Upon receipt of the product and prior to initial operation, read these instructions thoroughly, and retain for future reference.

MOTOMAN INSTRUCTIONS

The DX200 operator’s manual above corresponds to specific usage. Be sure to use the appropriate manual.
MANDATORY

• This manual explains MOTOPAL of the DX200 system. Read this manual carefully and be sure to understand its contents before handling the DX200.

• General items related to safety are listed in Chapter 1: Safety of the DX200 INSTRUCTIONS. To ensure correct and safe operation, carefully read the DX200 INSTRUCTIONS before reading this manual.

CAUTION

• Some drawings in this manual are shown with the protective covers or shields removed for clarity. Be sure all covers and shields are replaced before operating this product.

• The drawings and photos in this manual are representative examples and differences may exist between them and the delivered product.

• YASKAWA may modify this model without notice when necessary due to product improvements, modifications, or changes in specifications. If such modification is made, the manual number will also be revised.

• If your copy of the manual is damaged or lost, contact a YASKAWA representative to order a new copy. The representatives are listed on the back cover. Be sure to tell the representative the manual number listed on the front cover.

• YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids your product’s warranty.
Notes for Safe Operation

Read this manual carefully before installation, operation, maintenance, or inspection of the DX200.

In this manual, the Notes for Safe Operation are classified as “WARNING”, “CAUTION”, “MANDATORY”, or “PROHIBITED”.

- **WARNING**: Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to personnel.

- **CAUTION**: Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury to personnel and damage to equipment. It may also be used to alert against unsafe practices.

- **MANDATORY**: Always be sure to follow explicitly the items listed under this heading.

- **PROHIBITED**: Must never be performed.

Even items described as “CAUTION” may result in a serious accident in some situations.

At any rate, be sure to follow these important items

To ensure safe and efficient operation at all times, be sure to follow all instructions, even if not designated as “CAUTION” and “WARNING”.

WARNING

• Before operating the manipulator, check that servo power is turned OFF pressing the emergency stop buttons on the front door of the DX200 and the programming pendant. When the servo power is turned OFF, the SERVO ON LED on the programming pendant is turned OFF.

Injury or damage to machinery may result if the emergency stop circuit cannot stop the manipulator during an emergency. The manipulator should not be used if the emergency stop buttons do not function.

Figure 1: Emergency Stop Button

• Once the emergency stop button is released, clear the cell of all items which could interfere with the operation of the manipulator. Then turn the servo power ON.

Injury may result from unintentional or unexpected manipulator motion.

Figure 2: Release of Emergency Stop

• Observe the following precautions when performing teaching operations within the P-point maximum envelope of the manipulator:
  – View the manipulator from the front whenever possible.
  – Always follow the predetermined operating procedure.
  – Keep in mind the emergency response measures against the manipulator’s unexpected motion toward you.
  – Ensure that you have a safe place to retreat in case of emergency.

Improper or unintended manipulator operation may result in injury.

• Confirm that no person is present in the P-point maximum envelope of the manipulator and that you are in a safe location before:
  – Turning ON the power for the DX200.
  – Moving the manipulator with the programming pendant.
  – Running the system in the check mode.
  – Performing automatic operations.

Injury may result if anyone enters the P-point maximum envelope of the manipulator during operation. Always press an emergency stop button immediately if there is a problem. The emergency stop buttons are located on the right of the front door of the DX200 and the programming pendant.
Definition of Terms Used Often in This Manual

The MOTOMAN is the YASKAWA industrial robot product.
The MOTOMAN usually consists of the manipulator, the controller, the programming pendant, and supply cables.

In this manual, the equipment is designated as follows:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>DX200 controller</td>
<td>DX200</td>
</tr>
<tr>
<td>DX200 programming pendant</td>
<td>Programming pendant</td>
</tr>
<tr>
<td>Cable between the manipulator and the controller</td>
<td>Manipulator cable</td>
</tr>
</tbody>
</table>

CAUTION

- Perform the following inspection procedures prior to conducting manipulator teaching. If problems are found, repair them immediately, and be sure that all other necessary processing has been performed.
  - Check for problems in manipulator movement.
  - Check for damage to insulation and sheathing of external wires.
- Always return the programming pendant to the hook on the DX200 cabinet after use.

The programming pendant can be damaged if it is left in the manipulator's work area, on the floor, or near fixtures.

- Read and understand the Explanation of Warning Labels in the DX200 Instructions before operating the manipulator:
Descriptions of the programming pendant, buttons, and displays are shown as follows:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programming Pendant</td>
<td>The keys which have characters printed on them are denoted with [ ].</td>
</tr>
<tr>
<td>Character Keys</td>
<td>ex. [ENTER]</td>
</tr>
<tr>
<td>Symbol Keys</td>
<td>The keys which have a symbol printed on them are not denoted with [ ] but depicted</td>
</tr>
<tr>
<td></td>
<td>with a small picture. ex. page key</td>
</tr>
<tr>
<td>ex. page key</td>
<td>The cursor key is an exception, and a picture is not shown.</td>
</tr>
<tr>
<td>Axis Keys</td>
<td>“Axis Keys” and “Number Keys” are generic names for the keys for axis operation and</td>
</tr>
<tr>
<td>Number Keys</td>
<td>number input.</td>
</tr>
<tr>
<td>Keys pressed simultaneously</td>
<td>When two keys are to be pressed simultaneously, the keys are shown with a “+”</td>
</tr>
<tr>
<td></td>
<td>sign between them, ex. [SHIFT]+[COORD]</td>
</tr>
<tr>
<td>Displays</td>
<td>The menu displayed in the programming pendant is denoted with { }.</td>
</tr>
<tr>
<td></td>
<td>ex. {JOB}</td>
</tr>
</tbody>
</table>

**Description of the Operation Procedure**

In the explanation of the operation procedure, the expression "Select • • • " means that the cursor is moved to the object item and the SELECT key is pressed, or that the item is directly selected by touching the screen.

