YASKAWA

YRC1000 OPTIONS INSTRUCTIONS

FOR 3D GRAPHIC DISPLAY FUNCTION

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

MOTOMAN INSTRUCTIONS

MOTOMAN-□□□ INSTRUCTIONS
YRC1000 INSTRUCTIONS
YRC1000 OPERATOR'S MANUAL (GENERAL) (SUBJECT SPECIFIC)
YRC1000 MAINTENANCE MANUAL
YRC1000 ALARM CODES (MAJOR ALARMS) (MINOR ALARMS)

The YRC1000 operator's manual above corresponds to specific usage. Be sure to use the appropriate manual.
The YRC1000 operator's manual above consists of "GENERAL" and "SUBJECT SPECIFIC".
The YRC1000 alarm codes above consists of "MAJOR ALARMS" and "MINOR ALARMS".

Please have the following information available when contacting Yaskawa Customer Support:
- System
- Primary Application
- Software Version *(Located on Programming Pendant by selecting: {Main Menu} - {System Info} - {Version})*
  Robot Serial Number *(Located on robot data plate)*
  Robot Sales Order Number *(Located on controller data plate)*

Part Number: 178661-1CD
Revision: 0

MANUAL NO.
HW1483866

DANGER

- This manual explains the 3D graphic display function of the YRC1000 system. Read this manual carefully and be sure to understand its contents before handling the YRC1000. Any matter, including operation, usage, measures, and an item to use, not described in this manual must be regarded as "prohibited" or "improper".
- General information related to safety are described in "Chapter 1. Safety" of the YRC1000 INSTRUCTIONS. To ensure correct and safe operation, carefully read "Chapter 1. Safety" of the YRC1000 INSTRUCTIONS.

CAUTION

- In some drawings in this manual, protective covers or shields are removed to show details. Make sure that all the covers or shields are installed in place before operating this product.
- YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids the product warranty.

NOTICE

- 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.

NOTES FOR SAFE OPERATION

Read this manual carefully before installation, operation, maintenance, or inspection of the YRC1000.

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

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. Safety Signs identified by the signal word DANGER should be used sparingly and only for those situations presenting the most serious hazards.

Indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury. Hazards identified by the signal word WARNING present a lesser degree of risk of injury or death than those identified by the signal word DANGER.

Indicates a hazardous situation, which if not avoided, could result in minor or moderate injury. It may also be used without the safety alert symbol as an alternative to “NOTICE”.

NOTICE is the preferred signal word to address practices not related to personal injury. The safety alert symbol should not be used with this signal word. As an alternative to “NOTICE”, the word “CAUTION” without the safety alert symbol may be used to indicate a message not related to personal injury.

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 “DANGER”, “WARNING” and “CAUTION".

DANGER

- Before operating the manipulator, make sure the servo power is turned OFF by performing the following operations. When the servo power is turned OFF, the SERVO ON LED on the programming pendant is turned OFF.
  - Press the emergency stop buttons on the front door of the YRC1000, on the programming pendant, on the external control device, etc.
  - Disconnect the safety plug of the safety fence. (when in the play mode or in the remote mode)

If operation of the manipulator cannot be stopped in an emergency, personal injury and/or equipment damage may result.

Fig. : Emergency Stop Button

- Before releasing the emergency stop, make sure to remove the obstacle or error caused the emergency stop, if any, and then turn the servo power ON.

Failure to observe this instruction may result in personal injury caused by unintended manipulator movement.

Fig. : Release of Emergency Stop

- Observe the following precautions when performing a teaching operation within the P-point maximum envelope of the manipulator:
  - Be sure to perform lockout by putting a lockout device on the safety fence when going into the area enclosed by the safety fence. In addition, the operator of the teaching operation must display the sign that the operation is being performed so that no other person closes the safety fence.
  - View the manipulator from the front whenever possible.
  - Always follow the predetermined operating procedure.
  - Always keep in mind emergency response measures against the manipulator's unexpected movement toward a person.
  - Ensure a safe place to retreat in case of emergency.

Failure to observe this instruction may result in personal injury caused by improper or unintended manipulator movement.

- Confirm that no person is present in the P-point maximum envelope of the manipulator and that the operator is in a safe location before:
  - Turning ON the YRC1000 power
  - Moving the manipulator by using the programming pendant
  - Running the system in the check mode
  - Performing automatic operations

Injury may result if any person should enter the P-point maximum envelope of the manipulator during operation. Immediately press an emergency stop button whenever there is a problem. The emergency stop buttons are located on the front panel of the YRC1000 and on the right of the programming pendant.

- Read and understand the Explanation of the Warning Labels before operating the manipulator.

WARNING

- Perform the following inspection procedures prior to conducting manipulator teaching. If there is any problem, immediately take necessary steps to solve it, such as maintenance and repair.
  - Check for a problem in manipulator movement.
  - Check for damage to insulation and sheathing of external wires.
- Always return the programming pendant to the hook on the YRC1000 cabinet after use.

If the programming pendant is left unattented on the manipulator, on a fixture, or on the floor, the Enable Switch may be activated due to surface irregularities of where it is left, and the servo power may be turned ON. In addition, in case the operation of the manipulator starts, the manipulator or the tool may hit the programming pendant left unattended, which may result in personal injury and/or equipment damage.

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.

Equipment	Manual Designation
YRC1000 controller	YRC1000
YRC1000 programming pendant	Programming pendant
Cable between the manipulator and the controller	Manipulator cable

Descriptions of the programming pendant keys, buttons, and displays are shown as follows:

Equipment		Manual Designation
Programming Pendant	Character Keys /Symbol Keys	The keys which have characters or its symbol printed on them are denoted with [ ]. ex. [ENTER]
	Axis Keys /Numeric Keys	[Axis Key] and [Numeric Key] are generic names for the keys for axis operation and number input.
	Keys pressed simultaneously	When two keys are to be pressed simultaneously, the keys are shown with a “+” sign between them, ex. [SHIFT]+[COORD]
	Displays	The menu displayed in the programming pendant is denoted with { }. ex. {JOB}

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 [SELECT] is pressed, or that the item is directly selected by touching the screen.

