Motoman® NXC100 Controller

Modular RoboBar System Manual

• Entertainment Model
• Non–Alcohol Model

Part Number: 153317-1CD
Revision: 1

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Chapter 1

Introduction

1.1 About This Document

This System Manual provides coverage of the Motoman® Modular RoboBar system, and is organized as follows –

CHAPTER 1 - INTRODUCTION
This chapter provides a brief system overview, a list of reference documents, and Motoman Customer Support contact information.

CHAPTER 2 - SAFETY
This chapter provides information regarding the safe use and operation of Motoman® products.

CHAPTER 3 - EQUIPMENT DESCRIPTION
This chapter provides detailed descriptions of the major components of the Modular RoboBar system.

CHAPTER 4 - INSTALLATION
This chapter provides installation information for the Modular RoboBar system.

CHAPTER 5 - OPERATION
This chapter provides instructions for basic operation of the Modular RoboBar system. This section also provides procedures for start-up, normal operation, fault recovery, and shutdown.

CHAPTER 6 - MAINTENANCE
This chapter contains periodic maintenance requirements and troubleshooting suggestions for the Modular RoboBar system.

CHAPTER 7 - ORDER ENTRY PANEL AND SOFTWARE
This chapter provides a description of the Modular RoboBar Order Entry Panel / Command Center (HMI). This chapter also provides coverage of certain Modular RoboBar software parameters.
1.2 System Overview

The Modular RoboBar series of cells offer full RoboBar features and capabilities in a modular configuration. This new configuration allows separation of the complete RoboBar cell into four modules (see Figure 1) for easier installation and maneuverability when tight openings or hallways are a concern.

Modular RoboBar is available in the following versions –

- Entertainment Model . . . . . . . . . . . . . . . . . . . . . . Motoman P/N 153258-1
- Non-Alcohol Model . . . . . . . . . . . . . . . . . . . . . . . Motoman P/N 153259-1

A customer initiates the drink vending process by "swiping" a magnetic card at a magnetic card reader located at the top of the Order Entry Panel. Upon approval, the customer then selects the desired beverage(s) at the Order Entry Panel (refer to Chapter 7).

When the customer completes a beverage selection, the DA9IC robot begins preparation of the first drink by selecting a suitable cup, and filling it with the customer-selected beverage. The robot also adds ice to a cold beverage, if that function is selected by the customer during beverage selection (refer to Chapter 7).

The DA9IC robot then transfers a completed drink to the customer by placing it on a Drink Delivery Shuttle. If additional drink orders are in the order queue, Modular RoboBar then starts preparation of the next drink order.

The Modular RoboBar system features a total safety environment that meets or exceeds the requirements of the ANSI/RIA R15.06-1999 Robot Safety Standard.

1.3 System Layout

The Modular RoboBar system consists of four separable modules that facilitate shipment and customer-site installation (see Figure 1). The modules, when assembled and secured, form a complete Modular RoboBar cell (see Figure 2). Various "dash numbers" are associated with each of the modules. By use of the dash numbers when placing an order for a Modular RoboBar system, the customer is able to select the Modular RoboBar–NA version or the Modular RoboBar–E version (see Table 1).

One access door (key lockable, but not interlocked) at the rear of the assembled Modular RoboBar provides access to the interior of the RoboBar cell for authorized personnel.

Five safety-interlocked access doors are part of the assembled Modular RoboBar, and provide access to soft drink syrup boxes, bottles, cups and other consumables. These panels are both key-lockable and safety interlocked. Refer to Table 1 for a specific listing of access doors associated with each RoboBar module.

Transparent Lexan® polycarbonate shield panels are also part of the assembled Modular RoboBar cell (see Figure 2). These panels provide a view of the Modular RoboBar system in action, while preventing unauthorized access to the interior of the cell. Various shield panels can be opened to provide access to upper portions of the Modular RoboBar cell. These panels are also safety-interlocked.

Opening any of the safety-interlocked access doors or panels while RoboBar is in operation, immediately triggers an E-Stop condition (refer to Section 5.3.2).
Figure 1  Separable RoboBar Modules

Figure 2  Assembled Modular RoboBar (Typical)
Table 1 Modular RoboBar — Module Description and Features