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1 Introduction

1.1 What Is MOTOPAL?

MOTOPAL is the application software for pelletizing which runs on the Programming Pendant.

By MOTOPAL you can

- Select and run palletizing programs which you want to run easily.
- Create palletizing programs without teaching.
- Modify the position of palletizing programs easily.
- Monitor the status of conveyors, stations, hand and robot.
- Change the status of conveyors, stations, hand and robot.

NOTE

Before using MOTOPAL, MOTOPAL need to be set up according to DX200 OPTIONS INSTRUCTIONS FOR MOTOPAL SETUP.

1.2 How to Start Up MOTOPAL

When you start up MOTOPAL, the CompactFlash card which contains the appropriate data for MOTOPAL need to be inserted to the Programming Pendant. Without the CompactFlash card, MOTOPAL cannot start up and the following message appears.
1.2 How to Start Up MOTOPAL

1.2.1 One Touch Start Up
1. Press [MOTOPAL] button at the lower right corner of the display of the Programming Pendant.

1.2.2 Normal Start Up
1. Press [OPTION] button in MAIN menu. And the sub menu appears.
2. Press [MOTOPAL] button.

1.2.3 Automatic Start Up
MOTOPAL might start up automatically after you switch on DX200 according to the setting.

NOTE
There might not be this one touch button at the lower right corner of the display of the Programming Pendant according to the setting. In this case, start up MOTOPAL according to Section 1.2.2 “Normal Start Up” on page 1-2.
1.3 Input Operation in MOTOPAL

When you input numbers or characters to the items of MOTOPAL, follow the procedure below.

1.3.1 How to Input Numbers

1. Touch the item twice.
   or

1. Touch the item once and then press [SELECT] key on the Programming Pendant.
2. Input numbers by numeric keys on the Programming Pendant.

1.3.2 How to Input Characters

1. Touch the item twice.
   or

1. Touch the item once and then press [SELECT] key on the Programming Pendant.
2. Input characters by the software keypad.

For the way to use the software keypad, refer to DX200 OPERATOR’S MANUAL.
The numbers of CONVEYOR button and STATION button are not always 6. They are adjusted to your system.
MotoPal 2 MAIN Window of MOTOPAL
2.1 MENU BUTTON

2.1 MENU BUTTON

OPERATION button
Pressing this button changes the window to OPERATION window where you can select programs which you would like to run. Refer to Section 3.1 “How to Select Programs” on page 3-1.

MANUAL OPERATION button
Pressing this button changes the window to MANUAL OPERATION window where you can monitor / change the status of Conveyors, Stations, Hand and Robot. Refer to Chapter 4 MANUAL OPERATION.

PROGRAM button
Pressing this button changes the window to PROGRAM window where you can create / modify the pelletizing program. Refer to Chapter 5 How to Create / Make a Program.

SETTING button
Pressing this button changes the window to SETTING window where you can go to DX200 standard window. Refer to Chapter 6 Setting Menu.
2.2 PALLETIZE STATUS VIEW

CONVEYOR / button
- Display
This button shows the following 3 status.

<table>
<thead>
<tr>
<th>Status</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>![Normal]</td>
</tr>
<tr>
<td>Product Exist</td>
<td>![Product Exist]</td>
</tr>
<tr>
<td>Error</td>
<td>![Error]</td>
</tr>
</tbody>
</table>

- Button
Pressing this button changes the window to MANUAL OPERATION of CONVEYOR window. Refer to Section 4.1 “MANUAL OPERATION of CONVEYOR” on page 4-1.

STATION / button
- Display
This button shows the following 3 status.

<table>
<thead>
<tr>
<th>Status</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>![Normal]</td>
</tr>
<tr>
<td>Pallet is full</td>
<td>![Pallet is full]</td>
</tr>
<tr>
<td>Error</td>
<td>![Error]</td>
</tr>
</tbody>
</table>

- Number of layers and pieces
Left number shows the number of current layer and right number shows the number of pieces in the current layer. Both numbers shows how many layers and pieces have been already placed on the pallet.

- Button
Pressing this button changes the window to MANUAL OPERATION of STATION window. Refer to Section 4.2 “MANUAL OPERATION of STATION” on page 4-4.

ROBOT / button
- Display
This button can show the following 3 status.

<table>
<thead>
<tr>
<th>Status</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>![Normal]</td>
</tr>
<tr>
<td>Alarm / Error</td>
<td>![Alarm / Error]</td>
</tr>
</tbody>
</table>

- Speed
The number shows the override speed of the robot. Refer to Section 4.3 “MANUAL OPERATION of ROBOT” on page 4-6 also.

- Button
Pressing this button changes the window to MANUAL OPERATION ROBOT window. Refer to Section 4.3 “MANUAL OPERATION of ROBOT”.

HAND / button
- Display
This button can show the following 2 status.

<table>
<thead>
<tr>
<th>Status</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>![Normal]</td>
</tr>
<tr>
<td>Error</td>
<td>![Error]</td>
</tr>
</tbody>
</table>

- Button
Pressing this button changes the window to MANUAL OPERATION of HAND window. Refer to Section 4.4 “MANUAL OPERATION of HAND” on page 4-8.
## 2.3 SPECIAL OPERATION BUTTON

### CYCLE STOP

- **Display**
  
  This button shows the status of CYCLE STOP mode.

