

# Section 17: Pallet Changer

## Mechanical Overview

This section will describe the operation of the optional Pallet Changer. The pallet changer may be operated within the program or by use of the UT command. The pallets ride on rails with circular bearings. The pallet is locked in place on the table with a hydraulic clamp.

This clamp is released with program coding of a pallet change or through the utility menu function. The door operates with a hydraulic valve to open and close. The pallets are moved by a mechanical arm. The two pallets are identified as pallet A and pallet B. The forward pallet is pallet A. The rear pallet is pallet B.

There are three pallet positions, loaded, stored, and working. The loaded position is when the pallet is locked onto the table with the hydraulic brake. The stored position is when the pallet is ready to be loaded onto the table. This position locks into place with a mechanical release. The working position is when the pallet is released from the stored position. The pallet must be moved to this position manually. Push the release lever down to pull the table to the working position. This is the outermost position that the pallet can be moved to. This position is the most accessible to the operator for part changes.

There are three M Functions that may be used to operate the pallet changer. These functions can be used to exchange pallets or utilize only one pallet.

**Note:** The machine parameter “DO YOU HAVE A PALLET CHANGER?” **MUST** be answered YES for the pallet to operate.

## G17.1 - G17.2 A/B Word Swap

The G17.1 word swap activates B-axis command substitution for the A-axis command. This allows the use of the A-axis rotary moves in one program for use with the rotary heads on both pallets. If the program calls for an A-axis move and the rotary device is connected to the B-axis controller, the G17.1 code will swap the A word for a B word. Existing programs written for the dual 4th axis setups that contain the A and B words are allowed. The G17.1 will automatically swap the B words to A words. The G17.2 word cancels A/B axis command swap mode.

### **M31 Exchange Pallets**

M31 performs a pallet exchange. The pallet changer will store the current pallet on the machining table and load the other pallet onto the machining table. No other machine movements will be made. This is the only code allowed on the program line.

**Note:** All fixture and machine offsets MUST be canceled prior to attempting a pallet change.

### **M32 Store Pallet B and Load Pallet A**

When Pallet B is on the table, M32.1 will STORE Pallet B (outside machining area) and pallet arm will move to Pallet A. The machine will be placed in the WAITING state and the pallet door will remain open until the START button is pressed. When the START button is pressed Pallet A will be returned to the table inside the machining area (LOADED).

When Pallet A is on the table, M32.1 will STORE Pallet A. The machine will be placed in the WAITING state and the pallet door will remain open until the START button is pressed. When the START button is pressed Pallet A will be returned to the table inside the machining area (LOADED).

**Note:** All fixture and machine offsets MUST be canceled prior to attempting a pallet change.

### **M32.1 Store Pallet B & Load Pallet A & Verify Pallet A has been Loaded**

When Pallet B is on the table, M32.1 will STORE Pallet B and LOAD Pallet A. If Pallet A is at LOAD position (on machining table), M32.1 will verify Pallet A is at LOAD (on machining table). No movement will occur.

### **M33 Store Pallet A and Load Pallet B**

When Pallet A is on the table, M33 will STORE Pallet A (outside the machining area) and the pallet arm will move to Pallet B. The machine will be placed in the WAITING state and the pallet door will remain open until the START button is pressed. When the START button is pressed, Pallet B will be returned to the table inside the machining area (LOADED).

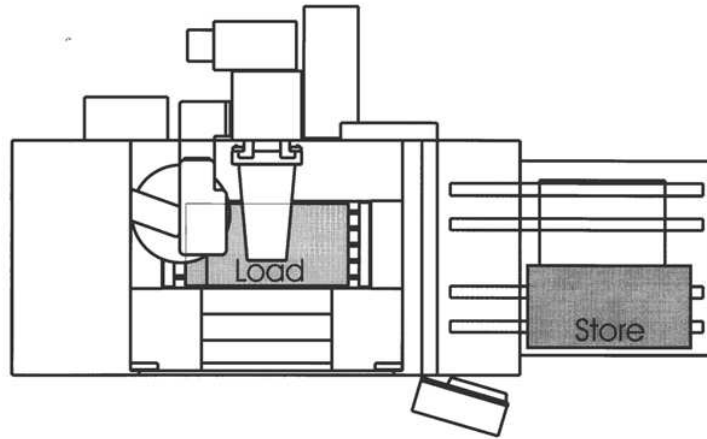
When Pallet B is on the table, M33 will STORE Pallet B. The machine will be placed in the WAITING state and the pallet door will remain open until the START button is pressed. When the START button is pressed, Pallet B will be returned to the table inside the machining area (LOADED).

**Note:** All fixture and machine offsets MUST be canceled prior to attempting a pallet change.

**M33.1 Store Pallet A & Load Pallet B & Verify Pallet B has been Loaded**

When Pallet A is on the table, M33.1 will STORE Pallet A and LOAD Pallet B.