<table>
<thead>
<tr>
<th>MODULE1</th>
<th>PART / DASH NO</th>
<th>INCLUDED COMPONENTS</th>
</tr>
</thead>
</table>
| FRONT MODULE (Non-Alcohol) | 153262-1 | • 3 CUP DISPENSERS  
• DRINK DELIVERY TRANSPORTER w/THEFT-PROOF DOOR  
• SERVICE DOOR FOR CUP REFILL (w/SAFETY SENSOR)  
• SODA/JUICE TOWER (8 SYRUPS+PUMPS+BAD-IN-BOX RACKS)  
• CARBONATOR, CHILLER PLATE, WATER FILTER  
• TOUCH SCREEN  
• NO BEER DISPENSER |
| FRONT MODULE (Entertainment) | 153262-2 | • 3 CUP DISPENSERS  
• DRINK DELIVERY TRANSPORTER w/THEFT-PROOF DOOR  
• SERVICE DOOR FOR CUP REFILL (w/SAFETY SENSOR)  
• SODA/JUICE TOWER (8 SYRUPS+PUMPS+BAD-IN-BOX RACKS)  
• CARBONATOR, CHILLER PLATE, WATER FILTER  
• TOUCH SCREEN  
• 3–BRAND BEER DISPENSER AND OTHER HARDWARE |
| LEFT MODULE (Entertainment) | 153261-1 | • AUTOMATIC ICE MAKER / DISPENSER  
• DOORS w/KEY LOCKS AND SAFETY INTERLOCKS  
• FULL-HEIGHT PERSONNEL ENTRY DOOR MOUNTS TO THIS MODULE  
• 3 BRAND BOTTLE RACK (2 EACH) |
| LEFT MODULE (Non-Alcohol) | 153261-2 | • AUTOMATIC ICE MAKER / DISPENSER  
• DOORS w/KEY LOCKS AND SAFETY INTERLOCKS  
• FULL-HEIGHT PERSONNEL ENTRY DOOR MOUNTS TO THIS MODULE  
• MACCO – AUTOMATIC COFFEE MAKER |
| CENTER (ROBOT) MODULE | 153263-1 | • MOTOMAN® DA9IC ROBOT |
| RIGHT MODULE (Non-Alcohol) (Entertainment) | 153260-1 | • DOORS w/KEY LOCKS AND SAFETY INTERLOCKS  
• COMPUTER AND MOUNTING FOR OTHER ELECTRICAL DISTRIBUTION  
• AUDIO SYSTEM  
• COMPUTER SYSTEM  
• 6 BRAND BOTTLE RACK (2 EACH) |

1 See Figure 1 for identification of the various modules that are assembled into a complete RoboBar system.

1.4 Example Configuration

<table>
<thead>
<tr>
<th>MODULE</th>
<th>ROBOBAR-E P/N 153258-1</th>
<th>ROBOBAR-NA P/N 153259-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>CENTER (ROBOT) MODULE</td>
<td>153263-1</td>
<td>153263-1</td>
</tr>
<tr>
<td>LEFT MODULE</td>
<td>153261-1</td>
<td>153261-2</td>
</tr>
<tr>
<td>RIGHT MODULE</td>
<td>153260-1</td>
<td>153260-1</td>
</tr>
<tr>
<td>FRONT MODULE</td>
<td>153262-1</td>
<td>153262-2</td>
</tr>
<tr>
<td>POWER KIT</td>
<td>153438-2</td>
<td>153438-3</td>
</tr>
<tr>
<td>DEVICENET KIT</td>
<td>TBD</td>
<td>TBD</td>
</tr>
</tbody>
</table>

NOTE – Reference Figure 1 and Table 1
1.5 **Standard Features**

Both Modular RoboBar cells incorporate the following standard features –

- High-speed, dual-arm, 11-axis robot equipped with two servo grippers
- Complete cell is separable into four individual modules
- Touch screen order entry system
- Soda/Juice Tower (8-flavor capacity + water/carbonated water)
- LCD display (12 in) mounted as robot's "head" to provide programmable voice and face "personality."
- Audio system
- Three cup dispensers (each with approximately 100 cup capacity)
- One-piece ice maker/ice dispenser
- Linear slide for drink delivery to the customer
- Theft-resistant drink door with sensors to detect open/closed status
- RIA-compliant safety enclosure with five safety-interlocked access doors and 1 key-locked operator door

1.6 **Additional Features**

1.6.1 **Modular RoboBar–E (Entertainment Model)**

The Modular RoboBar–E Model (P/N 153258-1) includes all of the standard features given in Section 1.5, plus the following –

- Draft beer (3 brands)
- Nine bottle holders, with capacity for 2 bottles of each brand

1.6.2 **Modular RoboBar–NA (Non-Alcohol Model)**

The Modular RoboBar–NA Model (P/N 153259-1) includes all of the standard features given in Section 1.5, plus the following –

- Coffee/Espresso machine (can be configured for coffee, espresso, cappuccino, and latte)
- Six bottle holders, with capacity for 2 bottles of each brand

1.7 **System Requirements**

The Modular RoboBar system requires the following customer-supplied items –

- Potable water supply (40 psi minimum water pressure)
- Drainage system (for ice melt, drips, spills, etc.)
- Electrical service (Split-Phase, 240 VAC, 60 Hz)
- Pressurized carbon dioxide (CO₂) supply cylinder for carbonated beverages
- Pressurized nitrogen (N) supply cylinder (for draft beer feature of RoboBar–E Model)
1.8 Reference Documentation

For additional information on individual Modular RoboBar components, refer to the following documentation that is included with your Modular RoboBar system –

- Motoman NXC100 Controller Manual (P/N 150975-1)
- Motoman DA9IC Manipulator Manual (P/N 151773-1)
- Motoman NX100 Concurrent I/O Manual (P/N 149230-1)
- Vendor Manuals/Instruction Sheets for Modular RoboBar system components not manufactured by Motoman, but supplied with your system.
- Motoman Wiring Diagram/Schematic Drawing Package supplied with your Modular RoboBar system.