  - **CYCLE STOP mode is OFF**
  - **CYCLE STOP mode is ON**

  ![CYCLE STOP]

  When CYCLE STOP mode is ON, the robot will stop after placing the product on a pallet.

- **Button**
  Pressing this button turns on / off CYCLE STOP mode.

### RETURN OPEORG Button

- **Display**
  
  This button shows whether robot is in Operation Origin.

  - **Robot is out of Operation Origin**
  - **Robot is in Operation Origin**

  ![RETURN OPEORG]

- **Button**
  
  On the following condition, pressing this button makes the robot return to Operation Origin.
  
  - The robot is out of Operation Origin.
  - Mode is "PLAY".
  - Servo power is ON.
  - The robot is not running.

### SAFETY SPEED Button

- **Display**
  
  This button shows the status of SAFETY SPEED mode.

  - **SAFETY SPEED mode is OFF**
  - **SAFETY SPEED mode is ON**

  ![SAFETY SPEED]

  When SAFETY SPEED mode is ON, the speed of the robot is limited to safety level.

- **Button**
  Pressing this button turns on / off SAFETY SPEED mode.
## 2.4 ROBOT STATUS DISPLAY AREA

ROBOT STATUS DISPLAY AREA shows robot status and is always displayed at the top of MOTOPAL window.

### A. Operation coordinate system

This icon expresses the selected coordinate system which can be switched by pressing [COORD] key on the Programming Pendant.

- : Joint Coordinates
- : Cartesian Coordinates
- : Cylindrical Coordinates
- : Tool Coordinates
- : User Coordinates

### B. Manual speed

This icon expresses the selected manual speed which can be switched by pressing [FAST] or [SLOW] key on the Programming Pendant.

- : Inching
- : Low Speed
- : Medium Speed
- : High Speed

---

**NOTE**

Icons in ROBOT STATUS DISPLAY AREA are same as ones in DX200 standard window. Refer to DX200 OPERATOR’S MANUAL also.
3 How to Run Palletize Programs

3.1 How to Select Programs

1. Stop the programs according to Section 3.3.1 “Cycle Stop” on page 3-3 if the robot is running.

2. Press [OPERATION] button in MAIN window and OPERATION window appears.

3. List the program which you want to run in OPERATION window.

   (1) When you want to add a program.

      i) Press [ADD] button and PROGRAM LIST appears.
3.2 How to Run Programs

3.2.1 Normal Operation

1. Go to MAIN window of MOTOPAL.

2. Set the mode switch on the Programming Pendant to "PLAY".

3. Turn on the servo power by pressing [Servo ON Ready] key on the Programming Pendant.


NOTE Always run programs from MAIN window of MOTOPAL.

3.2.2 Limited Speed Operation

In such cases that you try the program which you have just created or you have just recovered problems of your system, run the programs by this limited speed operation for safety.

1. Press [SAFETY SPEED] button in MAIN window of MOTOPAL and Make SAFETY SPEED mode Activated

2. Run the programs according to Section 3.2.1 "Normal Operation".

3. Press [SAFETY SPEED] button in MAIN window of MOTOPAL and Make SAFETY SPEED mode deactivated. The robot will run at programmed speed.

SAFETY SPEED mode can be turned on and off anytime even during the robot’s running by pressing [SAFETY SPEED] button.
3.3 How to Stop Programs

3.3.1 Cycle Stop
1. Press [CYCLE STOP] button in the MAIN window of MOTOPAL during robot’s running and activate CYCLE STOP mode. The robot will stop after placing the product on the pallet.

3.3.2 Hold Stop
1. Press the [HOLD] button on the Programming Pendant while robot is running. The robot will stop when pressing [HOLD] button.

3.3.3 Emergency Stop
1. Press [EMERGENCY STOP] button on the Programming Pendant. The robot will stop immediately and the servo power supply that drives the robot will turn off.

3.4 How to Restart

3.4.1 Continuous Restart
If the robot can continue to restart from the current position and status, run program according to Section 3.2.1 “Normal Operation” on page 3-2.

1. Run the programs according to Section 3.2.1 “Normal Operation”.

3.4.2 Restart from Operation Origin
When restarting the programs that is not in the current position of the robot but from Operation Origin, follow the procedure below.

1. Set the Mode switch on the Programming Pendant to “PLAY”.
2. Turn on the servo power by pressing [Servo ON Ready] key on the Programming Pendant.
3. Press [RETURN OPEORG] button in the MAIN window of MOTOPAL. The robot will go to Operation Origin.

When the servo power cannot be turned on, refer to Chapter 8 Troubles and Countermeasures.

In the following condition, the robot can go to Operation Origin when pressing [RETURN OPEORG] button.
- The robot is out of Operation Origin.
- Mode is “PLAY”.
- Servo power is ON.
- The robot is not running.

4. Run the programs according to Section 3.2.1 “Normal Operation” after the robot reach Operation Origin.
3.5 Other Operation Ways

In MOTOPAL, various operations are possible. Here some examples are described.

3.5.1 Change the Number of Layers and/or Pieces

In such cases that you have placed products manually or products already placed on a pallet dropped, run the programs after changing the number of layers and or pieces as below.

1. Stop the programs according to Section 3.3.1 “Cycle Stop” on page 3-3.
2. Go to MANUAL OPERATION of STATION window.
   (1) Press [STATION] button in PALLETIZE STATUS VIEW in MAIN window of MOTOPAL.
   Or
3. Change the number of [Layers] and/or [Pieces].
4. Press the [Close] button and go back to MAIN window.
5. Run the programs according to Section 3.2.1 “Normal Operation” on page 3-2.

