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

MOTOMAN INSTRUCTIONS

NX INSTRUCTIONS
NX OPERATOR’S MANUAL
NX MAINTENANCE MANUAL

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

Part Number: 143235-2CD
Revision: 6
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www.motoman.com
MANDATORY

• This user guide provides an overview of the Yaskawa RobotPro® NX system. It gives general information about the system, a description of its major components, and the procedures for installation, system operation, and preventive and repair maintenance. Be sure to read and understand this manual thoroughly before installing and operating the RobotPro® NX system.

• General items related to safety are listed in Section 2 of the NX Controller Manual. To ensure correct and safe operation, carefully read the NX Controller Manual before reading this manual.

• It is the purchaser’s responsibility to ensure that all local, county, state, and national codes, regulations, rules, or laws relating to safety and safe operating conditions for each installation are met and followed.

CAUTION

• Some drawings 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 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.
We suggest that you obtain and review a copy of the ANSI/RIA National Safety Standard for Industrial Robots and Robot Systems (ANSI/RIA R15.06-2012). You can obtain this document from the Robotic Industries Association (RIA) at the following address:

Robotic Industries Association
900 Victors Way
P.O. Box 3724
Ann Arbor, Michigan 48106
TEL: (734) 994-6088
FAX: (734) 994-3338
www.roboticsonline.com

Ultimately, well-trained personnel are the best safeguard against accidents and damage that can result from improper operation of the equipment. The customer is responsible for providing adequately trained personnel to operate, program, and maintain the equipment. NEVER ALLOW UNTRAINED PERSONNEL TO OPERATE, PROGRAM, OR REPAIR THE EQUIPMENT!

We recommend approved Yaskawa training courses for all personnel involved with the operation, programming, or repair of the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.
Notes for Safe Operation

Read this manual carefully before installation, or operation of the Yaskawa RobotPro® NX software.

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

- **DANGER**: Indicates an imminent hazardous situation which, if not avoided, could result in death or serious injury to personnel.

- **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.

**NOTE**: To ensure safe and efficient operation at all times, be sure to follow all instructions, even if not designated as “DANGER”, “WARNING” and “CAUTION”.
**Definition of Terms Used In this Manual**

The MOTOMAN manipulator is the YASKAWA industrial robot product. The manipulator usually consists of 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>NX controller</td>
<td>NX</td>
</tr>
<tr>
<td>NX 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>

**Safeguarding Tips**

All operators, programmers, hospital/lab personnel, maintenance personnel, supervisors, and anyone working near the system must become familiar with the operation of this equipment. All personnel involved with the operation of the equipment must understand potential dangers of operation. General safeguarding tips are as follows:

- Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation of this equipment, the operator's manuals, the system equipment, and options and accessories should be permitted to operate this equipment.
- Improper connections can damage the equipment. All connections must be made within the standard voltage and current ratings of the equipment.
- The system must be placed in Emergency Stop (E-Stop) mode whenever it is not in use.
- In accordance with ANSI/RIA R15.06-2012, section 4.2.5, Sources of Energy, use lockout/tagout procedures during equipment maintenance. Refer also to Section 1910.147 (29CFR, Part 1910), Occupational Safety and Health Standards for General Industry (OSHA).

**Mechanical Safety Devices**

The safe operation of this equipment is ultimately the user's responsibility. The conditions under which the equipment will be operated safely should be reviewed by the user. The user must be aware of the various national codes, ANSI/RIA R15.06-2012 safety standards, and other local codes that may pertain to the installation and use of this equipment.

Additional safety measures for personnel and equipment may be required depending on system installation, operation, and/or location. The following safety equipment is provided as standard:

- Safety barriers
- Door interlocks
- Emergency stop palm buttons located on operator station

Check all safety equipment frequently for proper operation. Repair or replace any non-functioning safety equipment immediately.
All operators, programmers, hospital/lab personnel, maintenance personnel, supervisors, and anyone working near the system must become familiar with the operation of this equipment. Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation, manuals, electrical design, and equipment interconnections of this equipment should be permitted to program, or maintain the system. All personnel involved with the operation of the equipment must understand potential dangers of operation.