1.9 Customer Support Information

If you need assistance with any aspect of your Modular RoboBar system, please contact Motoman® Customer Support at the following 24-hour telephone number –

937. 847. 3200

For routine technical inquiries, you can also contact Motoman® Customer Support at the following e-mail address –

techsupport@motoman.com

When using e-mail to contact Motoman® Customer Support, please provide a detailed description of your issue, along with complete contact information. Please allow approximately 24 to 36 hours for a response to your inquiry.

Note: Please use e-mail for routine inquiries, only. If you have an urgent or emergency need for service, replacement parts, or information, you must contact Motoman® Customer Support at the telephone number shown above.

Please have the following information ready before you call –

- SYSTEM . . . . . . . . . . . . . . . . . . Modular RoboBar
- ROBOT . . . . . . . . . . . . . . . . . . One DA9IC dual-arm robot
- CONTROLLER . . . . . . . . . . NXC100
- SOFTWARE VERSION . . . . . . Access this information on the Programming Pendant LCD display screen by accessing MAIN MENU ➔ SYSTEM INFO ➔ VERSION
- ROBOT SERIAL NUMBER . . . . . . Located on robot data plate
- ROBOT SALES NUMBER . . . . . . Located on NXC100 controller data plate
- WARRANTY ID CODE . . . . . . Located on back of the Programming Pendant
- NATURE OF DIFFICULTY . . . . Make note of any error messages received from the robot or Order Entry Panel software
Chapter 2
Safety

2.1 Introduction

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.

Motoman suggests that you obtain and review a copy of the ANSI/RIA National Safety Standard for Industrial Robots and Robot Systems. This information can be obtained from the Robotic Industries Association by requesting ANSI/RIA R15.06-1999.

Here is RIA contact information –

Robotics Industries Association
900 Victors Way
P.O. Box 3724
Ann Arbor, Michigan 48106 USA
TEL: 734.994.6088
FAX: 734.994.3338
www.roboticsonline.com

Ultimately, the best safeguard is trained personnel. The user is responsible for providing personnel who are adequately trained to operate, program, and maintain the robot cell. **THE ROBOT MUST NOT BE OPERATED BY PERSONNEL WHO HAVE NOT BEEN TRAINED!**

We recommend that all personnel who intend to operate, program, repair, or use the robot system be trained in an approved Motoman training course and become familiar with the proper operation of the system.
This safety chapter addresses the following –

- Standard Conventions (Section 2.2)
- General Safeguarding Tips (Section 2.3)
- Mechanical Safety Devices (Section 2.4)
- Installation Safety (Section 2.5)
- Programming, Operation, and Maintenance Safety (Section 2.6)

### 2.2 Standard Conventions

This manual includes the following alerts – in descending order of severity – that are essential to the safety of personnel and equipment. As you read this manual, pay close attention to these alerts to insure safety when installing, operating, programming, and maintaining this equipment.

**WARNING!**
Information appearing in a WARNING concerns the protection of personnel and equipment from potential hazards that can result in personal injury or loss of life in addition to equipment damage.

**CAUTION!**
Information appearing in a CAUTION concerns the protection of personnel and equipment, software, and data from hazards that can result in minor personal injury or equipment damage.

*Note: Information appearing in a Note provides additional information which is helpful in understanding the item being explained.*

### 2.3 General Safeguarding Tips

All operators, programmers, plant and tooling engineers, maintenance personnel, supervisors, and anyone working near the robot 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 robot, the operator's manuals, the system equipment, and options and accessories should be permitted to operate this robot system.
- Do not enter the robot cell while it is in automatic operation. Programmers must have the teach pendant when they enter the robot cell.
- Improper connections can damage the robot. All connections must be made within the standard voltage and current ratings of the robot I/O (Inputs and Outputs).
- The robot must be placed in Emergency Stop (E-Stop) mode whenever it is not in use.
In accordance with ANSI/RIA R15.06-1999, 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).

2.4 Mechanical Safety Devices

The safe operation of the robot, positioner, auxiliary equipment, and system 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 R15.06-1999 safety standards, and other local codes that may pertain to the installation and use of industrial 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 fences and barriers
- Light curtains and/or safety mats
- Door interlocks
- Emergency stop palm buttons located on operator station, robot controller, and programming pendant

Check all safety equipment frequently for proper operation. Repair or replace any non-functioning safety equipment immediately.

2.5 Installation Safety

Safe installation is essential for protection of people and equipment. The following suggestions are intended to supplement, but not replace, existing federal, local, and state laws and regulations. Additional safety measures for personnel and equipment may be required depending on system installation, operation, and/or location. Installation tips are as follows –

- Be sure that only qualified personnel familiar with national codes, local codes, and ANSI/RIA R15.06-1999 safety standards are permitted to install the equipment.
- Identify the work envelope of each robot with floor markings, signs, and barriers.
- Position all controllers outside the robot work envelope.
- Whenever possible, install safety fences to protect against unauthorized entry into the work envelope.
- Eliminate areas where personnel might get trapped between a moving robot and other equipment (pinch points).
- Provide sufficient room inside the workcell to permit safe teaching and maintenance procedures.
2.6 Programming, Operation, and Maintenance Safety

All operators, programmers, plant and tooling engineers, maintenance personnel, supervisors, and anyone working near the robot 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 robot should be permitted to program, operate, and maintain the system. All personnel involved with the operation of the equipment must understand potential dangers of operation.