Note: The number in both [Layers] and [Pieces] means how many layers and pieces have been already placed on the pallet.

Refer to Section 4.2 “MANUAL OPERATION of STATION” on page 4-4.

3.5.2 Eject a Pallet

When you want to eject a pallet before a pallet is full, please follow the procedure below.

1. Go to MANUAL OPERATION of STATION window.
   (1) Press the [STATION] button in PALLETIZE STATUS VIEW of MAIN window of MOTOPAL.
   Or
3. Press [Close] button and go back to MAIN window.

Refer also to Section 4.2 “MANUAL OPERATION of STATION” on page 4-4.

3.5.3 Change the Robot Speed

1. Go to MANUAL OPERATION of ROBOT window.
   
   (1) Press [ROBOT] button in PALLETIZE STATUS VIEW in MAIN window of MOTOPAL.

   Or

   (1) Press [MANUAL OPERATION] menu button in MAIN window of MOTOPAL. MANUAL OPERATION window appears then press the [ROBOT] menu button.

2. Change the override speed.

3. Press the [Close] button and go back to MAIN window.

Refer also to Section 4.3 “MANUAL OPERATION of ROBOT” on page 4-6.

3.5.4 Automatic Recognition of the Pallet Number

When executing jobs, the number of the pallet is automatically recognized by a phototube.

To execute this function, create a program by inputting the maximum value to [Pallet Num.] in (6) procedure in Section 5.1 “Create a New Program” on page 5-1 step 7.

An alarm “4438 UNDEFINED JOB” occurs in case higher Pallet Num. value than the value set at above mentioned procedure is input.

1. After setting desired number of pallets, execute this program following Section 3.2.1 “Normal Operation” on page 3-2.

When a job is executed, the automatic recognition of the pallet number by the phototube starts only after “0” is input to both “Layer” and “Pieces” of the relevant station.

If “0” has not been input, change the value to “0” by following Section 3.5.5 “Modification of the Pallet Number” on page 3-6.

In case “0” is input to both “Layer” and “Pieces” of the relevant station and some workpieces are put on the third or upper layers of the pallet, an alarm “8900 PALLET_IO_ERROR” occurs when a job is executed.
3.5 Other Operation Ways

3.5.5 Modification of the Pallet Number

When putting products on the pallet manually while executing a job by automatically recognizing the numbers of the pallet with the phototube, modify the number of pallets by following the procedures below:

1. In case the manipulator is in operation, stop its programs by referring to Section 3.3.1 “Cycle Stop” on page 3-3.

2. Display MANUAL OPERATION of STATION window.
   (1) Press {STATION} button in PALLETIZE STATUS VIEW in MAIN Window of MOTOPAL.
   Or
   (1) Press {MANUAL OPERATION} button in MAIN window of MOTOPAL. MANUAL OPERATION window appears. And then, press {STATION} menu button.

3. Modify the value of [Pallet Num.].

4. Press (CLOSE) button to return to the MAIN window.

5. Execute the program following the procedures in Section 3.3.1 “Cycle Stop”.

**NOTE** Jobs cannot be executed in case the signal of the first layer is turned OFF (due to failure of the phototube, etc.).

**NOTE** The height of the pallet will not be recognized appropriately if it is not same as the width of the phototube.

**SUPPLEMENT** When a value other than “1 to 3” is input to [Pallet Num.], a message “Pallet number need to be between 1 and 3.” appears.

**NOTE** When “0” is input to both [Layer] and [Pieces] of the relevant station, the value input to [Pallet Num.] will not be reflected.

**NOTE** If the value input to [Pallet Num.] is higher than the value set at [Pallet Num.] in (6) procedure of step 7 in Section 5.1 “Create a New Program” on page 5-1, an alarm “4438 UNDEFINED JOB” occurs when the job is executed.
4 MANUAL OPERATION

In MANUAL OPERATION window, you can check / change the status of conveyors, stations, a robot and a hand.

4.1 MANUAL OPERATION of CONVEYOR

1. Go to MANUAL OPERATION of CONVEYOR window.
   
   (1) Press [CONVEYOR] button in PALLETIZE STATUS VIEW in MAIN window of MOTOPAL.
   
   Or
   
   (1) Press [MANUAL OPERATION] menu button in MAIN window of MOTOPAL.

The number of the Conveyor is not always 6. It is adjusted to your system.
2. Check / Change the status of Conveyors as below.