Registered Trademark

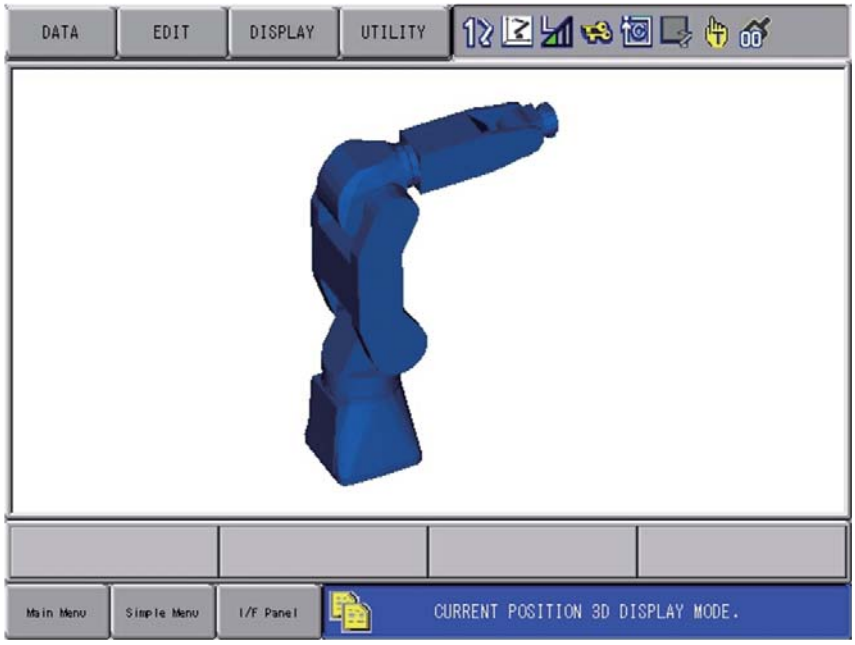
In this manual, names of companies, corporations, or products are trademarks, registered trademarks, or brand names for each company or corporation. The indications of (R) and ^{TM} are omitted.

Contents

1 Overview

1.1 3D Graphic Display Function

The 3D graphic display function (henceforth described as 3D display function) is that, a 3D model of the robot is displayed on the programming pendant window, and the current value of the robot can be confirmed.
By using the multi-window function, the job's teaching position displayed in the job content can also be confirmed on the 3D display window.
When the functional safety function is valid, the functional safety range can also be displayed.



NOTE Only the robot is displayed. Displaying the peripheral devices are not available.

1 Overview
1.1 3D Graphic Display Function

This function uses the free software, ”Panda3D”, and ”Panda3D” has been licensed agreement under the following conditions.

Panda3D License

What follows is the Modified BSD License. See also http://www.opensource.org/licenses/BSD-3-Clause

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2 Operation Method

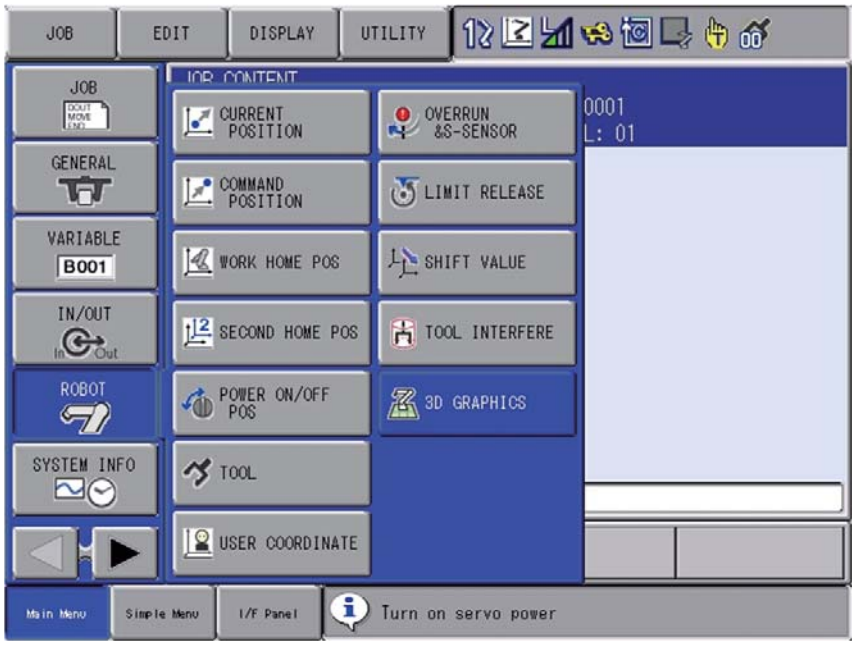
The operations for the 3D display function are described below in this chapter.

The 3D display function operations are basically performed by touching the window.

2.1 How to Start the 3D Graphic Display Function

The procedures for starting the 3D display function are described below.

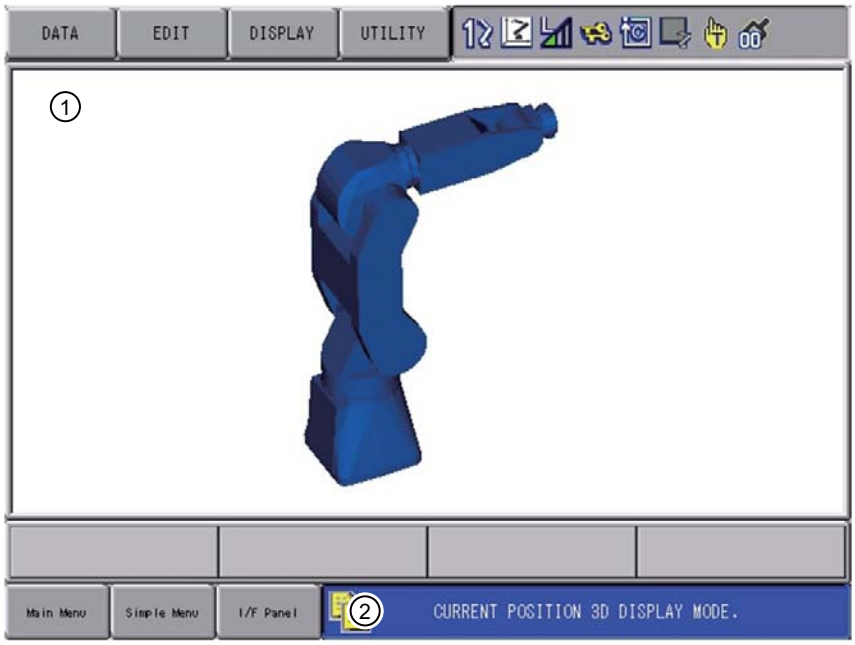
1. From the menu on the left of the window, select {ROBOT}.
2. From the sub-menu, select {3D GRAPHICS}.



2.2 Window Configuration

The window configuration is described below.

The 3D display function, when starting, is displayed on the general-purpose display area.