- Inspect the robot and work envelope 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.
- Do not enter the robot cell while it is in automatic operation. Be sure that only the person holding the programming pendant enters the workcell.
- Check the E-Stop button on the programming pendant for proper operation before programming. The robot 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 PART 1, System Section, of the robot controller concurrent I/O program can cause severe personal injury or death, as well as damage to the robot! Do not make any modifications to PART 1, System Section. Making any changes without the written permission of Motoman will VOID YOUR WARRANTY!
- Some operations require standard passwords and some require special passwords. Special passwords are for Motoman use only. YOUR WARRANTY WILL BE VOID if you use these special passwords.
- The robot controller allows modifications of PART 2, User Section, of the concurrent I/O program and modifications to controller parameters for maximum robot performance. Great care must be taken when making these modifications. 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 and other parts of the system. Double-check all modifications under every mode of robot operation to ensure that you have not created hazards or dangerous situations.
- Check and test any new or modified program at low speed for at least one full cycle.
- 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 robot. All connections must be made within the standard voltage and current ratings of the robot I/O (Inputs and Outputs).
Chapter 3

Equipment Description

3.1 DA9IC Robot

The Motoman 11-axis DA9IC robot is a dual-arm robot (see Figure 3). Coordinated and independent operation of the two arms provides highly accurate material handling capabilities. The robot features a payload capacity of 9 kg (19.8 lb) per arm, and a horizontal reach of 756 mm (29.8 in). An NXC100 controller, installed in the robot base, reduces installation space and provides simplified installation.

Figure 3 DA9IC Robot with Integral NXC100 Controller
3.1.1 Personality Display Unit and Audio System

The Personality Display Unit provides a “personality” for the Modular RoboBar DA9IC robot. Customers can choose a male or female countenance with matching audio voice. The Personality Display Unit can also be used as a data display.

The Personality Display Unit is a 12-inch color LCD display panel that mounts on top of the DA9IC robot. All video and audio signals associated with the Personality Display Unit are controlled by a dedicated computer system-unit located inside the Modular RoboBar safety enclosure. Audio output from the computer system-unit is amplified to a desired level by an amplifier unit located inside the Modular RoboBar safety enclosure. This amplified audio is then ported to compact, shielded speakers located on top of the safety enclosure. Male and female voice samples are provided.

3.2 NXC100 Controller

The integrated NXC100 robot controller features a Windows® CE Programming Pendant with color LCD touch screen, high-speed processing, Ethernet connectivity, and a robust PC architecture. The NXC100 easily handles multiple tasks and can control up to 15 axes. Advanced Robot Motion (ARM) control provides high-performance path accuracy and vibration control.

The NXC100 controls manipulator movement, processes input and output (I/O) signals, maintains variable data, and performs numeric processing to convert to and from different coordinate systems. In addition, the NXC100 controller provides main logic functions, servo control, program and constant data memory, cell safety, and power distribution.

The NXC100 controller features an embedded real-time operating system (RTOS) and is programmed with the Motoman INFORM programming language.

For additional information on the Motoman NXC100 controller, please refer to the NXC100 Controller Manual that is included with your Modular RoboBar system documentation package (refer to Section 1.8).

3.3 Programming Pendant

The Programming Pendant (see Figure 4) provides the primary means of programmer / operator interaction with the Modular RoboBar system.

The pendant features the Windows® CE operating system and displays information on a 6½-inch, color LCD, touch-screen display. The pendant also incorporates a CompactFlash® card slot for program backups. The Programming Pendant provides icon-driven system programming. It also features a menu-driven interface to simplify operator interaction with the robots. Most operator controls are located on the Programming Pendant.

The operator uses the Programming Pendant to teach robot motion, and perform programming, editing, maintenance, and diagnostic functions.
Figure 4  NXC100 Programming Pendant

Note: The Programming Pendant LCD touch screen display features a “screen saver” that causes the screen to go dark after a few minutes of inactivity. Press any key to restore the screen.
The Programming Pendant (see Figure 4) provides the following switches, menus, displays, and functions –

3.3.1 Mode Selector Switch

The Mode Selector Switch allows the operator to select Remote, Play or Teach mode. When Play or Teach is selected, the programming pendant controls system operation.

3.3.2 Menu Area

The Menu Area contains menu selections for the currently selected screen.

3.3.3 General Purpose Display Area

The General Purpose Display Area displays the currently selected menu choice.

3.3.4 Emergency Stop (E-Stop)

Pressing the E-Stop button puts the controller in Emergency Stop and stops all system operation.

3.3.5 Keypad

The user keypad on the programming pendant serves as an input device. The keys are grouped into different functional sections to simplify operator use.

3.3.6 Status Area

The Status Area shows system status as follows –

- Active Robot, External Axis, or Base Axis
  R1, R2; S1, S2
- Coordinate System
  Joint, World, Cylindrical, Tool, or User Frame
- Manual Speed Setting
  Inching, Low, Medium, or High
- Cycle Mode
  Step, 1-Cycle, or Auto
- System Status
  E-Stop, Stop, Running/Start, Hold, or Alarm
- Additional Pages (when applicable)
3.3.7 **MAIN MENU Key**

The MAIN MENU key returns the Programming Pendant display to the initial start-up menu. Use the cursor key or the touch screen to choose from the following menu options –

- **JOB**
  This option accesses job selections including: Master Job, Select Job, Job Capacity, and Create New Job while in TEACH mode.