<table>
<thead>
<tr>
<th>Product Exist [Display / Button]</th>
<th>This button is used to check and change the ready status of a product on a conveyor to be picked up.</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Display</td>
<td>The status of the input signal &quot;Product Exist&quot; is shown.</td>
</tr>
<tr>
<td>&quot;Product Exist&quot; is OFF</td>
<td>&quot;Product Exist&quot; is ON</td>
</tr>
<tr>
<td>- Button</td>
<td>In such a case that the sensor at conveyors for &quot;Product Exist&quot; is broken, it is possible to force the input signal &quot;Product Exist&quot; to be turned on / off. If you press this button and [INTERLOCK] button on the Programming Pendant at same time, the input signal &quot;Product Exist&quot; can be turned on / off by the output signal &quot;Dummy Product Exist&quot;. When the input signal &quot;Product Exist&quot; is forced to be turned on by the dummy signal, the button looks as below.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pick Done [Button]</th>
<th>This button is used to require a conveyor to supply next product.</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Button</td>
<td>If you press this button and [INTERLOCK] button on the Programming Pendant at same time, the output signal &quot;Pick Done&quot; is output by pulse, which means that a conveyor can supply next product.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Positioning 1/2 [Display / Button]</th>
<th>These buttons are used to check and operate the devices which position a product on a conveyor. If there is no such a device, this button doesn’t function.</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Display</td>
<td>The status of the input signal &quot;Return&quot; and &quot;Advance&quot; is shown.</td>
</tr>
<tr>
<td>&quot;Return&quot; is ON and &quot;Advance&quot; is OFF</td>
<td>&quot;Return&quot; is OFF and &quot;Advance&quot; is ON</td>
</tr>
<tr>
<td>- Button (Return)</td>
<td>If you press this button and [INTERLOCK] button on the Programming Pendant at same time, the output signal &quot;Return&quot; is turned on and the output signal &quot;Advance&quot; is turned off.</td>
</tr>
<tr>
<td>- Button (Advance)</td>
<td>If you press this button and [INTERLOCK] button on the Programming Pendant at same time, the output signal &quot;Return&quot; is turned off and the output signal &quot;Advance&quot; is turned on.</td>
</tr>
</tbody>
</table>
### 4.1 MANUAL OPERATION of CONVEYOR

<table>
<thead>
<tr>
<th>Error [Display]</th>
<th>This display shows the error status of a conveyor (the input signal &quot;Error&quot; of a conveyor).</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&quot;Error&quot; is OFF</td>
</tr>
<tr>
<td></td>
<td>&quot;Error&quot; is ON</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Forward [Display / Button]</th>
<th>This button is used to forward conveyors and shown only in Teach mode.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Display</td>
</tr>
<tr>
<td></td>
<td>The status of the output signal &quot;Forward&quot; is shown.</td>
</tr>
<tr>
<td></td>
<td>&quot;Forward&quot; is OFF</td>
</tr>
<tr>
<td></td>
<td>&quot;Forward&quot; is ON</td>
</tr>
<tr>
<td></td>
<td>- Button</td>
</tr>
<tr>
<td></td>
<td>If you press this button and [INTERLOCK] button on the Programming Pendant at same time, the output signal &quot;Forward&quot; is inverted.</td>
</tr>
</tbody>
</table>
4.2 MANUAL OPERATION of STATION

1. Go to MANUAL OPERATION of STATION window.
   
   (1) Press [STATION] button in PALLETIZE STATUS VIEW in MAIN window of MOTOPAL.

   Or


The number of the Station is not always 6. It is adjusted to your system.
2. Check / Change the status of Stations as below.

<table>
<thead>
<tr>
<th>Layer</th>
<th>This edit box is used to check and change how many layers have been already placed on the pallet.</th>
</tr>
</thead>
</table>
| [Display / Edit] | - Display  
The current number of the layer is shown.  
- Edit  
You can set the positive integer. |

<table>
<thead>
<tr>
<th>Pieces</th>
<th>This edit box is used to check and change how many pieces in the current layer have been already placed on the pallet.</th>
</tr>
</thead>
</table>
| [Display / Edit] | - Display  
The current number of pieces is shown.  
- Edit  
You can set the positive integer. |

<table>
<thead>
<tr>
<th>Pallet Num.</th>
<th>This edit box is used to check and change how many layers have been already placed.</th>
</tr>
</thead>
</table>
| [Display / Edit] | - Display  
The current layer numbers of the pallet is shown.  
- Edit  
You can set a positive integer from 1 to 3 only when a positive integer of 0 or higher is set to [Layer] or [Pieces] of the relevant station. |

<table>
<thead>
<tr>
<th>Full</th>
<th>This display is used to check whether a pallet is full of products (the status of the output signal &quot;Full&quot;).</th>
</tr>
</thead>
</table>
| [Display]        | "Full" is OFF  
[Image: OFF]  
"Full" is ON  
[Image: ON] |

<table>
<thead>
<tr>
<th>Eject Pallet</th>
<th>This button is used to eject a pallet manually.</th>
</tr>
</thead>
</table>
| [Button]         | - Button  
If you press this button and [INTERLOCK] button on the Programming Pendant at same time, the output signal "Eject Pallet" is output by pulse. |

<table>
<thead>
<tr>
<th>Error</th>
<th>This display shows the error status of station (the input signal &quot;Error&quot; of the hand).</th>
</tr>
</thead>
</table>
| [Display]        | "Error" is OFF  
[Image: OFF]  
"Error" is ON  
[Image: ON] |

**NOTE** When you want to set [Layer] and [Pieces] for an empty pallet, set 0 to both [Layer] and [Pieces].
4.3 MANUAL OPERATION of ROBOT

1. Go to MANUAL OPERATION of ROBOT window.
   (1) Press [ROBOT] button in PALLETIZE STATUS VIEW in MAIN window of MOTOPAL.
   Or

When you set wrong number to [Layer] or [Pieces], an alarm “4439 UNDEFINED LABEL” occurs when you try to run programs. Refer to Chapter 8 Troubles and Countermeasures.

