

- 24-hour Telephone Number: (937) 847-3200
 - Use for urgent or emergency needs for technical support, service and/or replacement parts
 - Routine Technical Inquiries: techsupport@motoman.com
- Allow up to 36 hours for response

YRC1000 OPTIONS INSTRUCTIONS

FOR ARM INTERFERE CHECK 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)

Have the following information available when contacting the YASKAWA Representative:

- System
- Primary Application
- Software Version (*Located on Programming Pendant by selecting: {Main Menu} - {System Info} - {Version}*)
- Warranty ID (*Located on Robot Controller*)
- Robot Serial Number (*Located on Manipulator data plate*)
- Robot Sales Order Number (*Located on Robot controller data plate*)



DANGER

- This manual explains the arm interfere check function of the YRC1000 system. Read this manual carefully and be sure to understand its contents before handling the YRC1000. Any matter 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, the protective covers or shields are removed to show details. Make sure to install all the covers and shields 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

- 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.

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”.



DANGER

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.



WARNING

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.



CAUTION

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

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 cause unintended movement of the manipulator, which may result in personal injury.

Fig. : Release of Emergency Stop



- Observe the following precautions when performing a teaching operation within the manipulator's operating range:
 - 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 cause improper or unintended movement of the manipulator, which may result in personal injury.

- Confirm that no person is present in the manipulator's operating range 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

Personal injury may result if a person enters the manipulator's operating range 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 unattended on the manipulator, on a fixture, or on the floor, etc., 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
	Axis Keys /Numeric Keys
	Keys pressed simultaneously
	Mode Switch
	Button
	Displays



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.

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1 Arm Interfere Check Function

1.1 Outline of Arm Interfere Check Function

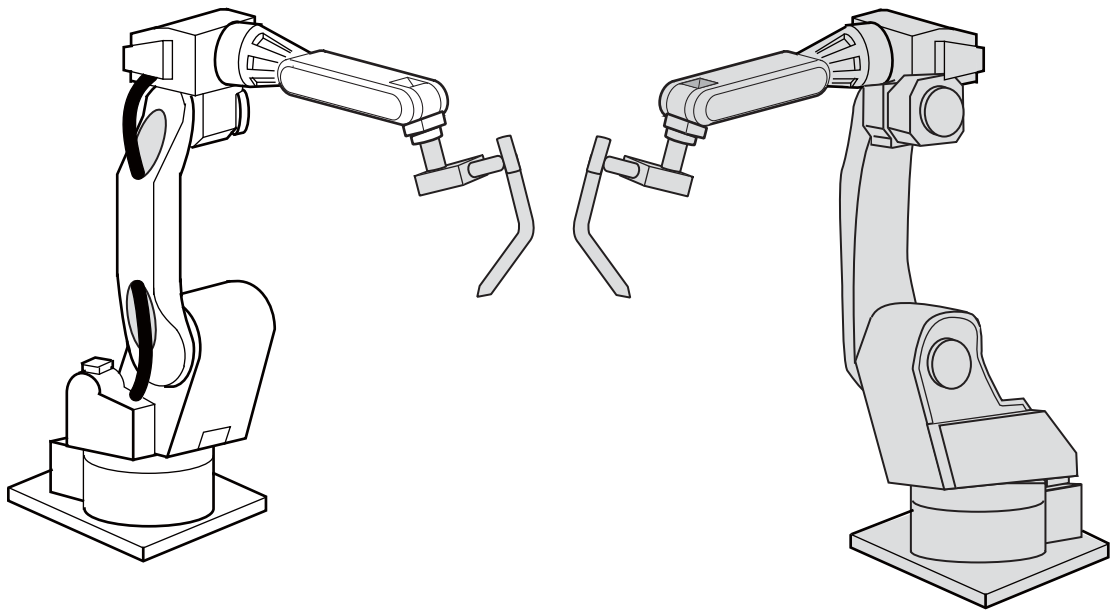
This function checks the interference among manipulator arms and tools in the system consisting of one controller and multiple manipulators.