- **ARC WELDING, GENERAL, HANDLING, or SPOT WELDING**
  This option allows you to select the applications available to the controller.

- **VARIABLE**
  This option accesses the display and editing menu for the arithmetic variables and display of position variables.

- **IN/OUT**
  This option accesses DETAIL and SIMPLE displays of all XRC I/O signals. In EDITING or MAINT. mode, Universal Outputs can be forced ON or OFF.

- **ROBOT**
  This option accesses robot information including: CURR.POS, POWER ON/OFF, POS, COMMAND POS, SECOND HOME POS, OPE ORIGIN POS, and TOOL and USER COORDINATE.

- **SYSTEM INFO**
  This option provides Version information for both hardware and software, Alarm History, and Monitoring Time.

- **FD/CF**
  This option accesses menu choices for FD (floppy disk) or CF (compact flash) program backup.

- **SETUP**
  This allows the user to set up system conditions and assign hot keys.

3.3.8 **AREA Key**

The AREA key moves the cursor to different areas of the display screen.

3.3.9 **CURSOR Key**

The CURSOR key is an 8-way, directional key that moves the cursor up, down, left or right to highlight a desired item that can then be chosen using the SELECT key.
3.3.10  **SELECT Key**

The SELECT key is used to choose the item currently highlighted by the cursor.

3.3.11  **CompactFlash® Card Slot**

The CompactFlash® card slot accepts CompactFlash® memory cards for backup of program files and data.

3.3.12  **ENABLE Switch**

The ENABLE switch is part of the Programming Pendant, and provides a safety feature that controls servo power while the system is in TEACH mode (see Figure 4 and Figure 5). When pressed in, this switch allows the operator to enable servo power. However, should the operator release the switch or grasp it too tightly, servo power is immediately disabled, thus preventing further robot movement.

![Figure 5 Programming Pendant ENABLE Switch](image)

3.3.13  **SERVO ON Key**

When the pendant is in TEACH mode, The SERVO ON key turns servo power ON when the ENABLE switch is activated. When the pendant is in PLAY mode, the SERVO ON key turns servo power on.
3.4 Beverage Dispensing

3.4.1 Bottle Racks and Sleeves

Bottles are grouped and secured in two polyethylene bottle racks that are mounted concentrically in the top of the stainless steel bar surface (see Figure 6). Each bottle rack contains bottle sleeves. Each sleeve holds one bottle. One rack holds the primary bottles, while the second rack holds the secondary (backup) bottles. Each bottle sleeve is labelled to ensure correct loading of bottles in the sleeves. Each bottle sleeve contains a directional arrow to ensure correct alignment of bottle pour spout (see Figure 6).

![Figure 6 Bottle Rack / Bottle Sleeve Assembly](image)

NOTE – Directional arrows shown in this graphic indicate correct alignment of the pour spout attached to each bottle.

3.4.2 Soda / Mix Tower

The Soda / Mix Tower dispenses up to ten different combinations of beverages. The Mix Tower is configured to dispense four juices and four sodas from concentrated syrup mixes. Additionally, water and carbonated water can be dispensed from the tower.

For full details on the operation, cleaning, and servicing of the soda / mix tower, please refer to the vendor manual that is included with your Modular RoboBar system documentation package (refer to Section 1.8).
3.4.3 Ice Maker / Dispenser

The counter top ice maker / dispenser holds up to 40 lbs of ice and features a stainless steel exterior cabinet and metered ice dispense system.

For full details on the operation, cleaning, and servicing of the ice dispenser, please refer to the vendor manual that is included with your Modular RoboBar system documentation package (refer to Section 1.8).

3.4.4 Coffee Machine (RoboBar–NA Model, Only)

The coffee machine grinds coffee beans and can produce plain coffee (decaffeinated or regular), as well as espresso, cappuccino, and latte drinks.

For full details on coffee machine features, operation, cleaning, and servicing, please refer to the vendor manual that is included with the Modular RoboBar system documentation package (refer to Section 1.8).

3.4.5 Cup Dispenser

Three self-adjusting cup dispensers are mounted in the stainless steel bar surface of the front module. Two of the dispensers are stocked with cups for cold beverages. The remaining dispenser is stocked with cups for hot beverages. Gaskets, supplied with the cup dispensers, enable use of the following cup sizes and capacities –

- Paper, plastic, or foam cups up to a maximum capacity of 13 cl (44 ounces)
- Cups with a 57 – 117 mm (2-1/4 – 4-5/8 inch) lip diameter

3.4.6 Drink Delivery Shuttle

The Drink Delivery Shuttle incorporates a servo-driven slide assembly to deliver completed drinks to the customer. Sensors monitor the status of the Drink Delivery Shuttle to determine when a completed drink has passed through the interlocked door assembly and is ready for customer pick-up. When a drink is retrieved from the slide, it will return inside the RoboBar cell allowing delivery of another drink.