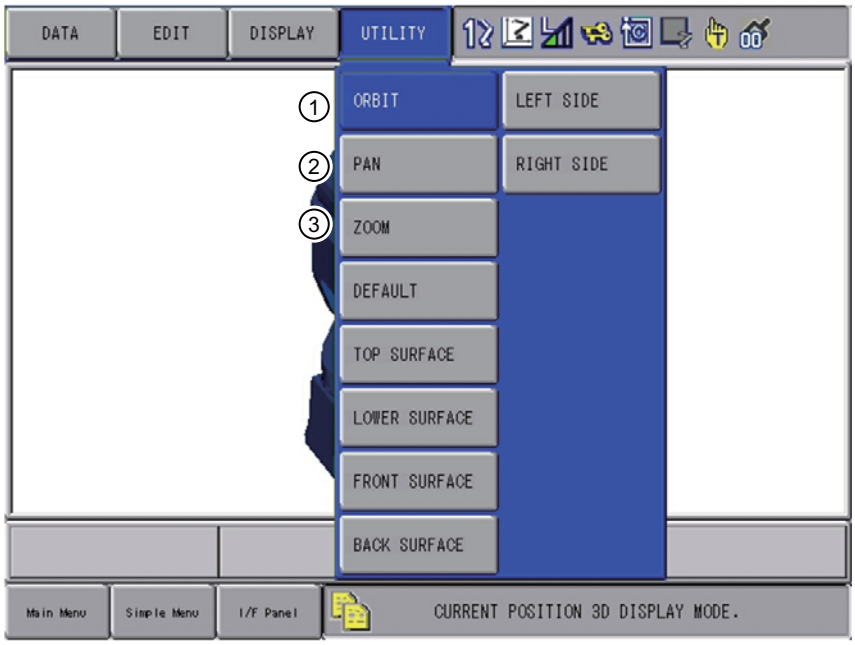


Name		Function
①	3D display area	The area that displays the robot model in 3D.
②	Human interface display area	Messages notifying the 3D display function mode are displayed.

2.3 Operating the Viewpoint

The procedure for changing the viewpoint is described below.

1. From the pull-down menu, select {UTILITY}.
2. Select a viewpoint operating method.
3. Touch the 3D display area with one finger, and then move the finger up, down, left and right.
   Touch operations using two fingers or multiple fingers are not supported.
   The types of the viewpoint operation are as follows.



The types of the viewpoint operation are as follows.

Name		Function
①	ORBIT	The viewpoint rotates in the direction of the operation performed using a finger.
②	PAN	The viewpoint moves parallel in the direction of the operation performed using a finger.
③	ZOOM	The viewpoint zooms in when an upward operation is performed using a finger, and zooms out when a downward operation is performed using a finger.

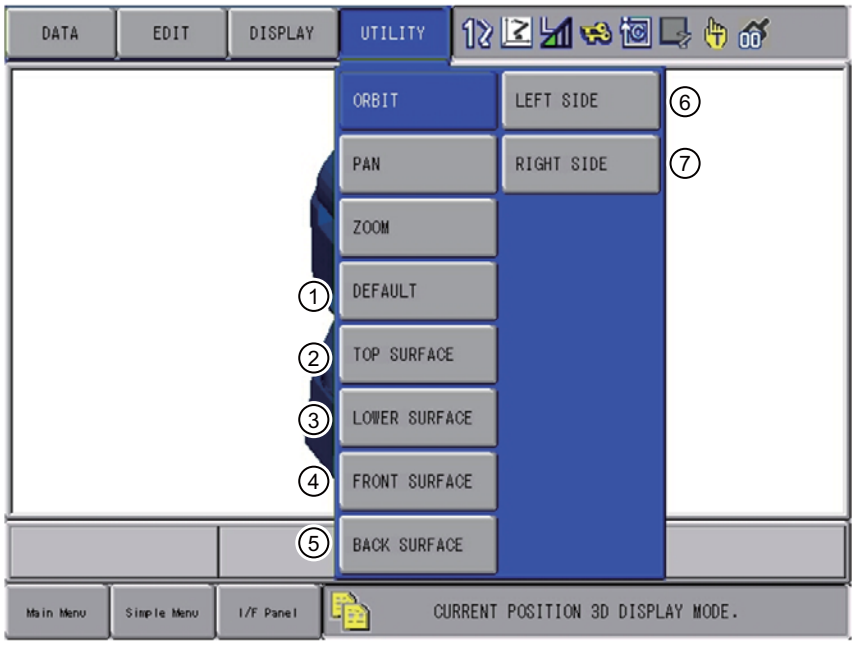
The viewpoint operation can be also performed by the key operations. The operation method is as follows.

Name		Key operation
①	ORBIT	[SHIFT] + [CURSOR]
②	PAN	[CURSOR]
③	ZOOM	[INTERLOCK] + [CURSOR]

2.4 Preset Viewpoint

The preset viewpoint, such as the viewpoint position when starting, the top surface and the side, can be called.

1. From the pull-down menu, select {UTILITY}.
2. Select the preset viewpoint.

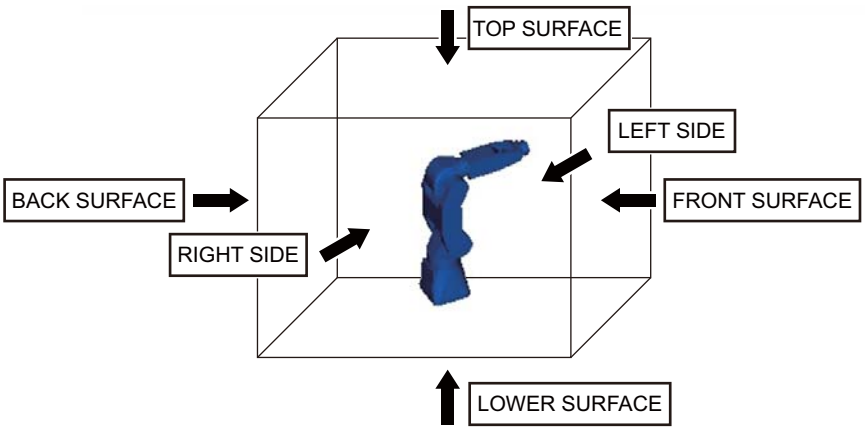


The preset viewpoint and the direction of the viewpoint are as follows.

Name		Function
①	DEFAULT	Changes to the viewpoint when starting.
②	TOP SURFACE	Changes to the viewpoint observed from above.
③	LOWER SURFACE	Changes to the viewpoint observed from below.
④	FRONT SURFACE	Changes to the viewpoint observed from front.
⑤	BACK SURFACE	Changes to the viewpoint observed from back.
⑥	LEFT SIDE	Changes to the viewpoint observed from the left side.
⑦	RIGHT SIDE	Changes to the viewpoint observed from the right side.

