1".

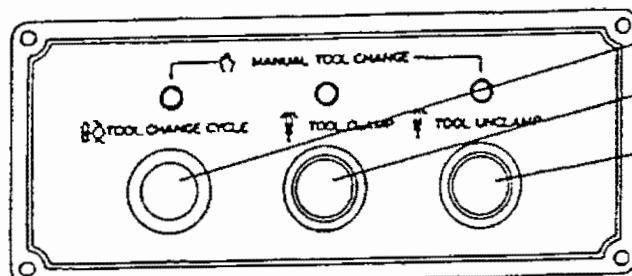
- (c) When the ATC operation is reset during the cycle, the 1 STEP ADVANCE, 1 STEP REVERSE or RETURN CYCLE START key can also be used.

- (d) In the return cycle, even when the ATC operation sequence number is set to "1" by depressing the RETURN CYCLE START key after resetting the operation, the next tool number is not set at "0". The operation above, during the ATC operation sequence, numbers smaller than those indicated above, resets the next tool number to "0". This is because the tool change operation with the next tool will possibly be made if the next tool number has been written when the ATC operation sequenced number is set to "1" by the 1 STEP ADVANCE key.

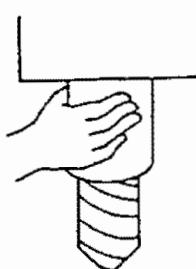
When it is necessary to set the next tool number to "0", enter T00 in the MDI mode and press the CYCLE START button after pressing the WRITE key since "0" entry for the next tool is impossible in the tool data setting mode.

To change the next tool number, set the required number at the TOOL DATA SET screen.

4-2. Manual Tool Change



- (1) Press the TOOL CHANGE CYCLE button.
- (2) Press the TOOL CLAMP button.
- (2) Press the TOOL UNCLAMP button.



(Arrangement of operation switches varies depending on machine model.)

- (1) Press the Tool CHANGE CYCLE button.

The X-, Y- and Z-axis move together to the tool change position. (varies depending on machine model.)

- (2) Hold the tool set in the spindle by hand, press the TOOL UNCLAMP button, and remove the tool.
- (3) Set the new tool in the spindle and press the TOOL CLAMP button. This completes manual tool change operation.

A lamp lights for each button pressed to show the respective condition.

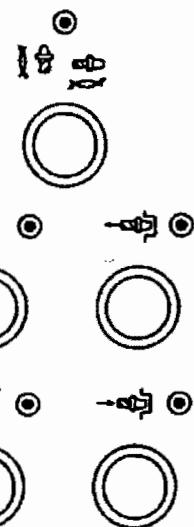


: When changing tools manually, the tool number presently on the spindle and the active tool number displayed on the ATC operation panel will differ. Write the correct active tool number on the *TOOL DATA SET* page to avoid having the tool returned to the wrong magazine pot.

MCM:

- (1) Press the TOOL CHANGE CYCLE button.

The indicating lamp above the TOOL CHANGE CYCLE button comes on indicating that a tool change cycle can be carried out.



- (2) Hold the tool in the spindle by hand or using a proper base and press the TOOL UNCLAMP button for vertical or horizontal spindle. The tool in the spindle can be removed. When the TOOL UNCLAMP button is pressed, the indicating lamp above the button comes on.

- (3) Set a new tool in the spindle and press the TOOL CLAMP button for the spindle for which the tool is to be set. This turns off the TOOL UNCLAMP and TOOL CHANGE CYCLE lamps and the manual tool change cycle ends.



- : (1) When it is necessary to cancel the manual tool change cycle mode after pressing the TOOL CHANGE CYCLE button, simply press the TOOL CHANGE FINISH button on the machine operation panel.
- (2) When changing tools manually, the tool number presently on the spindle and the active tool number displayed on the ATC operation panel will differ. Write the correct active tool number on the *TOOL DATA SET* screen to avoid having the tool returned to the swing magazine pot.

4-3. Manual Magazine Operation

Turn the MANUAL INT. switch on the MG MANUAL operation panel ON to allow manual magazine operation.