If Pallet B is at LOAD position (on machining table), M33.1 will verify Pallet B is at LOAD (on machining table). No movement will occur.



**Figure 17-1** Pallet B at LOAD Position

**Note:** The table move to the pallet position may be stopped with the SLIDE HOLD button. The pallet movement to and from the stored position may also be stopped with the SLIDE HOLD button.

**Note:** The pallet MUST be in the stored position to change pallets. When in the working position, the message “RETURN PALLET TO THE STORED POSITION” will appear if a change is attempted.

**Note:** The air and hydraulics are turned off between M32 and M33 pallet changes, and after a STORE PALLET in the pallet utilities.

**Note:** When a pallet is placed in the service position during a pallet change, the machine tool enters the WAITING state.

**Pallet A Rotary Table & Pallet B Rotary Table Override Potentiometer**

Pallet changer machines that are equipped with dual rotary tables have two potentiometers located on the sheet metal, one to the left and one to the right of the pallet door. They are Pallet A rotary table potentiometer for the rotary table on Pallet A, and Pallet B rotary table potentiometer for the rotary table on Pallet B. This is assuming the rotary table on the Pallet A is A axis, and Pallet B rotary table is B axis.

Potentiometers will become active after Cold Starting the machine and then enabling the M48.2, Pallet A rotary table override pot, or M48.3, Pallet B rotary table override pot. These M codes may be used in a program or in MDI mode. The intention of the potentiometers are to allow the operator to turn the rotary table for removing or installing the workpiece.

The rotary tables will return automatically to the original position when the M49.2, Pallet A Rotary Table Override Potentiometer Disable, or M49.3, Pallet B Rotary Table Override Potentiometer Disable, is programmed. This may also be done in a program or in MDI mode. The movement of the rotary table will be slow when the potentiometer is turned. When the axis is returned with disable codes (M49.2 or M49.3) the move will be automatic and slow in speed. This rate of speed is not adjustable. The corresponding pot disable M code will lock out the potentiometer and then bring the rotary tables to the last position. This will ensure that the rotary tables are in the original position before returning to the work area.

**M48.2 Pallet A  
Rotary Table  
Override  
Potentiometer  
Enable**

M48.2 enables the Pallet A rotary table axis override pot while Pallet A is stored.

**M49.2 Pallet A  
Rotary Table  
Override  
Potentiometer  
Disable**

M49.2 disables the Pallet A rotary table axis override pot while Pallet A is stored.

**M48.3 Pallet B  
Rotary Table  
Override  
Potentiometer  
Enable**

M48.3 enables the Pallet B rotary table axis override pot while Pallet B is stored.

**M49.3 Pallet B  
Rotary Table  
Override  
Potentiometer  
Disable**

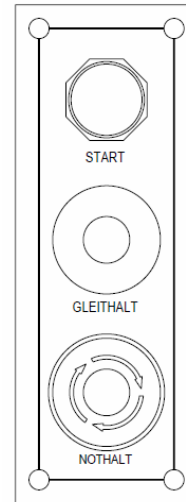
M49.3 disables the Pallet B rotary table axis override pot while Pallet B is stored.

**EXAMPLE:** *N3 E0 X0Y0 A0*

N4 M33.1 (STORE PALLET A, LOAD PALLET B IN MACHINING AREA  
 N5 M48.2 (PALLET A ROTARY OVERRIDE POT ENABLE  
 ...  
 N506 M49.2 (PALLET A ROTARY OVERRIDE POT DISABLE  
 N507 E0 X0 Y0 A0  
 N508 M33.1 (STORE PALLET B ROTARY OVERRIDE POT ENABLE  
 ...  
 N1017 M49.3 (PALLET B ROTARY OVERRIDE POT DISABLE

## Remote Machine Control

There are two remote machine control panels mounted by the pallet work area. These controls provide the operator with the START, SLIDE HOLD, and EMERGENCY STOP buttons for machine control. They are located on the side of the machine enclosure at both pallet work areas.



**Figure 17-2** Remote Machine Control

## Utility Menu

The pallets may also be operated using the UT command. When the UT command is entered, the following menu appears:

```

X           0       0
Y           0       0
Z           0       0 c

UTILITY OPTIONS:
1  TOOL SETTING CYCLE
2  FIXTURE OFFSET SETTING
3  TEST TS-20 PROBE
4  TEST MP PROBE
5  PALLET CHANGER
6  CLOCKS
7  EXIT
ENTER OPTION NUMBER <
```

**Figure 17-3** Utility Menu

```
X      0      0
Y      0      0
Z      0      0 c

PALLET CONTROLS:
1 EXCHANGE PALLETS (A-B)
2 LOAD-STORE PALLET A
3 LOAD-STORE PALLET B
4 SERVICE UTILITY
5 EXIT
ENTER OPTION NUMBER (
```

**Figure 17-4** Pallet Controls Menu

**OPTION 1** When option 1 is selected, the following sequence will occur:

- 1) The door opens.
- 2) The machine enters the WAITING state, and the message “PRESS START TO MOVE PALLET” appears. The X, Y, M48, F150, and G1 will also appear if a table move is necessary.
  - a. When the START button is pressed, the machine will move to position for the pallet change. When in position the machine will enter the WAITING state.
- 3) When the START button is pressed, the hydraulic clamp is released and the pallet will move to the stored position. The table then moves into position to receive the other pallet. The pallet is moved into the loaded position on the table. The hydraulic clamp is engaged and the door is closed.
- 4) The PALLET CONTROLS menu is displayed.