- Inspect the equipment to be sure no potentially hazardous conditions exist. Be sure the area is clean and free of water, oil, debris, etc.
- Be sure that all safeguards are in place. Check all safety equipment for proper operation. Repair or replace any non-functioning safety equipment immediately.
- Check the E-Stop button on the operator station for proper operation before programming. The equipment must be placed in Emergency Stop (E-Stop) mode whenever it is not in use.
- Back up all programs and jobs onto suitable media before program changes are made. To avoid loss of information, programs, or jobs, a backup must always be made before any service procedures are done and before any changes are made to options, accessories, or equipment.
- Any modifications to the controller unit can cause severe personal injury or death, as well as damage to the robot! Do not make any modifications to the controller unit. Making any changes without the written permission of Yaskawa will VOID YOUR WARRANTY!
- Some operations require standard passwords and some require special passwords. Special passwords are for Yaskawa use only. YOUR WARRANTY WILL BE VOID if you use these special passwords.
- The equipment allows modifications of the software for maximum performance. Care must be taken when making these modifications. All modifications made to the software will change the way the equipment operates and can cause severe personal injury or death, as well as damage parts of the system. Double check all modifications under every mode of operation to ensure that you have not created hazards or dangerous situations.
- This equipment has multiple sources of electrical supply. Electrical interconnections are made between the controller and other equipment. Disconnect and lockout/tagout all electrical circuits before making any modifications or connections.
- Do not perform any maintenance procedures before reading and understanding the proper procedures in the appropriate manual.
- Use proper replacement parts.
- Improper connections can damage the equipment. All connections must be made within the standard voltage and current ratings of the equipment.
Fire Safety

All locations where combustible materials are used or stored have the risk of fire. Fire can cause extensive damage, injury, and loss of life.

It is the purchaser’s responsibility to provide a workspace for RobotPro® NX that meets state and local occupancy classification requirements. This use classification may require certain design features such as automatic fire protection systems. The following are sample requirements:

- Locate fire extinguishers in the workspace.
- Provide access control. Limit access to authorized personnel only. Yaskawa recommends the placement of warning signs: “Authorized Personnel Only” where appropriate.
- Hazard communication: provide and properly indicate location of emergency exits per local codes.

Ignition sources must be controlled and eliminated where possible to reduce the risk of fire.

- Post hazard warning signs: “Danger, Combustible Dust May Be Present. No Smoking, No Sparks, No Open Flame.”
- All maintenance work that can produce heat or sparks must be done following standard hot work procedures.

Certain electrical circuits within this equipment are protected by fuses against over-current conditions. For continued protection against risk of fire, replace fuses only with the same type and rating specified.

Maintenance Safety

Turn the power OFF and disconnect and lockout/tagout all electrical circuits before making any modifications or connections.

Perform only the maintenance described in this manual. Maintenance other than specified in this manual should be performed only by Yaskawa-trained, qualified personnel.
Combustible Dust Safety

Although the quantities of combustible dust from the foam carving operation are small, the dust is combustible and the accumulation of dust creates both a fire and a potential combustible dust deflagration hazard. There is no “de minimis” amount for combustible dust. Since there is a risk of fire or deflagration, National Fire Protection Association (NFPA) standards and Occupational Safety and Health Administration (OSHA) combustible dust requirements apply.

It is the purchaser’s responsibility to ensure that all local, county, state, and national codes, regulations, rules, or laws relating to safety and safe operating conditions for each installation are met and followed. Yaskawa recommends that you review the following codes and standards for applicability to your project:

- Federal OSHA Combustible Dust National Emphasis Program requirements
- NFPA 654: Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids
- NFPA 68: Standard on Explosion Protection by Deflagration Venting
- NFPA 69: Standard on Explosion Prevention Systems
- NFPA 77: Recommended Practice on Static Electricity
- NFPA 91: Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids
- NFPA 499: Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas

All operators, programmers, plant and tooling engineers, maintenance personnel, supervisors, and anyone working near the RobotPro® NX unit must become familiar with the operation of the carving equipment. All personnel involved with the operation of the carving equipment must understand potential dangers of operation. General safeguarding tips are as follows:

- Check all safety equipment for proper operation. Repair or replace any non-functioning safety equipment immediately.
- Improper operation can damage the equipment. Only trained personnel familiar with the operation, manuals, electrical design, and equipment interconnections of this robot should be permitted to operate the system.
- All modifications made to the controller will change the way the robot operates and can cause severe personal injury or death, as well as damage the robot. Check and test all changes at slow speed.
- All personnel involved with the operation of the carving equipment and anyone working near the unit must understand and comply with the requirements listed below:

To reduce explosion potential, do not permit dust to accumulate. Keep work areas clean and orderly.