3.4.7 Drink Serving Door

The drink serving door is spring-loaded and should close when the Drink Delivery Shuttle retracts to enable the robot to place a new drink on the shuttle. Two sensors monitor the state of the door (opened or closed).
3.5 **Order Entry Panel**

The Order Entry Panel (refer to Chapter 7) is used to process drink orders. A magnetic card reader, located at the top of the Order Entry Panel, reads magnetic cards. Upon transaction authorization, the customer is free to configure a drink order at the Order Entry Panel.

3.6 **Safety Features**

The Modular RoboBar system includes a total safety environment that complies with the ANSI/RIA R15.06-1999 safety standard.

*Note: Modular RoboBar safety features are independent of program logic. All safeguards are “hard wired” and provide protection that is independent of any software program. System safeguards do not depend upon a programmer correctly inputting an instruction in the operating program.*

*Note: Modular RoboBar system safeguards are interfaced with normally closed (NC) “fail-to-safe” switch contacts. These components will stop cell operation if they are disconnected or damaged.*

*Note: Users are responsible for determining that the safeguards provided with the Modular RoboBar system are adequate for conditions in their facility. Users must also ensure that all safeguards are maintained in working order.*

3.6.1 **Safety Enclosure**

When all of the modules are in position and locked together, a stainless steel framework and clear Lexan® polycarbonate upper view panels enclose the entire Modular RoboBar system (see Figure 2). Together, the framework and the Lexan® view panels form a physical barrier that prevents the unintentional movement of personnel or objects into the RoboBar cell during automatic operation. A key-lockable access door at the rear of the cell provides a point of entry for programming and maintenance personnel.

3.6.2 **Emergency Stop (E-Stop)**

E-Stop is a primary safety feature of the Modular RoboBar system. If any of the installed interlocks are defeated, or if the Programming Pendant E-Stop push button is depressed, the E-Stop feature immediately de-energizes the control system and activates a robot braking system. The E-Stop push button on the Programming Pendant is used for an intentional shutdown of the Modular RoboBar system.

To resume operation after an E-Stop system shutdown, the operator must clear and reset the action that caused the E-Stop condition (refer to Section 5.3.2).
3.6.3 Programming Pendant Enable Switch

The ENABLE switch is part of the Programming Pendant, and provides a safety feature that controls servo power while the system is in TEACH mode (see Figure 4 and Figure 5). When pressed in, this switch allows the operator to enable servo power. However, should the operator release the switch or grasp it too tightly, servo power is immediately disabled, thus preventing further robot movement.

3.6.4 Emergency Braking System

The DA9IC robot incorporates a braking system that protects personnel from injury and prevents equipment damage if servo power is removed (as in an E-Stop condition). Upon loss of servo power, the brake system activates to hold all robot axes in place.
Chapter 4
Installation

**CAUTION!**
The Modular RoboBar system should be installed by qualified personnel who are familiar with the installation and set-up of a robotic system.

**CAUTION!**
Handle all system components with care. The Modular RoboBar system is not extremely fragile, but it is a sophisticated robotic system that can be damaged by rough handling.

Two to three qualified technicians can install the Modular RoboBar system in a reasonable amount of time. Always comply with established safety procedures throughout the installation process (refer to Chapter 2).

4.1 Materials Required

All system components and most hardware required for installing Modular RoboBar are included with your shipment. The following identifies some typical customer-supplied items and tools required to complete installation.

4.1.1 Customer-Supplied Items

- Potable water supply (40 psi minimum water pressure)
- Drainage system (for ice melt, drips, spills, etc)
- Pressurized carbon dioxide (CO₂) supply cylinder for carbonated beverages
- Pressurized nitrogen (N) supply cylinder (for Modular RoboBar–E beer dispense)
- Local electrical service (Split-phase, 240 VAC, 60 Hz)
- Stepladder
- Forklift and/or overhead crane/fork extensions
- Appropriate hand tools
4.1.2 Recommended List of Hand Tools and Equipment

- Safety glasses
- Face shield
- Gloves (heavy-duty leather recommended)
- Level (short and long)
- Ratchet Handle (with 3/4-inch hex socket)
- Adjustable wrench (large and small)
- Phillips and flat-blade screwdrivers
- Hammer (dead-blow and steel)
- Hammer (non-marring)
- Socket set (SAE and Metric)
- Air-impact gun (with 3/4-inch hex socket)
- Open-end wrench set (SAE and Metric)
- "Allen" wrench set (SAE and metric)

4.2 Site Preparation

**CAUTION!**
During installation planning, allow sufficient room for full opening of access doors and panels, and system components that are exterior to the Modular RoboBar cell.

To prepare your site, proceed as follows –

1. Clear floor space and overhead area needed for the Modular RoboBar system (see Figure 7). Allow an additional 1.2 - 1.5 m (4 to 5 ft) on all sides of the work cell to provide the clearance needed for installation.

2. Gather all customer-supplied items and required tools (refer to Section 4.1).
4.3 Removal of RoboBar Modules from Shipping Skids

Each module of the Modular RoboBar system is attached to a wooden shipping skid at the factory, prior to shipment to the customer. The customer is responsible for removing all components from the shipping skid, and inspecting all components for shipping damage.