(At the bottom of MOTOPAL window, an alarm of “Please confirm Layer and Pieces.” appears.)
2. Check / Change the status of the robot as below.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Override Speed (%)</td>
<td>This edit box is used to reduce the speed of the robot from the programmed speed by setting the percentage of the programmed speed.</td>
</tr>
<tr>
<td></td>
<td>- Display</td>
</tr>
<tr>
<td></td>
<td>The current Override Speed is shown.</td>
</tr>
<tr>
<td></td>
<td>- Edit</td>
</tr>
<tr>
<td></td>
<td>You can set the value between 0 to 100%.</td>
</tr>
<tr>
<td>Safety Fence</td>
<td>This display shows the status of Safety Fence (the signal &quot;Safety Plug&quot; of robot specific input terminal block). When safety fence is open, servo power of the robot cannot be turned on in PLAY mode.</td>
</tr>
<tr>
<td></td>
<td>Safety Fence is Open (&quot;Safety Plug Input&quot; is Off)</td>
</tr>
<tr>
<td></td>
<td>Safety Fence is Closed (&quot;Safety Plug Input&quot; is On)</td>
</tr>
<tr>
<td>External E-Stop</td>
<td>This display shows the status of External E-Stop (the signal External Emergency Stop of robot specific input terminal block). When External E-Stop is off, servo power of the robot cannot be turned on.</td>
</tr>
<tr>
<td></td>
<td>&quot;External E-Stop&quot; is ON</td>
</tr>
<tr>
<td></td>
<td>&quot;External E-Stop&quot; is OFF</td>
</tr>
<tr>
<td>Shock Detection</td>
<td>This button is used to check and change the effective status of Shock Detection Function.</td>
</tr>
<tr>
<td></td>
<td>- Display</td>
</tr>
<tr>
<td></td>
<td>The effective status of Shock Detection Function (the specific output signal &quot;Shock Detection Valid&quot; (50560)) is shown.</td>
</tr>
<tr>
<td></td>
<td>Shock Detection is invalid</td>
</tr>
<tr>
<td></td>
<td>Shock Detection is valid</td>
</tr>
<tr>
<td>Alarm / Error</td>
<td>- Display</td>
</tr>
<tr>
<td></td>
<td>The status of alarm and error of the robot is shown. To know what type of alarm or error is occurring, you need to go to DX200 window. To go to DX200 window, refer to Section 6.1 “How to Go to DX200 Window” on page 6-1.</td>
</tr>
<tr>
<td></td>
<td>Alarm/Error is not occurring</td>
</tr>
<tr>
<td></td>
<td>Alarm/Error is occurring</td>
</tr>
<tr>
<td></td>
<td>- Button</td>
</tr>
<tr>
<td></td>
<td>If you press this button and [INTERLOCK] button on the Programming Pendant at same time, the effective status of Shock Detection Function is switched between &quot;INVALID&quot; and &quot;VALID&quot;.</td>
</tr>
</tbody>
</table>
|                           | If you press this button and [INTERLOCK] button on the Programming Pendant at same time, it is possible to reset alarms or errors. But there are some alarms which cannot be reset. In this case, go to DX200 window to check the detail of the alarms or restart DX200.
4.4 MANUAL OPERATION of HAND

1. Go to MANUAL OPERATION of HAND window.
   
   (1) Press [HAND] button in PALLETIZE STATUS VIEW in MAIN window of MOTOPAL.

   Or

### 4.4 MANUAL OPERATION of HAND

2. Check / Change the status of the hand as below.

<table>
<thead>
<tr>
<th>Valve [Display / Button]</th>
<th>This buttons are used to check and operate the valve at the hand. If there are not as many valves as 5, some buttons don’t function.</th>
</tr>
</thead>
</table>
|                         | - Display  
|                         |   The status of the input signal A and B is shown.  
|                         |   | A is ON and B is OFF | A is OFF and B is ON |
|                         |   | ![A is ON and B is OFF](image) | ![A is OFF and B is ON](image) |
|                         | - Button (A)  
|                         |   If you press this button and [INTERLOCK] button on the Programming Pendant at same time, the output signal A is turned on and the output signal B is turned off.  
|                         | - Button (B)  
|                         |   If you press this button and [INTERLOCK] button on the Programming Pendant at same time, the output signal A is turned off and the output signal B is turned on.  |

| Sensor [Display] | This display shows the status of sensor at the hand. If there are not as many sensors as 6, some display don’t function.  
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Error [Display] | This display shows the error status of the hand (the input signal "Error" of the hand).  
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5. How to Create / Make a Program

5.1 Create a New Program

1. Press [PROGRAM] button in MAIN window of MOTOPAL and PROGRAM LIST window appears.

![Program List Window]


![Program Detail Window]
5 How to Create / Make a Program
5.1 Create a New Program

3. Set the product data.
   There are 2 ways to set the product data. Follow the procedure i) or ii).

   (1) Input each data manually.
      When you use the completely new product, follow this procedure.
      i) Input the product number to [No.]. The number shouldn’t be used for other product and need to be positive integer between 1 and 255.

      You can check what number is already used by checking PRODUCT LIST. To see PRODUCT LIST, press [PRODUCT LIST] button.
      If you input the number which was already used for other product, the following message appears when you try to change the window to PALLET, PATTERN or CREATE. If you press [OK] in this message, the product data will not be overwritten by the data shown in PRODUCT window and the window changes. If you press [NO], the product data will not be overwritten and the window changes. If you press [CANCEL], the product data will not be changed and the window remains PRODUCT.

      ii) Input [Name]. The length of name need to be less than 32 characters.

      iii) Input [Length], [Width], [Height] and [Mass]. Each value needs to be positive integer.

      If you input the value which is out of range, the message which indicates it appears when you try to change the window to PALLET, PATTERN or CREATE.

      For [No.], [Length], [Width], [Height] and [Mass], input only positive integer. If you input decimal data, the following message appears when you try to change the window to PALLET, PATTERN or CREATE. In this case the input data are not properly reflected.