Maintain material MSDS forms on site and ensure that all raw materials are correct and stored according to the manufacturer’s recommendations.
Clean any accumulated dust. Do not allow accumulations greater than 1/8” in thickness.

Prevent dust spread by not allowing compressed air for cleaning.

Maintain records of housekeeping and maintenance activities.

Prevent dust spread by operating integral dust collection system to capture and control dust generated in the enclosure.

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**MANDATORY**

All personnel involved with the operation of this foam carving equipment and anyone working near the equipment must understand and comply with the requirements listed below:

- Federal OSHA Combustible Dust National Emphasis Program requirements
- NFPA 654: Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids
- NFPA 68: Standard on Explosion Protection by Deflagration Venting
- NFPA 69: Standard on Explosion Prevention Systems
- NFPA 77: Recommended Practice on Static Electricity
- NFPA 91: Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids
- NFPA 499: Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas

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**Summary of Warning Information**

This manual is provided to help you establish safe conditions for operating your equipment. Specific considerations and precautions are also described in the manual, but appear in the form of Dangers, Warnings, Cautions, and Notes.

It is important that you operate your equipment in accordance with this instruction manual and any additional information which may be provided by Yaskawa. Address any questions regarding the safe and proper operation of your equipment to Yaskawa Customer Support.
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1 Introduction

RobotPro® NX is a PC-based expert system for preventive maintenance consultation, error-code troubleshooting, and repair procedures. RobotPro® NX provides effective step-by-step procedures, drawings, schematics, and other information.

1.1 Features and Benefits

- Test and repair procedures
- Interactive troubleshooting
- Illustrative graphics
- Preventive maintenance procedures
- Service and training information
- User friendly, graphical user interface
- Tailored to specific robot and controller models
- Maximum robot uptime
- Lower repair costs
- Reduced spares inventory
- Increased productivity
- Increased troubleshooting proficiency
- Reduced training costs
- No special hardware required

1.2 System Requirements

To run RobotPro® NX, the following hardware and software are required:

- Computer: IBM compatible personal computer (PC)
- Processor: Pentium, 400 MHz (1 Ghz recommended)
- Memory: 128 MB minimum (256 MB recommended)
- Hard Disk: 200 MB minimum (400 MB minimum with .Net Framework)
- DVD-ROM Drive: 4x speed or faster
- Monitor: SVGA, 800x600 resolution, 16 million colors, small fonts selected
- Operating System: Microsoft Windows 7 or Microsoft Windows 10 (32/64 bit).

**NOTE**

- RobotPro® NX is a tool for the robot service personnel. This manual assumes that the user is already familiar with PC usage and robot programming.
- If you experience abnormal display of the RobotPro® NX screens, ensure that your system is set to use small fonts in the monitor setup control panel.

1.3 RobotPro® NX Components

Before installing RobotPro® NX, make sure your package includes all of the items listed below:

- RobotPro® NX DVD (packaged by robot model)
- Hardware key
1.4 Care of RobotPro® NX Components

Take precautions to avoid scratching the DVD. Always store the DVD in its case and avoid placing the DVD on any surface when not in its protective case.

![CAUTION]

Keep the hardware key in a safe place. If you lose the hardware key the RobotPro® NX will not work and you will need to purchase a new copy of the software.

It is highly recommended that the key(s) be insured for the full value of the software package. Lost or stolen keys cannot be replaced. If the key is lost, users will have no alternative but to purchase a new copy of the software.

If the key is accidentally damaged, return it to Yaskawa for replacement. There is a charge for key replacement.

1.5 Customer Service Information

If you are in need of technical assistance, contact the Yaskawa service staff at (937) 847-3200. Please have the following information ready before you call:

- RobotPro® NX executable, general, and troubleshooting versions along with model specific versions
- Software configuration (hard disk capacity, memory, operating system, software, etc.)
- Description of difficulty (make note of any error messages)
2 Installation

2.1 Installing RobotPro® NX

RobotPro® NX is part of the MotoSoft family of software solutions. Each RobotPro® NX package is provided on a single DVD with an installer utility.

To install RobotPro® NX, proceed as follows:

1. Insert DVD into DVD-ROM drive.
2. The setup program executes automatically.
3. Follow the RobotPro® NX install wizard instructions as it guides you through the installation process.