Interference between each of the following is checked:

- (1) An arm and an arm
- (2) An arm and a tool
- (3) A tool and a tool

The checking method is to approximate each axis arm and tool in cylinder and then the interference is checked between the approximated cylinders. Spheres are set at both ends of the cylinder, and the interferences are checked between spheres and between sphere and cylinder.

If this cylinder or sphere is intersected, the manipulators stop.



- 1 Arm Interfere Check Function
- 1.2 Setting of Arm Interfere Check Function

1.2 Setting of Arm Interfere Check Function

1.2.1 Tool Interfere File

The arm interfere check function requires setting of cylinder and sphere for the robot arm. These setting values need not be set by the customer because they are factory-set.

The tool part must be set by the customer because the tool shape depends on the work that the robot performs. These settings are set in the tool interfere file.

The tool interfere file is shown by using the procedure to select {MAIN MENU} → {ROBOT} → {TOOL INTERFERE}.

The screenshot shows the 'TOOL INTERFERE' screen with a table for setting tool parameters. The table has columns for POINT1 (mm), POINT2 (mm), and RADIUS (mm). The rows are numbered 1 to 5, each with X, Y, and Z coordinates. The current tool number is 0 out of 64.

	POINT1 (mm)	POINT2 (mm)	RADIUS (mm)
1. X	0	140	70
Y	0	0	
Z	0	100	
2. X	140	140	30
Y	0	0	
Z	-50	240	
3. X	0	0	0
Y	0	0	
Z	0	0	
4. X	0	0	0
Y	0	0	
Z	0	0	
5. X	0	0	0

At the bottom of the screen, there are buttons for 'Main Menu' and 'Simple Menu', and a 'PAGE' indicator.

- A maximum of 64 tool interfere files can be set.
In accordance with the tool number specified in operation, one file is selected out of 64 files.
- A maximum of 5 cylinders and spheres can be set.
1 to 5 points can be set by moving the cursor below.
- Point 1 and Point 2 set both end positions that set the cylinder.
Like the setting of the tool dimensions, the setting values are set with the center of T-axis flange regarded as the starting point (X=0, Y=0, Z=0).
- Radius sets the radius of the cylinder and sphere between Point 1 and Point 2. The sphere is set for Point 1 and Point 2.

1	Arm Interfere Check Function
1.2	Setting of Arm Interfere Check Function

1.2.2 Release of Arm Interfere Check

The release of the arm interfere check can be set in the limit release screen.

The limit release screen is shown by using the procedure to select {MAIN MENU} → {ROBOT} → {LIMIT RELEASE}.

When the cursor is moved to "INVALID" of the arm interfere check release and the [SELECT] is pressed, "INVALID" is changed to "VALID" or "VALID" is changed to "INVALID".

Setting "INVALID" invalidates the arm interfere check release and checks the arm interfere.

Setting "VALID" validates the arm interfere check release and does not check the arm interfere.