Switch Name	Function
MANUAL INT - ON	The automatic tool change cycle is interrupted immediately eve during ATC operation when the MANUAL INT. switch is ON. The lamp above the switch lights, indicating that manual magazine operations are enabled. The lamp will not light up when manual magazine operation creates hazards and it is not allowed. After returning the MANUAL INT. switch back to OFF from ON, the interrupted cycle will automatically restart from the ATC operation point reached before turning the switch to ON and will execute until up to the end of the cycle.
CONSTANT INDEX - ON	Continuously rotates the magazine without stopping at each pot.
INDEX START - CW/CCW	CW Rotates the magazine in a clockwise direction. CCW Rotates the magazine in a counterclockwise direction.
INDEX STOP	Pressing this button while the magazine is in continuous rotation stops the magazine at the nearest pot position in the direction of rotation.
EMG. STOP	Cuts operating power to the NC control box. (Refer to Section 2, 3. "Emergency Stop".)

Operating method is shown below:

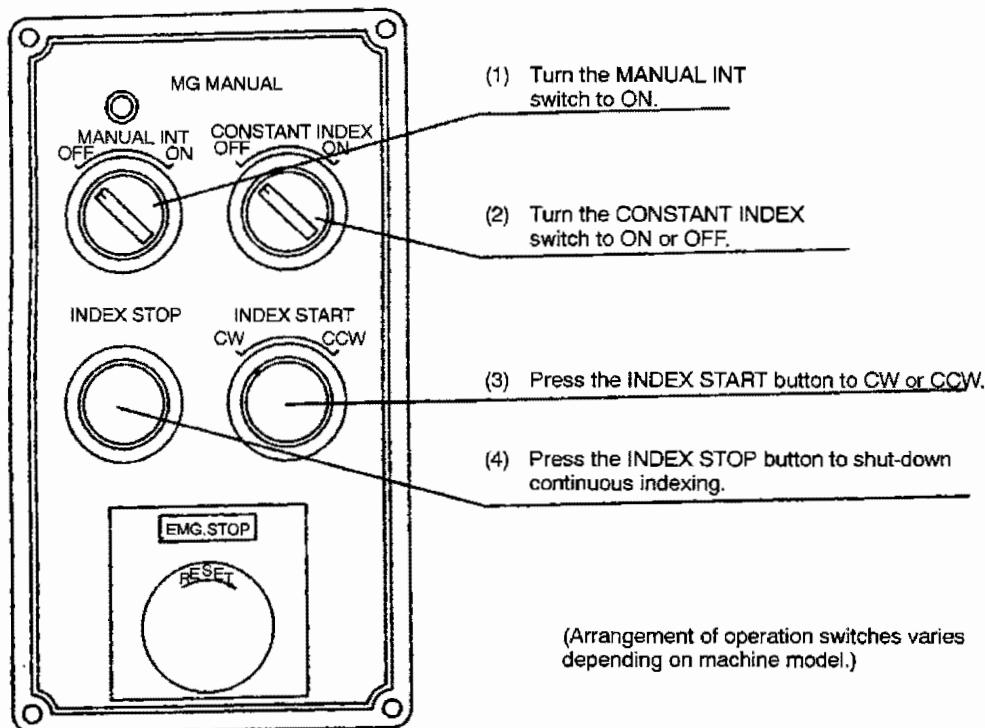


Fig. 3-2 Manual Magazine Operation

- (1) The lamp lights when the MANUAL INT. switch is ON, indicating that manual magazine operation is possible.
- (2) Set the CONSTANT INDEX switch ON or OFF.
ON Starts continuous rotations.
OFF Stops at each pot.
- (3) After setting the INDEX START button to CW or CCW, press it. The magazine starts rotating. Magazine operating conditions are shown below.

Constant Index	Index Start	Magazine Operation
ON	CW	Continuous rotation in the clockwise direction until the INDEX STOP button is pressed
	CCW	Continuous rotation in the counterclockwise direction until the INDEX STOP button is pressed
OFF	CW	Stops at each pot while rotating in the clockwise direction.
	CCW	Stops at each pot while rotating in the counterclockwise direction.

With the CONSTANT INDEX switch turned OFF, the magazine will rotate as long as the INDEX START button is pressed. Releasing the button will stop the magazine at the nearest pot position in the direction of rotation.

- (4) The magazine rotates continuously when the CONSTANT INDEX switch is turned ON. Pressing the INDEX STOP button stops the magazine at the nearest pot position in the direction of rotation.