Setup executes automatically when the DVD is inserted into the DVD-ROM drive unless auto-execute has been disabled on your computer. If the setup program fails to auto-execute, refer to the directions on the DVD label for more information.

2.2 Installing the Hardware Key

A separate hardware key is supplied with each RobotPro® NX robot model and must be attached to your computer’s USB port or RobotPro® NX will not function properly. If multiple USB keys are in use, a USB hub can be used to expand the number of available USB ports. If you have difficulties using multiple USB hardware keys, contact Yaskawa customer service at (937) 847-3200.

2.2.1 Optional Parallel Port Key

If you have the optional parallel port key, (this port is commonly used to connect printers and other peripheral devices to your computer) proceed as follows:

1. Disconnect any device currently connected to your computer’s parallel port.
2. Carefully insert the hardware key into the parallel port. If the key does not fit, do not force it. The key should fit snugly but does not require significant force to insert.
3. Connect your peripheral cable to the free end of the hardware key. The key will not interfere with the operation of your printer or other peripheral devices.

Remove hardware key from computer if parallel port is used for any other operation.

Key may not operate properly when stacked with any additional keys or if attached to anything other than a parallel port (e.g. SCSI adapter).
2.3 First Use Instructions

When you launch RobotPro® NX for the first time, you must create a new robot configuration for the RobotPro® NX database. Click the [Create New Configuration] button to continue. The Configuration screen appears.

1. Enter a unique name describing your robot so it will not be confused with other robots.

2. Using the drop-down menu lists, select the manipulator, controller, and application for this robot.

3. Enter the values for the remaining fields that best describe the operation of your robot.

**NOTE**
The “Number of days threshold” and “Number of servo bours threshold” are used for notification of past due items in the Maintenance component (See section 3.4.)
4. By clicking on the {Customize Maintenance Schedule} button, you can customize the Maintenance Schedule.

![Configuration window]

5. After selecting the equipment and operation options that best describe your system, click [Apply]. The Main Menu screen appears and you are ready to begin using RobotPro® NX.
3 Operation

This section describes the features of each component of RobotPro® NX. These include the following main components:

- Configuration Options
- General Information
- Parts & Wiring Diagrams
- Maintenance
- Procedures
- Troubleshooting

3.1 Configuration Options

The Configuration Options section of RobotPro® NX allows you to create new robot configurations, select, edit, and delete existing configurations. To access Configuration Options, proceed as follows:

1. From the Main Menu, click the [Configuration Options] button or use the Quick Links drop down menu. The Configuration Options screen appears.

2. Select the appropriate button to select, edit, delete, or create a new configuration.
3.1.1 Automatic Updates

1. Select whether or not to automatically check for updates when RobotPro® NX starts.

![Automatic Updates Window]

**NOTE** Clicking on “Options” displays additional settings for internet connections.
3.2 General Information

The General Information section of RobotPro® NX contains safety information, contact information, revision information, torque specifications, and notes on lubrication. To access General Information, proceed as follows:

1. From the Main Menu, click the [General Information] button or use the Quick Links drop down menu. The General Information screen appears.
2. Select the appropriate radio button at the top of the screen to display the desired information.

3.3 Parts & Wiring Diagrams

This section includes a spare parts list, illustrated parts list, and wiring diagrams including testing procedures and wiring instructions. To access the Parts & Wiring Diagrams, proceed as follows:

1. From the Main menu, click the [Parts & Wiring] button or use the Quick Links drop down menu. The Parts & Wiring screen appears.
2. Double click any tree entry or click the [Show Diagram] button to view diagrams, parts lists, and wiring.
3. Click the [Zoom Out] and [Zoom In] buttons to magnify the image.
4. Click the [Diagrams Menu] button to return to the Parts & Wiring menu.
3.4 Maintenance Component

The Maintenance Component of RobotPro® NX provides an automated maintenance scheduler. This scheduler enables the user to document each maintenance procedure and schedule future maintenance. The Maintenance Scheduler lists the recommended maintenance schedules along with each inspection item.

The next due date and servo hour are calculated based upon information entered during the configuration setup including the robot's application and last completed servo hour. The robot's application has a weighted factor that affects the calculation. When using a customized schedule, this factor is ignored for any values different than recommended. To ignore this factor on all values, select one of the Low Speed applications. Items appearing in green are due within the set threshold. Items appearing in red are past due, and items appearing in black are not due within the set threshold.