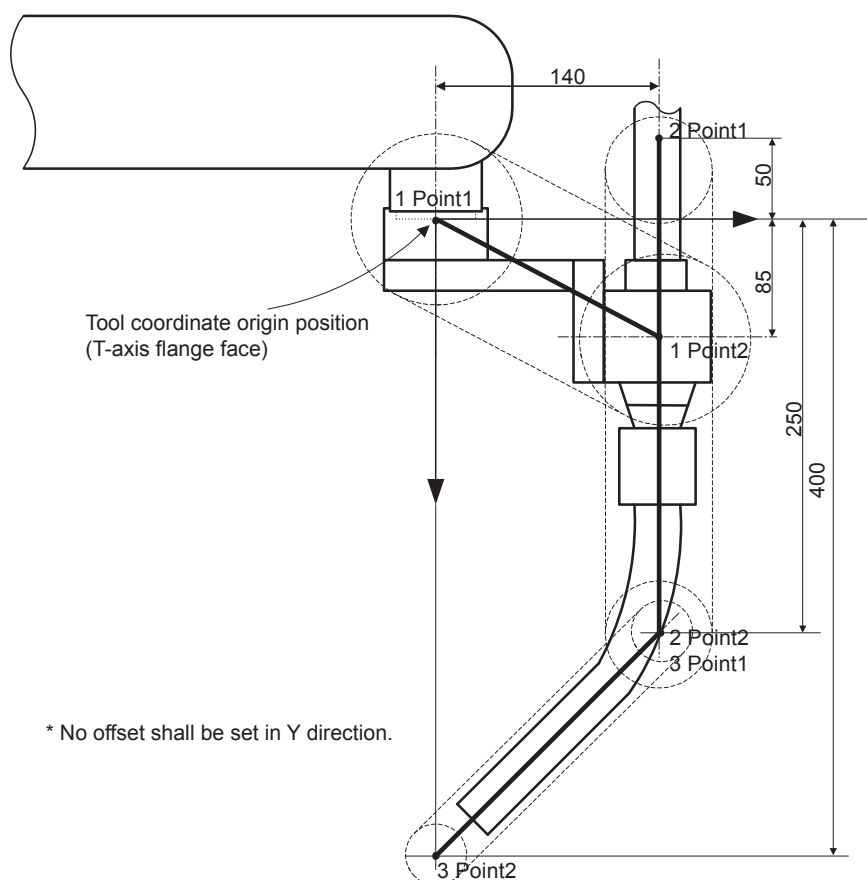


1.2.3 Calibration between Manipulators (Robots)

To use this function, perform the calibration between manipulators. For the procedure of the calibration between manipulators, refer to chapter 3.5 "System Setup" in "YRC1000 OPTIONS INSTRUCTIONS FOR INDEPENDENT/COORDINATED CONTROL FUNCTION (HW1484042)".

- 1 Arm Interfere Check Function
- 1.3 Example of Setting Tool Interfere File

1.3 Example of Setting Tool Interfere File



* No offset shall be set in Y direction.

TOOL INTERFERE			
TOOL NO. : 0 / 64			
	POINT1 (mm)	POINT2 (mm)	RADIUS (mm)
1. X	0	140	70
Y	0	0	
Z	0	85	
2. X	140	140	30
Y	0	0	
Z	-50	250	
3. X	140	0	20
Y	0	0	
Z	250	400	
4. X	0	0	0
Y	0	0	
Z	0	0	
5. X	0	0	0
Y	0	0	
Z	0	0	

1	Arm Interfere Check Function
1.4	Alarm/Error

1.4 Alarm/Error

1.4.1 Axis Operation

If the arm (tool) interference occurs during the axis operation, "ARM (TOOL) INTERFERE" is shown in the message line and the manipulators stop.

In this case, perform the axis operation in the direction with no arm interfere. If the axis operation is not allowed in the direction with no arm interfere in this case, temporally invalidate the arm interfere check as described in *chapter 1.2.2 "Release of Arm Interfere Check"*.

1.4.2 PLAYBACK/FWD/BWD/TEST Operation

If the arm (tool) interfere occurs in PLAYBACK/FWD/BWD/TEST operation, "Alarm 4620 ARM (TOOL) INTERFERE" is issued and the manipulators stop.

In this case, perform the axis operation to move to the position with no arm interfere.

If the arm interfere occurs during playback, review the job to prevent the arm interfere.

1.5 Notes

- (1) About accuracy of arm (tool) interfere check
The robot accuracy has an error due to the calibration accuracy between robots or a delay in the servo system.
Therefore, set the radius of the tool interfere file with an allowance.
- (2) Determine the setting value of the TOOL INTERFERE file in accordance with the drawing.
- (3) The arm interfere check function may not be used depending on the robot type.
Contact a YASKAWA representative nearest you.

YRC1000 OPTIONS INSTRUCTIONS

FOR ARM INTERFERE CHECK FUNCTION


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