4-4. Manual Tool Change in Automatic Mode Operation

(1) MDB

The entry of M06 places the control in the manual tool change mode like the TOOL CHANGE CYCLE button has been pressed.

Exchange the tools in the same manner as exchanging the tools in the manual mode operation.

After the completion of the tool exchange, press the TOOL CHANGE CYCLE FINISH button on the machine operation panel.

(2) MCV, MCR, MCM

The entry of M70 places the control in the manual tool change mode like the TOOL CHANGE CYCLE button has been pressed.

Exchange the tools in the same manner as exchanging the tools in the manual mode operation.

After the completion of the tool exchange, press the TOOL CHANGE CYCLE FINISH button on the machine operation panel.

5. APC

5-1. APC Operation

(1) Status Indication and operation keys

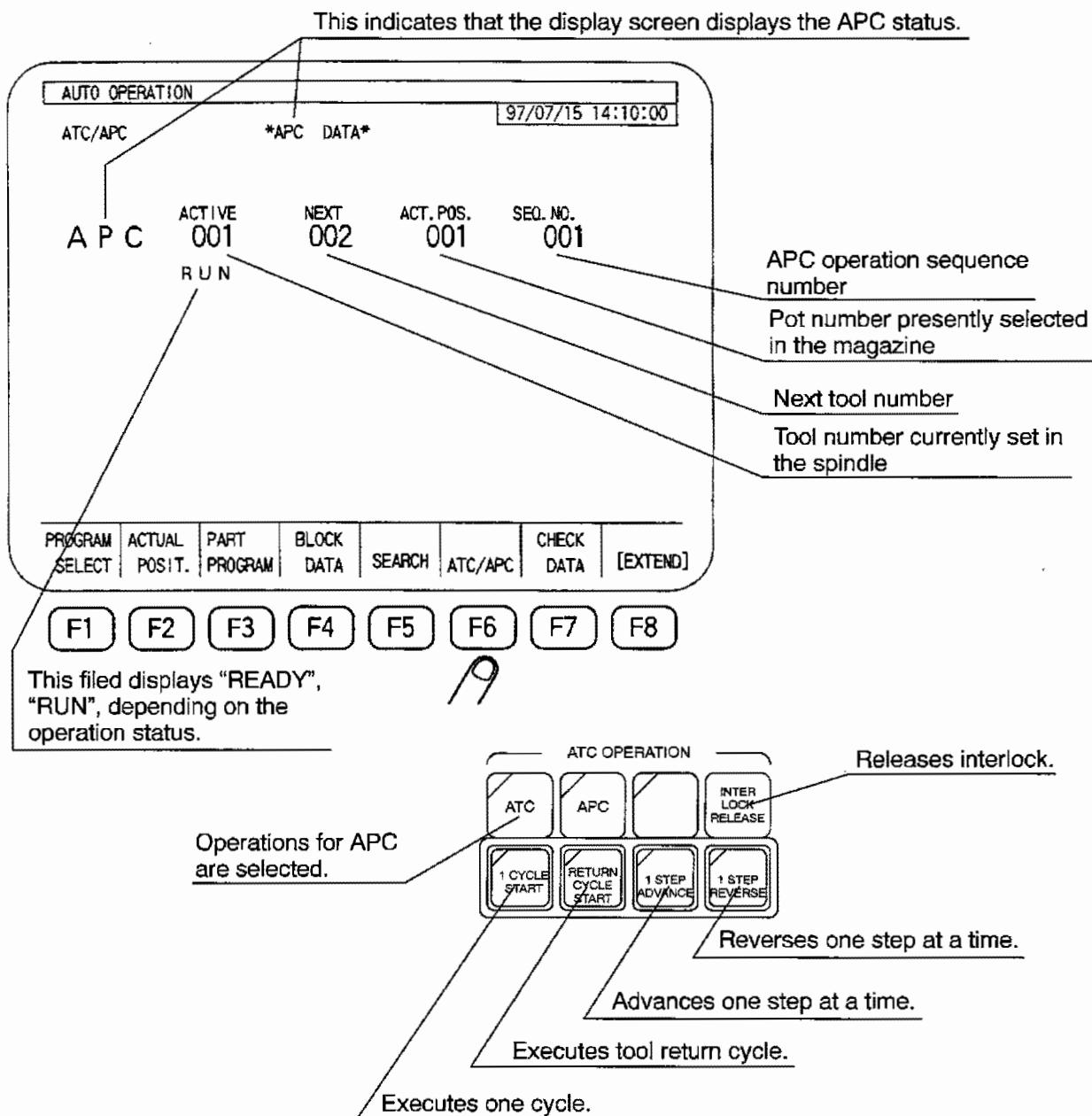


Fig. 3-3 APC Operation Using Flat Panel

(a) ATC/APC display

In the automatic, MDI or manual mode, press function key [F6] (ATC/APC) to display the ATC/APC screen.

(b) Selection of APC operation

Press the APC key at the APC OPERATION panel. Whether the APC operation is selected can be checked by the CRT screen display – *APC DATA*.

(c) 1 CYCLE START

When this key is pressed, one automatic pallet change cycle is carried out. Note that this operation is effective only when the message "READY" is displayed on the screen.

(d) RETURN CYCLE START

When this key is pressed, the automatic pallet change cycle is carried out in the reverse order up to its operation sequence number of "1".

(e) 1 STEP ADVANCE

Each time this key is pressed, the automatic pallet change cycle is advanced step by step. Note that this key is inoperative when "RUN" is displayed on the screen.

If "RUN" message is displayed for a long time, the cycle will be stopped due to unfulfilled step advance conditions. In this case, press the RESET button to clear "RUN" message and then press the 1 STEP ADVANCE key. Should "RUN" message appear again, consult your local Okuma representative.

(f) 1 STEP REVERSE