2 Operation Method
2.4 Preset Viewpoint

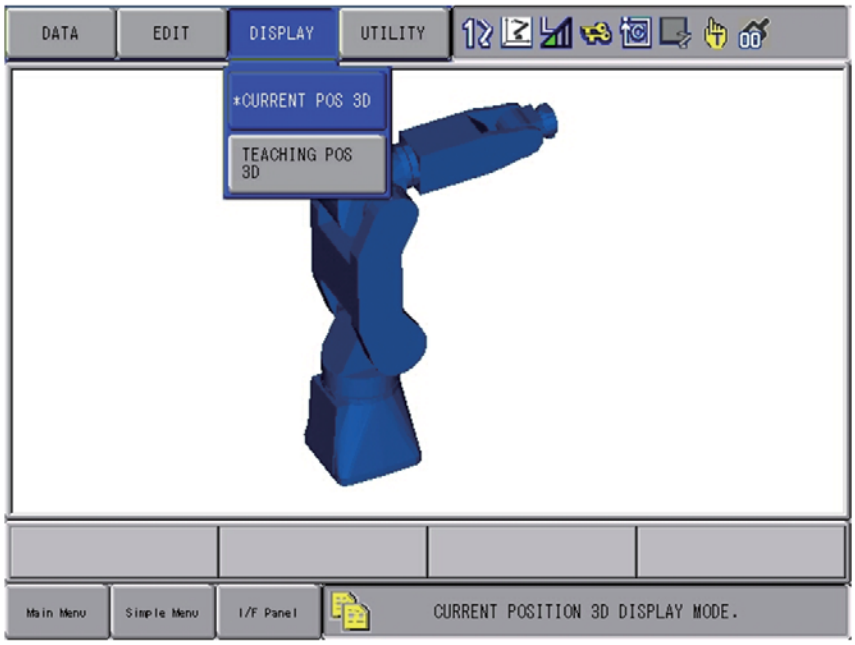
Top surface, lower surface, front surface, back surface, left side and right side are the viewpoints observed from a perpendicular direction from each side of the cuboid defined in the 3D graphic space.



3 Current Position 3D Display

The current position 3D display mode is described below in this chapter. For changing to the current position 3D display mode, perform the operations in the procedure below.

1. From the pull-down menu, select {DISPLAY}.
2. Select {CURRENT POS 3D}.
3. In the human interface display area, the message "CURRENT POSITION 3D DISPLAY MODE." is displayed.

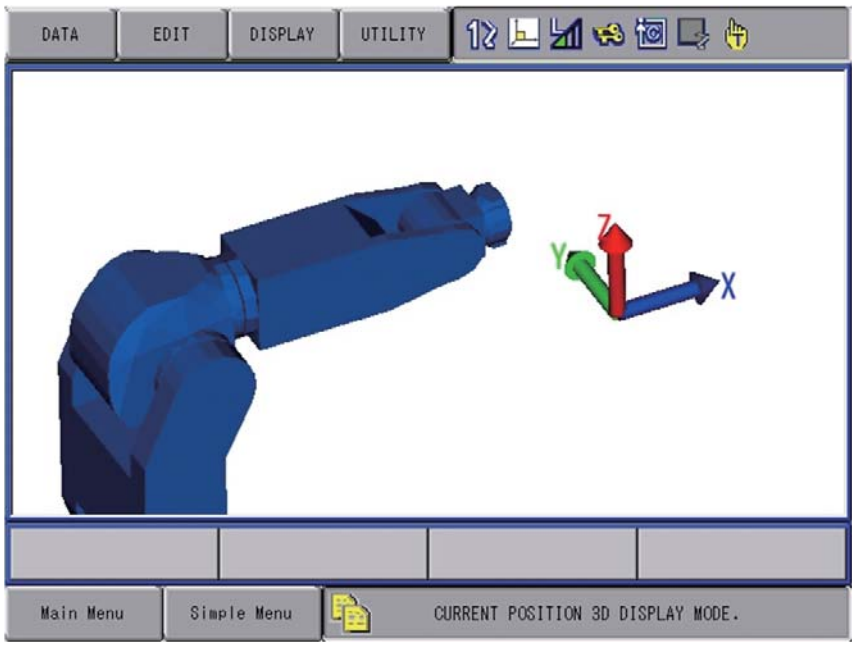


3.1 Display Content

3.1.1 Display During TEACH MODE

In the teach mode, according to the jog operation or the FWD key operation of the robot, the posture of the robot in the 3D display area changes.

When operating by using the cartesian coordinates system, the tool coordinates system, and the user coordinate system, an arrow that indicates the operation direction is displayed. The displayed position is the position (TCP position) considering the selected tool data. The directions of the arrow are the positive direction of the X-axis, the Y-axis, and the Z-axis. The each axis is displayed as follows; X-axis direction is blue, the Y-axis direction is green, and the Z-axis direction is red.



NOTE The robot cannot be operated by dragging the arrow.

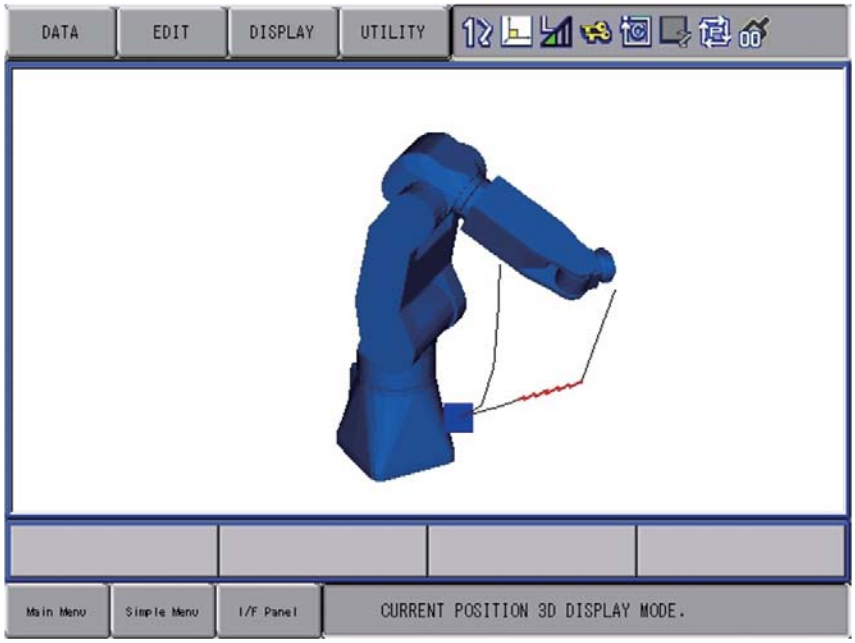
3.1.2 Display During PLAY MODE

Even in the play mode, in accordance with the motion of the robot, the posture of the robot in the 3D display area changes.

And during playback, the motion path is displayed. The motion path, in the working section, is displayed in different color. When the IO instruction is executed, the icon is changed and displayed.

NOTE

- The motion path display requires the processing for drawing the information, therefore, the path display is less delayed than the actual motion of the robot.
- Since the path is displayed on the basis of sampling data, depending on the speed, the angular position may not be displayed at the corner.