To begin using the Maintenance component, proceed as follows:

1. From the Main menu, click the [Maintenance] button or use the Quick Links drop down menu. The Maintenance Scheduler screen appears.

The set threshold can be modified in the configuration menu. From the Main menu, click the [Configuration Options] button or use the Quick Links drop down menu. Click the [Edit Current Configuration] button.
2. Select the appropriate radio button at the top of the screen to display the desired maintenance schedule.

 NOTE The Display selection drop down allows the ability to view either the robot only, controller only, or both.

3. Select the inspection items you wish to complete.

 NOTE Click the [Go to Procedure] button to view the inspection procedures.

4. Once the maintenance procedure has been completed, double click the selected items, or click the [Mark as Completed] button. The Item Update window appears

5. Select the item you wish to update. Fill in the Date, Servo Hour, and name of technician who performed the maintenance and click the [Apply] button. The Maintenance Schedule is updated with the new information.

For more information about periodic maintenance and lubrication schedules, click the [Information on PM’s & Lubrication Schedule] button.

3.4.1 History

Checking “Enable Continuous Logging” creates a log of all completed maintenance items including dates and hours completed. This log is valuable if a complete history is ever needed for any maintenance item. However, a larger portion of disk space is used to store this additional data. To view the history, simply click on the [Show Complete History] button on the Maintenance Scheduler.

The history file can be cleared to save disk space. However, it is recommended that the database be exported and saved as a backup. To export the history database, proceed as follows:
1. Click the [Export Database] button on the Maintenance Scheduler screen. The Export Options screen appears.

2. Select export format (.mdb or delimited text) and click Save.

   **NOTE** An exported maintenance database that was exported in native .mdb format may be imported by selecting the Import tab and then selecting the file.

3. To clear the history, click the [Clear History] button.
3.5 Procedures Component

The Procedures Component of RobotPro® NX provides maintenance and troubleshooting procedures. Procedures can be accessed from the Main Menu, Quick List, or Maintenance Scheduler. To begin using the Procedures component, proceed as follows:

1. From the Main menu, click the [Procedures] button or use the Quick Links drop down menu. The Repair Procedures screen appears.

2. Select a procedure and click the [Show Procedure] button or double click any tree entry to view procedures.

   NOTE: Click on the [+] to expand the Parts & Wiring tree.
3. Use the scroll bar to the right to scroll through the procedure.
4. Click the [Procedures Menu] button to return to the repair procedures tree.

**NOTE**

The navigation arrows at the top right of the screen can be used to move forwards and backwards through separate related procedures.

5. Torque values are provided in procedures involving the tightening of bolts and screws, and appear as mouse overs in the diagrams. To select the torque unit, use the Torque Unit Selection drop-down menu.

<table>
<thead>
<tr>
<th>Torque Unit Selection</th>
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</thead>
<tbody>
<tr>
<td>Kilogram Meters (kg-m)</td>
</tr>
<tr>
<td>Kilogram Meters (kcm)</td>
</tr>
<tr>
<td>Newton Meters (Nm)</td>
</tr>
<tr>
<td>Foot Pounds (ft-lb)</td>
</tr>
<tr>
<td>Inch Pounds (in-lb)</td>
</tr>
</tbody>
</table>
3.6 Troubleshooting Component

The Troubleshooting component of RobotPro® NX provides troubleshooting for controller alarms. A series of questions guide you through the troubleshooting process. Procedures can be accessed using the [How to Link] button if the Procedures component has been installed.

**NOTE**

The troubleshooting screen can be viewed as a tree by clicking the [Tree View] button.

To begin using the Troubleshooting component, proceed as follows:

1. From the Main menu, click the [Troubleshooting] button or use the Quick Links drop down menu. The Troubleshooting screen appears.

2. Select the alarm number using the drop down menu.

3. The alarm name and description appear. Answer each question or click the [Tree View] button to view all questions and answers.
3 Operation

3.6 Troubleshooting Component

4. As you answer each question, RobotPro® NX prompts you for more information until a solution is given. The [How to Link] button activates if there is a troubleshooting procedure available.

5. Click the [Restart] button to reset the current alarm questions to the beginning.
ROBOTPRO® NX
SYSTEM MANUAL

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