**Note:** If you notice any equipment damage, notify your shipping contractor as soon as possible.

1. Use a suitable forklift to lift each shipping pallet (with attached Modular RoboBar system module) from the shipping contractor's hauler and move it to the planned installation location or preselected staging area.
2. Carefully remove protective plastic wrapping, cardboard, paper, and any other protective shipping materials from each module.
3. Inspect each module for shipping damage.

**Note:** If you notice any equipment damage, notify your shipping contractor as soon as possible.

4. Remove each module from it’s shipping pallet.
5. Place each module in position on a flat and level installation surface.

**Note:** Be sure to allow adequate room on all sides of the Modular RoboBar system for opening access doors, servicing, stocking consumables, and maintenance.

4.4 Assembly and Leveling of RoboBar Modules

Procedure –

1. Place center module in position and level.
2. Attach front module, left module, and right module to the center module (see ).

Figure 8 Assembly and Levelling of RoboBar Modules
4.5 Electrical / Data Wiring Interconnects

Refer to the Schematics / Wiring Diagrams that are included with your Modular RoboBar documentation package (refer to Section 1.8).

4.6 Cable and Supply Hose — Routing and Connections

Locate the interconnect cables and supply hoses for the Modular RoboBar system components and route them according to the system drawings / schematics that are included in the Modular RoboBar system documentation package (refer to Section 1.8). All cables and supply hoses are labelled to ensure correct connection to mating connectors on applicable system component.

4.6.1 Carbon Dioxide (CO₂) / Nitrogen (N) Supply Cylinder

**WARNING!**
Secure and store supply cylinders according to applicable safety regulations. A fully-charged supply cylinder is pressurized to several thousand pounds/inch² (psi). Damage to the supply cylinder or it's main control valve can result in injury or death to personnel and damage to surrounding equipment.

**WARNING!**
Be sure that you understand the operation of the pressure regulator and the supply cylinder. Never attempt to bypass the pressure regulator.

1. Ensure that the main valve on the supply cylinder is rotated fully clockwise to OFF.
2. Connect a pressure regulator to the threaded outlet port on the supply cylinder (see Figure 9).
3. Turn the screw or handle on the pressure regulator fully clockwise to OFF.
4. Locate the Modular RoboBar system gas supply hose (inside the Modular RoboBar system safety enclosure) and route it to the supply cylinder as shown in Figure 9. Connect the gas supply hose to the threaded regulator output fitting.
5. Slowly turn the main output valve on the supply cylinder counter clockwise to open it. The regulator's inlet pressure gauge should indicate a nominal reading of several thousand pounds / inch² (psi).
6. Do not open pressure regulator valve until ready to supply gas pressure to the Modular RoboBar system.
4.6.2 Local Electrical Service

**WARNING!**
Local electrical service shall be connected to the Modular RoboBar system by a qualified, licensed electrician. Electrical and grounding connections must comply with applicable portions of the National Electrical Code (NEC) and local electrical codes.

After all system components are properly installed, connect local electrical service to the Modular RoboBar system as follows –

1. Install Split-Phase 240 VAC wiring to the fused disconnect box located outside the Modular RoboBar safety enclosure.
2. Install a suitable lug on the incoming ground wire.
3. Connect ground wire to disconnect box ground stud with hardware provided.
4. Make sure that all wiring inside the fused disconnect box is routed correctly and tightened to correct torque for type and size wire used.

*Note: Modular RoboBar is configured for Split-Phase, 240 VAC, 60 Hz voltage, unless another voltage configuration was requested by the customer. If your system requires a different voltage configuration, please contact Motoman Customer Support (refer to Section 1.9).*
4.7 Safety / Operation Check

Before placing the Modular RoboBar system into service, take a few minutes to perform the following safety /operation check –

1. Check the security and integrity of all cable connections.
2. Ensure that all safety interlocked access doors and panels are closed.
3. Verify that the available local electrical service complies with the electrical specifications called out for your Modular RoboBar system.

**CAUTION!**
The Modular RoboBar system is now ready for power-up. Qualified, trained personnel, who are familiar with this system, should perform the power-up sequence.

4. Turn main power ON, and continue the safety /operation check.
5. Check all system E-Stops.
6. Check system HOLD button on Programming Pendant.

Remove power from the Modular RoboBar system after completion of the safety /operation check.

4.8 Stocking Consumables

**CAUTION!**
Stocking of consumables shall be performed by personnel who are familiar with operation of the Modular RoboBar system.

*Note: All consumables for the Modular RoboBar system shall be supplied by the customer.*

4.8.1 Bottles

Each bottle rests in a specially designed sleeve in either the primary or secondary (backup) bottle rack (see Figure 6). Each bottle is fitted with a specially designed pour spout to accurately control portions (see Figure 10).

Stock the bottle racks as follows –

1. Open appropriate Lexan® access panel.

**CAUTION!**
Use only the pour spout that is designed for the Modular RoboBar system. Use of any other pour spout (or no pour spout) will degrade the quality of drinks produced by the Modular RoboBar system.

2. Select the bottles that are empty and need to be refilled or replaced.
3. Ensure that each replaced or refilled bottle is fitted with the correct pour spout.
CAUTION!
Each bottle sleeve / bottle combination is labelled to indicate a particular type or brand of juice or flavoring syrup. When refilling or replacing a bottle, make sure to place it back in its matching, labelled sleeve.