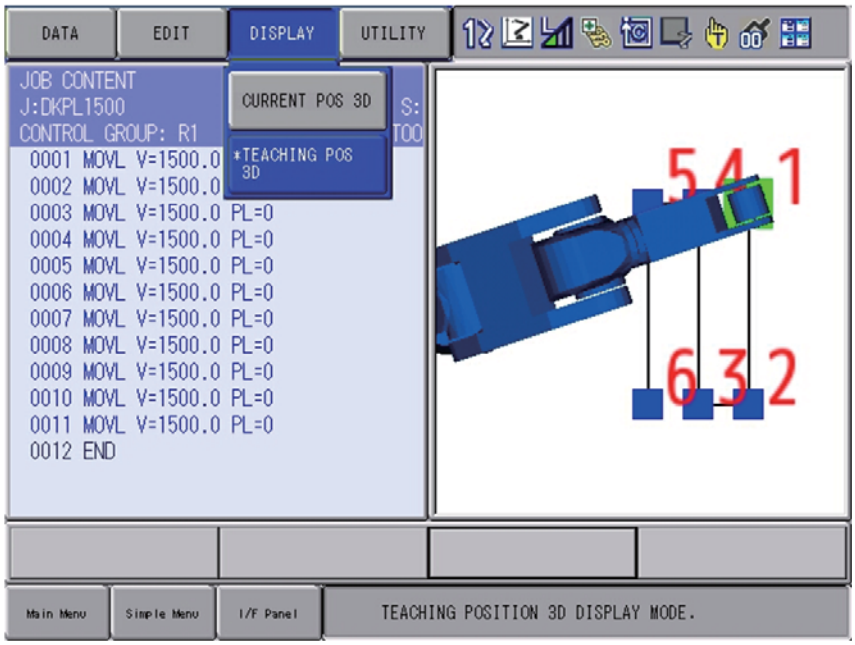
4 Teaching Position 3D Display

The teaching position 3D display mode is described below in this chapter.

In teaching position 3D display mode, the job teaching position displayed in the job contents is displayed in 3D. When performing the jog operation, the operation will not be reflected to the robot, and the current position will not be displayed.
The teaching position 3D display mode is only valid in the teach mode. And when the mode is changed to the play mode, it is changed to the current position 3D display mode.

For changing to the teaching position 3D display mode, perform the operations in the procedure below.

1. From the pull-down menu, select {DISPLAY}.
2. Select {TEACHING POS 3D}.
3. In the human interface display area, the message "TEACHING POSITION 3D DISPLAY MODE." is displayed.



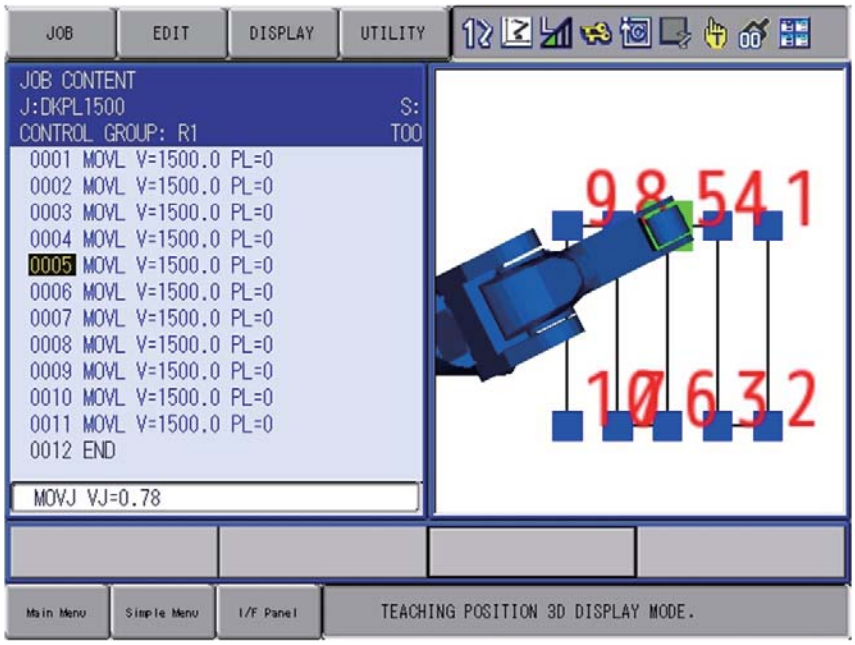
NOTE

- When changing to the play mode, the {TEACHING POS 3D} menu will not display.
- The job content window must be displayed.

4.1 Display Content

On the job content window, when the cursor is moved to the move instruction position, the posture of the robot in the 3D display area changes to the posture of the teaching position.

The teaching positions of the previous five steps and the following five steps are displayed in broken lines. The position of each broken line indicates the TCP position with an icon. The teaching position currently displayed has a large icon. The step number is displayed next to the icon.



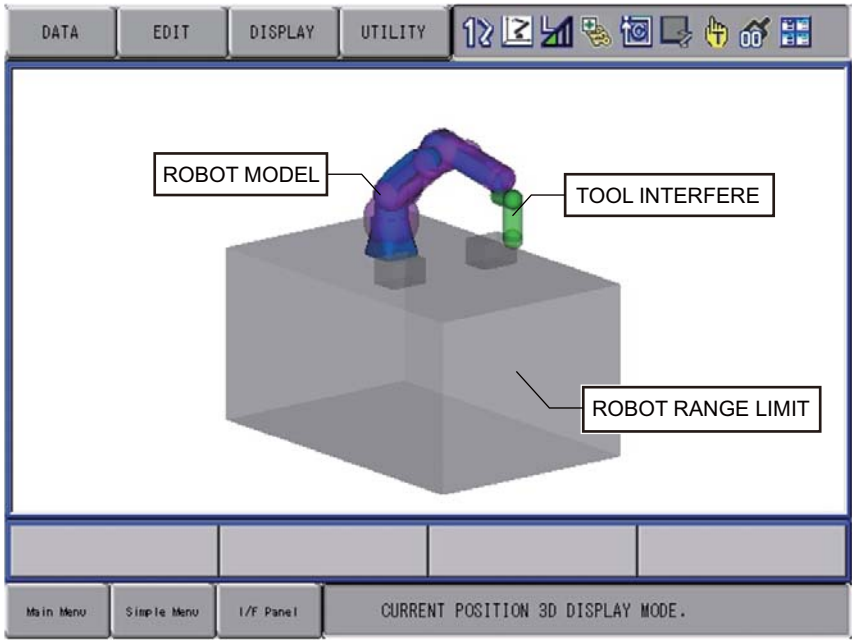
NOTE

- The displayed step is only for the job displayed in the job content. Job calling is not displayed.
- The broken lines connect the teaching positions linearly, so it differs to the actual motion path of the robot.

5 Functional Safety Range Display

The functional safety range display is described below in this chapter.