   (2) Select from PRODUCT LIST.
      When you use the product which was already used for other program, follow this procedure.
      i) Press [PRODUCT LIST] button. And PRODUCT LIST
5. How to Create / Make a Program

5.1 Create a New Program

which lists the products already used appears.

ii) Select the product which you want to use.

iii) Press the [OK] button. Pressing the [CANCEL] button closes the PRODUCT LIST without doing anything.

When you want to delete the unused product from PRODUCT LIST, follow the procedure below.

1) Select the product which you want to delete.
2) Press [DELETE] button.


5. Set the pallet data.

There are 2 ways to set the pallet data. Follow the procedure i) or ii).

(1) Input each data manually.

When you use the completely new pallet, follow this procedure.
5-1 Create a New Program

i) Input [Name]. The name shouldn’t be used for other pallet. The length of name needs to be less than 32 characters.

You can check what name is already used by checking PALLET LIST. To see PALLET LIST, press [PALLET LIST] button.

If you input the name which was already used for other pallet, the following message appears when you try to change the window to PRODUCT, PATTERN or CREATE. If you press [OK] in this message, the pallet data will be overwritten by the data shown in PALLET window and the window changes. If you press [NO], the pallet data will not be overwritten and the window changes. If you press [CANCEL], the pallet data will not be changed and the window remains PALLET.

NOTE

If you input the value which is out of range, the message which indicates it appears when you try to change the window to PRODUCT, PATTERN or CREATE.

For [Length], [Width] and [Height], input only positive integer. If you input decimal data, the following message appears when you try to change the window to PRODUCT, PATTERN or CREATE. In this case the input data are not properly reflected.

NOTE

(2) Select from PALLET LIST.
When you use the pallet which was already used for other program, follow this procedure.

i) Press [PALLET LIST] button. And PALLET LIST which
Lists the pallets already used appears.

ii) Select the pallet which you want to use.


When you want to delete the unused pallet from PALLELIST, follow the procedure below.

1) Select the pallet which you want to delete.

2) Press [DELETE] button.


7. Set the pattern information.

   (1) Input [Layer Num]. [Total height (calc.)] is automatically calculated.
5.1 Create a New Program

and it needs to be less than the maximum height.

If the value input to [Total height (calc.)] is higher than the maximum height, the message which indicates it appears when you try to change the window to PRODUCT, PALLET or CREATE.

(2) If you want to palletize products, overhanging from the pallet, set overhang value.

   i) Press [OVERHANG] button. And OVERHANG window appears.

   ii) Set [Length(dL)] and [Width(dW)]. The value needs to be positive integer.

5.1 Create a New Program

(3) Set Layer type
Layer type can be set up to 3.
   i) Press [Layer] button. And SELECT LAYER window appears.

   ![Select Layer Window]

   ii) Select Layer type. When you select [Arbitrary Layer], input the layer number to the edit box.


(4) Select Patterns to each layer type which you selected.
   i) Press [Pattern] button. And SELECT PATTERN window appears. In this window, only the patterns which can fit the pallet and overhang value are shown and the patterns are listed in effective order. So, you can always see the most effective patterns at the top of the list.

   ![Select Pattern Window]

   ii) Select a pattern. Selected pattern is show in the right.


   iv) Confirm the selected patterns by pressing [Display] button in PATTERN window.

(5) Adjust [Total Height] (only when needed).
It is a function to assume the shape distortion of palletized
5.1  Create a New Program

products at lower layers by the weigh of ones at upper layers. By inputting [Total Height (real)] of the products in which the distortion is taken into consideration, the manipulator can put products till it reaches to the desired height. Note: The value can be input from the window shown in step 6.

i) Check the left side of [Total Height (real)].

ii) It becomes possible to input a value to the right side of [Total Height (real)] after it is checked at step i). Input a desired total height (mm) by taking the distortion into consideration.

iii) When this function is invalid, clear the check input at step i) but the value input at step ii) can be left.

If the value input to [Total Height (real)] is higher than the maximum height, a message to alarm that the input height is exceeding the maximum value appears.

If the value input to [Total Height (real)] is lower than 50% of [Total Height (calc.)], a message to ask inputting 50% of [Total Height (calc.)] or higher value to [Total Height (real)] appears.

The value input to [Total Height (real)] will not be reflected if it is unchecked.

(6) Input a maximum value to [Pallet Num.] (only when needed). It is a function to palletize products on the several layered pallets. A value from 1 to 3 can be set to [Pallet Num.]. Note: The value can be input from the window shown in step 6.

(7) Input the maximum number to the right side of [Pallet Num.]

When a value other than “1 to 3” is input to [Pallet Num.], a message [Set a value from “1 to 3” in [Pallet Num.]] appears.
5. How to Create / Make a Program
5.1 Create a New Program


9. Create the program
   (1) Select a [CV] and a [ST].
   (2) Press [CREATE] button. And MOTOPAL creates the program.


   **NOTE**

   All the information you input or select in PRODUCT, PALLET, PATTERN and CREATE windows will not be reflected on the program until you press [CREATE] button.
5.2 Edit the Program

1. Press [PROGRAM] menu button in MAIN window of MOTOPAL. And PROGRAM LIST appears.

2. Select the program which you want to edit in the PROGRAM LIST.


4. Modify the information of the program and create the program again according to Section 5.1 “Create a New Program” on page 5-1.

The program will be overwritten by this procedure when you press [CREATE] button.