This operation returns the automatic pallet change cycle step by step each time it is pressed. Functions of the 1 STEP REVERSE key are the same as the 1 STEP ADVANCE key except that the APC operations are returned instead of advanced.

For APC operation, refer to maintenance manuals for each models.

5-2. Automatic APC Operations

(1) Pallet Change

Automatic pallet change cycle is carried out by executing the M60 command.

(2) Workpiece Setup Completion

The automatic pallet change cycle is carried out after the workpiece setup has been confirmed. This setup completion condition is confirmed by pressing the WORK LOAD FINISHED button.

The WORK LOAD FINISHED button is located on the operation panel and also on the separately installed APC operation panel (option). Both of these buttons have the same function. When the WORK LOAD FINISHED button is pressed, its indicating lamp lights.

Even when the automatic pallet change M code command is read while the workpiece setup completion is not confirmed (lamp OFF), the APC does not operate. In this case, the diagnosis message tells that the workpiece setup is not confirmed. Press the WORK LOAD FINISHED button after making sure that the workpiece has been set on the pallet.

In the manual mode, the control is always in the state that the WORK LOAD FINISHED button is pressed.

(3) WORK LOAD RESET Pushbutton Switch

If the WORK LOAD FINISHED button is pressed mistakenly while a workpiece has not been set on the pallet, this setup completion confirmation state can be cancelled by pressing the WORK LOAD RESET button.

The WORK LOAD RESET button is located on the operation panel and also on the separately installed APC operation panel (option). Both of these buttons have the same function. When the WORK LOAD RESET button is pressed, its indicating lamp goes off.

The workpiece setup completed state cannot be cancelled by pressing the RESET button.

5-3. Manual APC Operations

Manual pallet changer operation is possible when the MANUAL INT. switch is set at the ON position.

(1) Parallel or Rotary Type 2-Pallet APC (Vertical/Horizontal Machining Center)