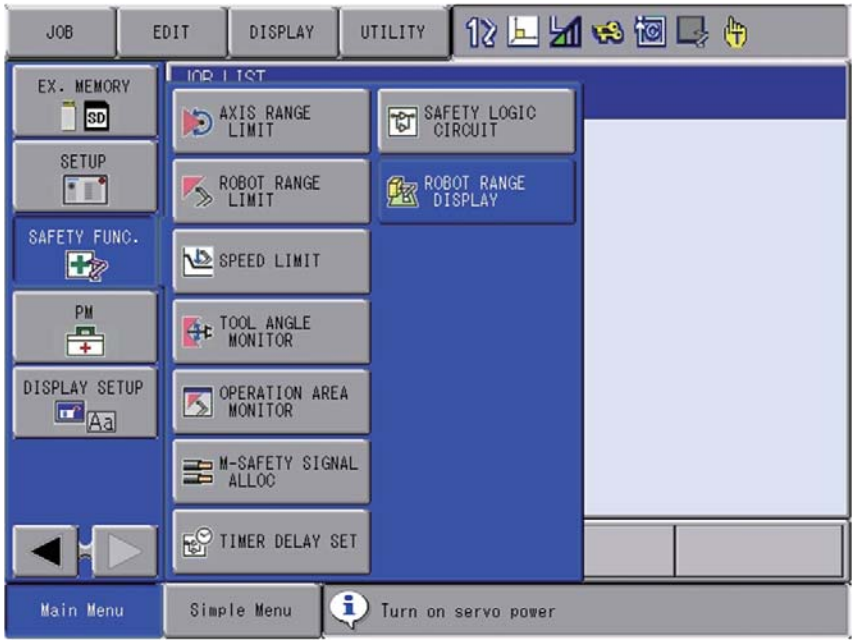
For the system which functional safety is valid, the functional safety range is displayed on the 3D display window. The areas that can be displayed are the robot operation limit range and the tool interference. The robot model for the range monitoring is also displayed.



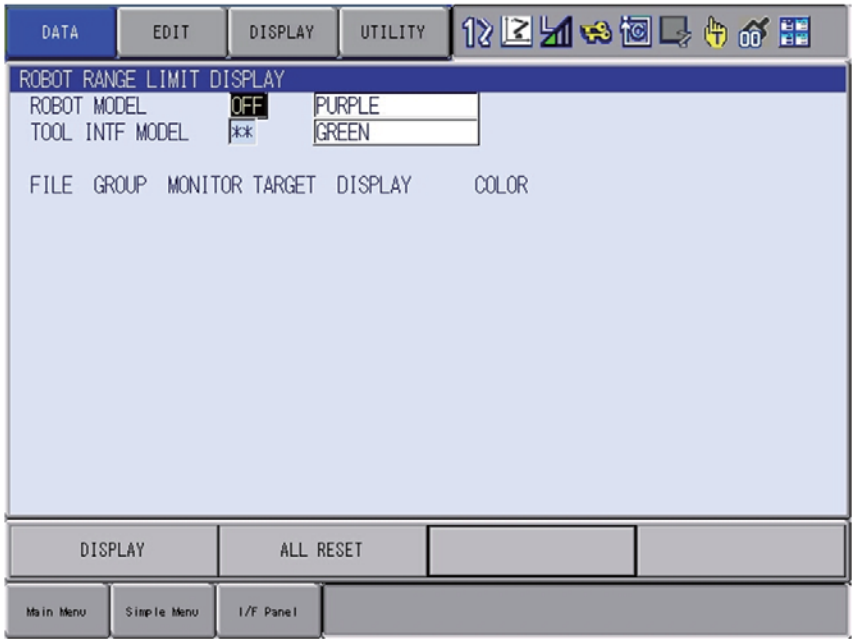
5.1 Display Setting

For setting the display, perform the operations in the procedure below.

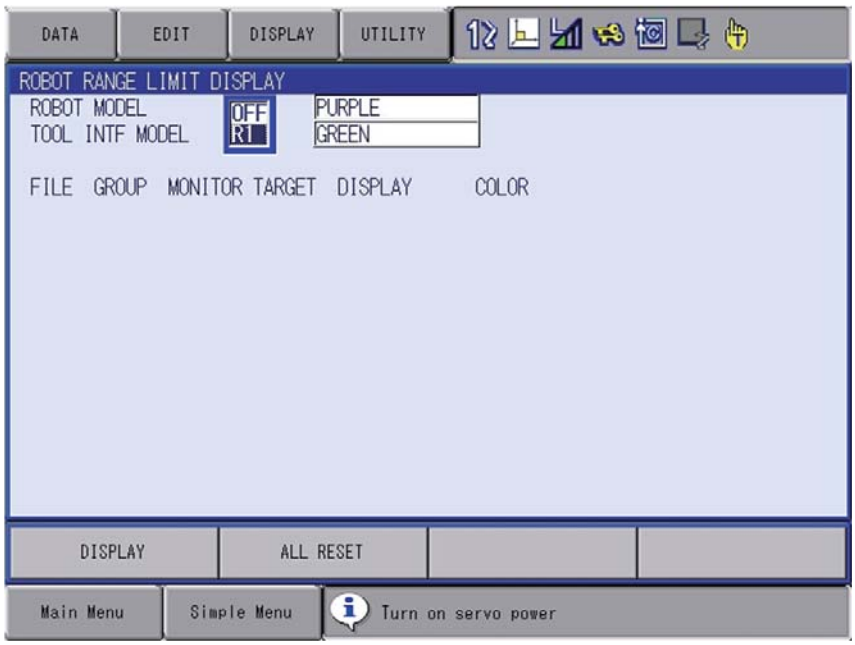
1. From the menu on the left of the window, select {SAFETY FUNC.}.
2. From the sub-menu, select {ROBOT RANGE DISPLAY}.



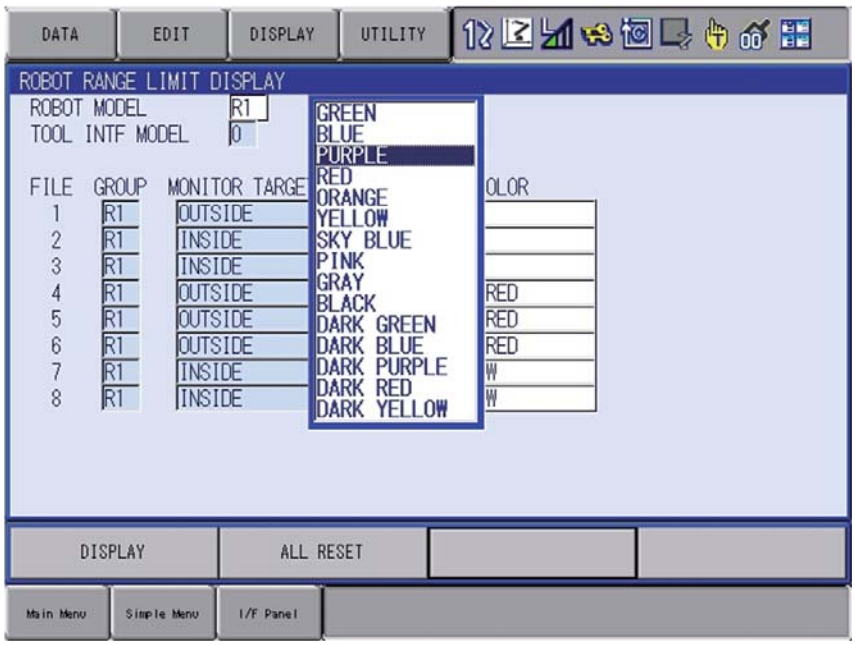
3. The ROBOT RANGE LIMIT DISPLAY window is displayed.