If the following messages appear, the product data or pallet data have been changed since you created the program but those data changes have not been reflected on the program.
5.3 Copy the Program

1. Press [PROGRAM] menu button in MAIN window of MOTOPAL and PROGRAM LIST appears.
2. Select the program which you want to copy in the PROGRAM LIST.
4. Modify the information of the program and create the program according to Section 5.1 “Create a New Program” on page 5-1.

**NOTE**
If you don’t change [No.] in PRODUCT window, [CV] in CREATE window, or [ST] in CREATE window, the original program which you copied will be overwritten.

5.4 Delete the Program

1. Press [PROGRAM] menu button in MAIN window of MOTOPAL and PROGRAM LIST appears.
2. Select the program which you want to delete in the PROGRAM LIST.

**NOTE**
When you delete the program which you are selecting in OPERATION window (refer to Section 3.1 “How to Select Programs” on page 3-1), you need to select all programs in OPERATION window again. Otherwise, robot alarm "4438 UNDEFINED JOB" could occur (Refer to Chapter 8 Troubles and Countermeasures).
5.5 Modify the Program

1. Press [PROGRAM] menu button in MAIN window of MOTOPAL and PROGRAM LIST appears.

2. Select the program the position of which you want to modify in the PROGRAM LIST.


4. Select [Layer] and the pattern in the layer is shown in the right. When you select [Arbitrary], input the layer number to the edit box.

   **NOTE** If there are more than 1 patterns in the selected layers, pattern cannot be shown in the right.

5. Select [Pieces] When you select [Arbitrary], input the piece number to the edit box.

6. Input [X], [Y], [Z] and [Theta]. The direction of X, Y and Theta is shown as below. The direction of Z is vertical way and upper way is plus.

5.6 Modify the Whole Height

It is a function to assume the shape distortion of palletized products at lower layers due to the weight of ones at upper layers. By inputting the desired real total height [Total Height (real)] of the products in which the distortion is taken into consideration, the manipulator can put products till the height of the products reaches to the height.

1. Press [MODIFY WHOLE HEIGHT] which is at the upper side of [PROGRAM DETAIL] window.

2. Calculate the distortion by the weight of upper layers of products based on “height of a product” x [Layer Num.]. Then, input a desired real height of palletized product in which the distortion is taken into consideration to [Total Height (real) Hr].

   If the value input to [Total Height (real) Hr] is lower than 50% of [Total Height (calc.) Hc], a message to ask inputting 50% of [Total Height (calc.) Hc] or higher value to [Total Height (real) Hr] appears.

6 Setting Menu

From setting menu, you can go to DX200 standard window where you can monitor / change the various information of DX200. When robot alarms or errors are occurring, you can check what type of alarms or errors are occurring by going to DX200 window.

6.1 How to Go to DX200 Window

1. Press [SETTING] menu button in MAIN window of MOTOPAL and the SETTING menu appears.

2. Press [TO DX200 WINDOW] button.

6.2 How to Go Back to MOTOPAL Window

To go back to MOTOPAL is the same as the way to start up MOTOPAL. Refer to Section 1.2 “How to Start Up MOTOPAL” on page 1-1.
7 CompactFlash Card and Backup

7.1 CompactFlash Card

In order for MOTOPAL to work properly, the CompactFlash card which contains the appropriate data for MOTOPAL needs to be inserted in the Programming Pendant. Without the CompactFlash card, MOTOPAL cannot start up and work properly and the following message can appear.

![CompactFlash Card Error Message]

7.2 Backup

Make a backup of the data in the CompactFlash card for MOTOPAL periodically because MOTOPAL stores its data into the CompactFlash card.
## 8 Troubles and Countermeasures

<table>
<thead>
<tr>
<th>Trouble</th>
<th>Causes and Countermeasures</th>
</tr>
</thead>
</table>
| Servo power cannot be turned on             | Some signals prevent the servo power from being turned on. Check the following items.  
  - Is the emergency stop button on the Programming Pendant released?  
  - Is the emergency stop button on DX200 controller released?  
  - Is Safety Fence close?  
    (You can check this status in MANUAL OPERATION of ROBOT window. Refer to Section 4.3 “MANUAL OPERATION of ROBOT” on page 4-6.)  
  - Is External E-Stop ON?  
    (You can check this status in MANUAL OPERATION of ROBOT window. Refer to Section 4.3 “MANUAL OPERATION of ROBOT”.)  
  - Are External Servo Off signals OFF?  
    (You can check External Servo Off Signals (40054, 40065, 40066) in DX200 window. To go to DX200 window, refer to Section 6.1 “How to Go to DX200 Window” on page 6-1.) |
| Robot alarm "4438 UNDEFINED JOB".            | Programs are not properly selected. Select programs again according to Section 3.1 “How to Select Programs” on page 3-1.                                                                                                       |
| Robot alarm "4439 UNDEFINED LABEL".          | The number of layer and/or pieces are wrong. Set the correct number according to Section 4.2 “MANUAL OPERATION of STATION” on page 4-4.                                                                                           |
| Robot alarm "8900 PALLET_IO_ERROR".          | Confirm that some workpieces are mounted on the pallet of the relevant station. If the workieces are manually mounted, re-input values of “Layer” and “Pieces” by referring to Section 4.2 “MANUAL OPERATION of STATION”. |
| Robot alarm "8901 NO_PALLET_ERROR".          | IO signal of “Pallet in Place” at the relevant station is turned OFF. Confirm that the pallet is properly mounted.                                                                                                            |

When an alarm occurs, rest the alarm, move the manipulator to its home position, then resume the operation.
DX200 OPTIONS
INSTRUCTIONS
FOR MOTOPAL

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Specifications are subject to change without notice
for ongoing product modifications and improvements.