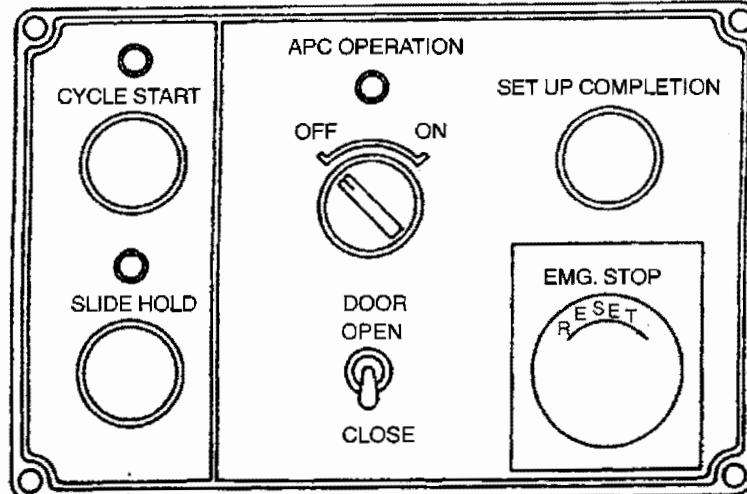


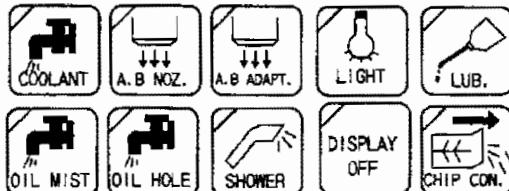
Fig. 3-4 APC Operation Panel – Parallel or Rotary Type 2-pallet APC
(Vertical/Horizontal Machining Center)

Switch Name	Function
MANUAL INT. ON/OFF	Turning the MANUAL INT. switch ON during the automatic pallet change cycle interrupts the automatic pallet change cycle being carried out and manual pallet change operation is permitted. The indicating lamp above this selector switch lights when the switch is ON. In case the manual pallet change operation is dangerous, the indicating lamp does not come on, thus inhibiting manual pallet change operation intervention. Returning the switch to the OFF position and pressing the SETUP COMPLETION button will automatically resume the interrupted automatic pallet change cycle from the sequence where the interruption has occurred up to the end of the cycle.
SETUP COMPLETION	This button should be pressed after the setup of workpiece on the pallet has been completed. The indicating lamp lights and the CNC unit acknowledges set up completion.
DOOR OPEN/CLOSE	OPEN The door enclosing the machine is opened. CLOSE ... The door enclosing the machine is closed. The setting of the DOOR CLOSE/DOOR OPEN switch is effective even when the MANUAL INT. switch is set in the OFF position. During the automatic pallet change cycle, the door will not be closed even when the switch is turned down to the CLOSE position since automatic pallet change cycle is carried out with the door open. The door will be closed only after the completion of the cycle.
CYCLE START	Pressing this button starts the NC system operation.
SLIDE HOLD	This button brings the NC system into the slide hold mode.
EMG. STOP	This button shuts off the control power of the NC system. (Refer to Section 2, 3. "Emergency Stop".)
PALLET IN POSITION (for MC-H parallel type 2-pallet APC)	The PALLET IN POSITION lamp will light when the pallet is positioned at the predetermined position.
SAFETY GUARD INTERLOCK (rotary type 2-pallet APC)	While the guard is open, the SAFETY GUARD INTERLOCK indicating lamp stays on and automatic pallet changer cycle is disabled. The lamp will go off when the safety guard is closed, thus enabling pallet changer position.

6. Other Functions

These include the COOLANT, OIL MIST, AIR BLOW, OIL HOLE, CHIP CONVEYOR and DISPLAY SCREEN.

(1) Operation keys



These keys are flat keys. When a key is pressed, the LED at the upper left corner turns on and the corresponding function is turned on. When it is pressed again, the function is turned off and the lamp goes off simultaneously.

(2) Keys

(a) COOLANT, OIL MIST, AIR BLOW, OIL HOLE

Setting of these keys is effective independent of the operation mode, whether MANUAL, MDI or AUTO.

For both M08 and M09, the M code entered last becomes effective in the same way as the coolant switches.

(b) LUB.

When the key is pressed, axis slideway is lubricated.

(c) DISPLAY ON/OFF

ON Display is disabled.

OFF Display is enabled.

Turning this key off when display screen is not required can elongate service life of display screen.

NOTICE

: Y/Z AXIS CROSS RAIL (W) CLAMP

When these axis clamp switches set at the upper position, the corresponding axis (Y for spindlehead, Z for ram and W for crossrail) is clamped with the indicating lamp lighted up. Turning the switches to the lower position unclamp the axis and the indicating lamp goes off.

If the axes are clamped during axis feed, the axis movement is brought to a stop and clamped. However, this operation will cause the guideways to be worn rapidly and therefore clamp/unclamp operation should not be carried out while the axes are being fed.

When power is turned on to the machine, X-, Y-axis and crossrail (W-axis) are in the unclamp state.