4. Select the target robot model.

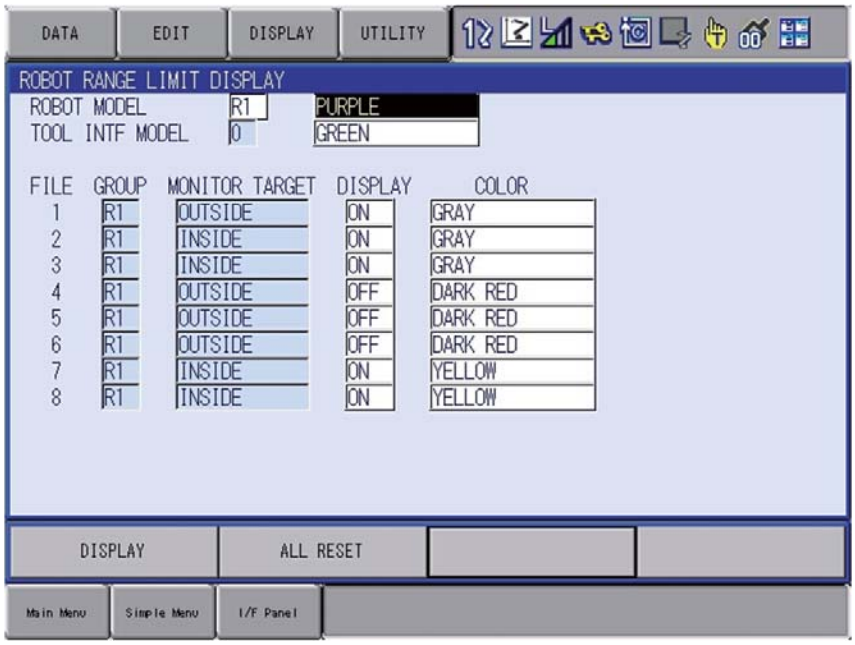


5. Select the model color.



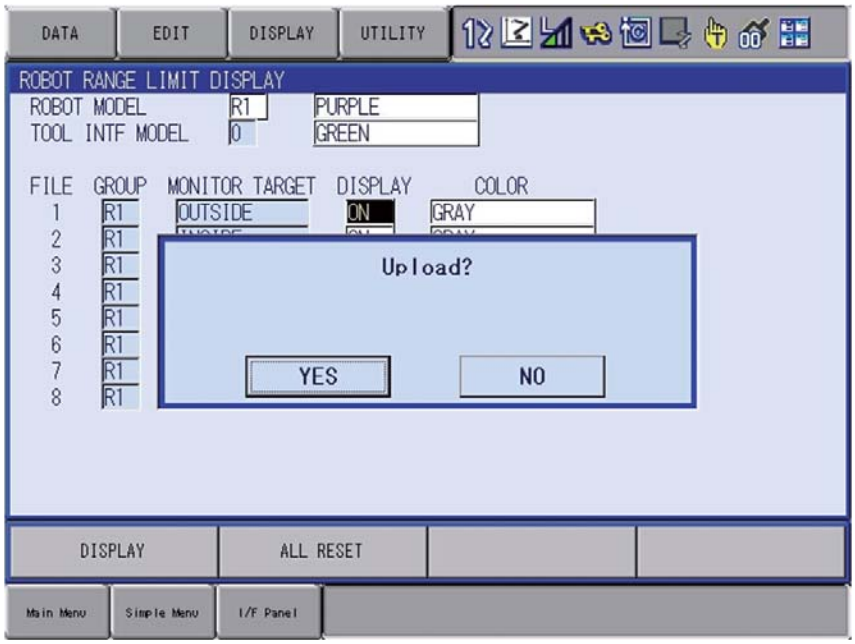
6. The tool interference model is selected by the tool of the target robot. The color can be changed.

7. When the robot model is selected, the target robot range limit display file is displayed. Set ON to "DISPLAY" of the file number to be concealed. And set OFF to it when hiding the file number.



8. Press {DISPLAY}.
9. A message, "Upload?" is displayed. Press {YES}.

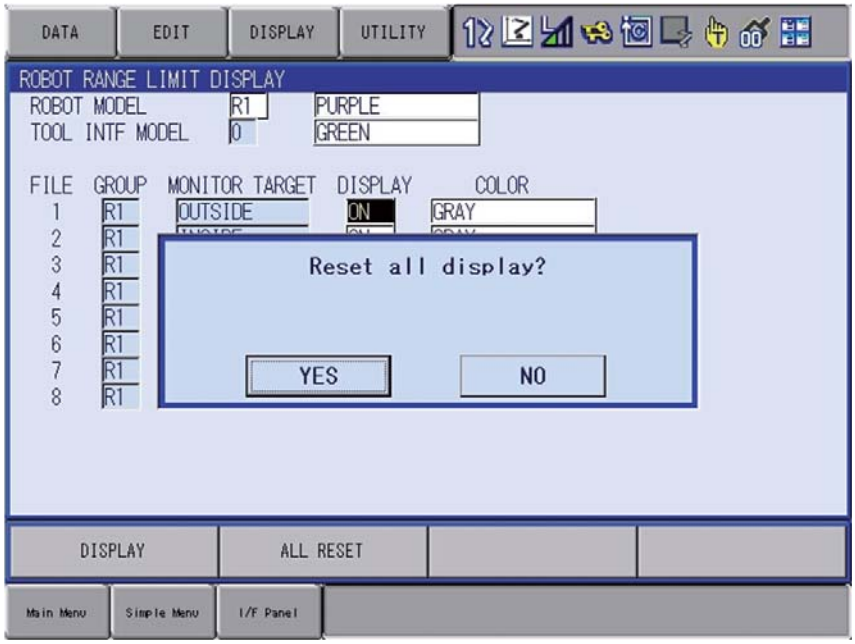
The settings are reflected in the 3D display function. When {NO} is pressed, the settings will not be reflected in the 3D display function.