**OPTION 2** If Pallet B is on the table, this option performs the same as option 1. When option 2 is selected and Pallet A is on the table, the following will occur:

- 1) The door opens.
- 2) The machine enters the WAITING state, and the message “PRESS START TO MOVE PALLET” appears. The X, Y, M48, F150, and G1 will also appear if a table move is necessary.
  - a. When the START button is pressed the machine will move to position for the pallet change. When in position the machine will enter the WAITING state.

- 3) When the START button is pressed the hydraulic clamp is released and the pallet will move to the stored position. The machine enters the WAITING state for the operator to change parts.
- 4) When the START button is pressed the pallet is returned to the loaded position and the door closes.
- 5) The PALLET CONTROLS menu is displayed.

**OPTION 3** If Pallet A is on the table, this option performs the same as option 1. When option 2 is selected and Pallet B is on the table, the following sequence will occur:

- 1) The door opens.
- 2) The machine enters the WAITING state, and the message, "PRESS START TO MOVE PALLET" appears. The X, Y, M48, F150, and G1 will also appear if a table move is necessary.
  - a. When the START button is pressed the machine will move to position for the pallet change. When in position the machine will enter the WAITING state.
- 3) When the START button is pressed the hydraulic clamp is released and the pallet will move to the stored position. The machine enters the WAITING state for the operator to change parts.
- 4) When the START button is pressed the pallet is returned to the loaded position.
- 5) The PALLET CONTROLS menu is displayed.

**OPTION 4** When this option is selected the following menu appears:

```

X           0       0
Y           0       0
Z           0       0 c

PALLET SERVICE UTILTIY:
1 CLAMP/UNCLAMP
2 OPEN/CLOSE DOOR
3 STORE PALLET
4 LOAD PALLET
5 MOVE TABLE TO A
6 MOVE TABLE TO B
7 DISPLAY SWITCHES
8 JOG
9 EXIT
ENTER OPTION NUMBER (
  
```

**Figure 17-5** Pallet Service Utility Menu

**OPTION 1:** This option toggles the hydraulic clamp on and off.

**OPTION 2:** This option toggles the door open and closed.

**OPTION 3:** The table **MUST** be in position to receive a pallet the following occurs:

- a. The door opens if not already open.
- b. The machine enters the WAITING state and displays the message “PRESS START TO MOVE PALLET”.
- c. When the START button is pressed, the pallet moves to the stored position. While the pallet moves to this position, the message “STORING PALLET...” appears. If the pallet is already stored, the message “STORING PALLET...PALLET IN STORAGE” appears and the control is returned to the command mode.

**OPTION 4:** This option is only used when the table is empty. The table **MUST** be in position to receive the pallet. See option 5 and 6. When the table is in position, the following occurs:

- a. The door opens if not already open.
- b. The machine enters the WAITING state and displays the message “PRESS START TO MOVE PALLET”
- c. When the START button is pressed, the pallet moves to the loaded position on the table. While moving to the loaded position the message “LOADING PALLET...” appears. If the table is not in the change position the message “LOADING PALLET...RAILS NOT ALIGNED” appears and the control returns to the command mode.

**OPTION 5:** This option moves the table to the change position for Pallet A. The following occurs:

- a. The door opens.
- b. The machine enters the WAITING state and displays the message “PRESS START TO MOVE PALLET”. The X, Y, M48, F150, and G1 will also appear if a table move is necessary.
- c. When the START button is pressed, the table moves to the change position for Pallet A.

**OPTION 6:** This option moves the table to the change position for Pallet B. The following occurs:



- a. The door opens.
- b. The machine enters the WAITING state and displays the message “PRESS START TO MOVE PALLET”. The X, Y, M48, F150, and G1 will also appear if a table move is necessary.
- c. When the START button is pressed, the table moves to the change position for Pallet B.

**OPTION 7:** This option displays the maintenance switches for the pallet system. This option is to be used by trained maintenance personnel.

**OPTION 8:** This option allows the operator to enter the JOG mode. The message “PRESS JOG TO CONTINUE OR MANUAL TO EXIT” appears. Press the JOG button to enter the Jog mode. When in the Jog mode, press MANUAL to return to the pallet service utility menu. If the MANUAL button is pressed when this message appears, the control returns to the command mode.

**OPTION 9:** This option is used to return to the PALLET CONTROLS menu.

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