5.2 Concealing Setting

For concealing all functional safety range, perform the operations in the procedure below.

1. From the menu on the left of the window, select {SAFETY FUNC.}.
2. From the sub-menu, select {ROBOT RANGE DISPLAY}.
3. The ROBOT RANGE LIMIT DISPLAY window is displayed.
4. When {ALL RESET} is pressed, a message saying "Reset all display?" is displayed.
   When {YES} is pressed, the settings are reset.
   When {NO} is pressed, the settings will not be reset.



5. Press {DISPLAY}.
6. A message saying "Upload?" is displayed. Press {YES}. The settings are reflected in the 3D display function. When {NO} is pressed, the settings will not be reflected in the 3D display function.

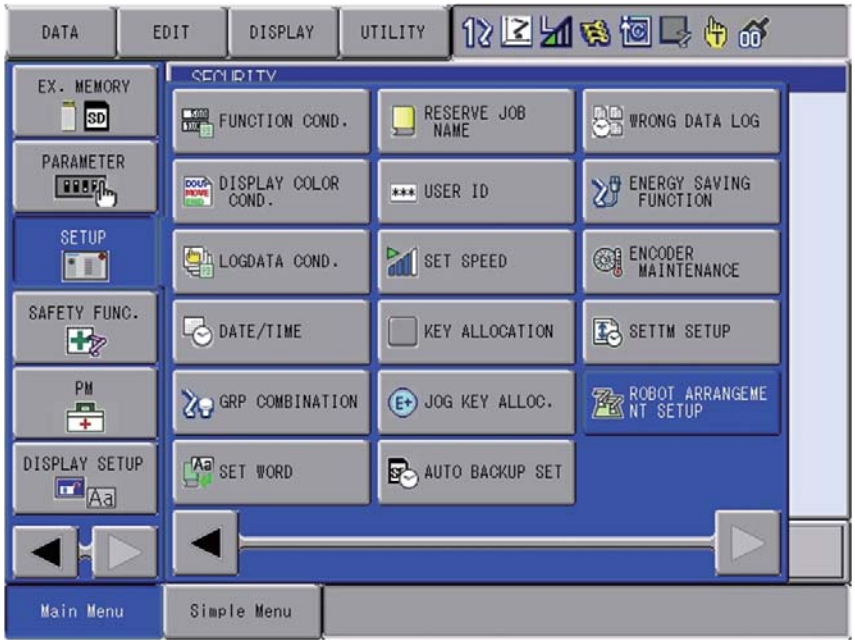
6 Other Settings

Other settings are described in this chapter.

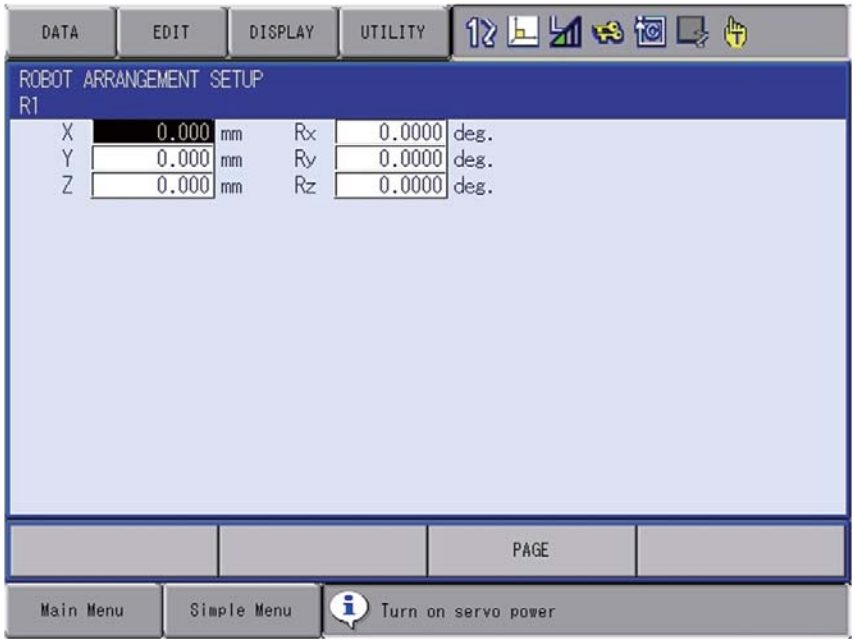
6.1 How to Change the Robot Model Arrangement in a Multiple Robot System

For multiple robot systems, the robot arrangement displayed in the 3D display function can closely match the actual arrangement. When changing the arrangement, perform the operations in the procedure below.

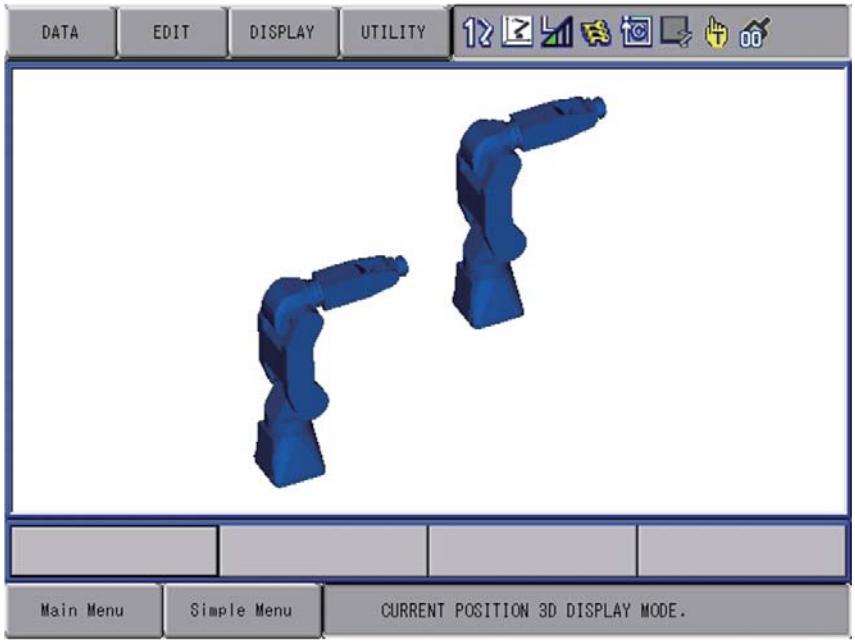
1. From the menu on the left of the window, select {SETUP}.
2. From the sub-menu, select {ROBOT ARRANGEMENT SETUP}.



3. The ROBOT ARRANGEMENT SETUP window is displayed.



4. Enter the arrangement.
5. For changing the robot to set, press {PAGE} and then select. Also [PAGE] can be changed.
6. The entered settings are reflected in the 3D graphic window.



YRC1000 OPTIONS
INSTRUCTIONS

FOR 3D GRAPHIC DISPLAY FUNCTION

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