CAUTION!
When replacing a bottle, always verify that the pour spout is aligned with the directional arrow in the bottle sleeve. Failure to align the pour spout with the directional arrow can cause inconsistent pours and spillage.

4. Verify that all bottle pour spouts, including those that were replaced, are correctly aligned with the directional arrow inside the bottle sleeve (see Figure 10).

5. Close all access doors.

4.8.2 Stocking Juice Mixes

The bag-in-box juice mixes rest on a special rack located under the countertop. To stock the juice mixes, refer to Figure 11 and the following steps —
1. Open access door
2. Disconnect empty box
3. Place new box on box rack and connect hose.
4. If product is needed, the air operated pump engages to draw syrup toward the dispenser tower.

![Diagram of QDC II Connector and Bag-in-Box Juice Mix](image)

**Figure 11** Stocking Juice Mixes

### 4.8.3 Stocking Soda Syrup Mixes

The bag-in-box soda syrup mixes rest on a special rack located under the countertop. Depending on what soda you are dispensing, there are two different styles of bag-in-box connectors (see Figure 12).

Your system is set up at the factory for your choice of soda vendors. To stock the soda syrup mixes, proceed as follows:

1. Open lower side access door.
2. Disconnect empty box if restocking.
3. Place new box on box rack and connect hose.
4. If product is needed, the air operated pump engages to draw syrup toward the dispenser tower.

![Diagram of RoboBar](image)

**Figure 12** Stocking Soda Syrup Mixes

### 4.8.4 Stocking Cup Dispenser

The cup dispensers hold approximately 100 cups each.

Stock cups as follows –

1. With the robot E-stopped, open one or both of the Lexan® access panels (located above each access door).

*Note: The Lexan® access panels are safety interlocked and will trigger an E-Stop condition if opened during operation.*

2. Place cups (upside down) into the spring-loaded cup dispensers.
3. Close Lexan® access panel(s).
4.8.5 Stocking the Coffee Machine (RoboBar–NA Model)

Refer to the Coffee Machine documentation that is included with the Modular RoboBar documentation package (refer to Section 1.8).
Chapter 5

Operation

**CAUTION!**
The customer is responsible for providing trained operators to run the equipment. The customer is also responsible for making sure that the equipment is operated in accordance with the ANSI/RIA R15.06-1999 Robot Safety standard, as well as any other local or state standards.

This chapter provides a brief overview of the operating procedures and precautions for your Modular RoboBar system. For more in depth operating information, refer to specific component manuals that are part of the Modular RoboBar system documentation package (refer to Section 1.8).

5.1 **Programming**

The operation of this system is programming dependent. The following operating instructions are based on one possible configuration of this system. Your system configuration and job structure may differ slightly from that presented here; however, basic operation will be the same. For additional programming instructions, refer to the controller and operator manuals that came with your system.

**CAUTION!**
Modifications should be performed only by personnel who have received operator training from Motoman, and who are familiar with the operation of this Motoman system.

Any changes made to your system configuration and/or job structure will alter the operation of this cell. Motoman recommends you do not modify the original jobs and system configuration that came with your system. If modifications need to be made, they should be made to copies of these jobs and not to the originals.

If you have questions concerning the configuration of your system, please contact Motoman Customer Support (refer to Section 1.9).
5.2 **Daily Operation**

The procedures below represent the typical operating sequence from power up to shutdown. Your basic operating procedures may vary depending on your situation.

- Stock system consumables
- Perform start-up procedures
- Move robot to HOME position
- Select MASTER JOB
- Perform operation cycle
- Perform SHUTDOWN procedures

5.2.1 **Stock RoboBar System Consumables**

*Note: All Modular RoboBar system consumables shall be supplied by the customer.*

1. Fill coffee maker with coffee beans and empty used beans from previous day’s operations.
2. Check bag-in-box syrup supplies.
3. Verify bottles are in correct locations and pour spouts are correctly oriented.

*Note: If the volume in a bottle is changed, count variables I010 - I014 must be modified to reflect this in the NXC-100 controller (refer to Chapter 7).*

4. Fill all cup dispensers.

5.2.2 **Start-Up**

Procedure –

**WARNING!**
Water and CO₂ gas supply cylinder must be turned ON before supplying power to the carbonator. Failure to do this can cause damage to the carbonator.

1. Open regulator valve on CO₂ gas supply cylinder.
2. Turn on water supply.
3. Set MAIN POWER switch on service disconnect to ON.
4. Turn on computer.
5. Make sure all enclosure doors are closed.
6. Make sure Programming Pendant E-Stop button is released.
7. Select TEACH mode on Programming Pendant.
8. Move robot to HOME position (refer to Section 5.2.3).
5.2.3  Move Robot to HOME Position

Procedure –
1. Select TEACH mode on the Programming Pendant.
2. Select MAIN MENU on Programming Pendant touch screen.
5. Using cursor key, move cursor to HOME job and press SELECT. Job appears on display.
6. Turn servo power ON by pressing SERVO ON and holding in the ENABLE switch.
7. Use the FWD button on the Programming Pendant to jog the robot to HOME position.

5.2.4  Start the MASTER JOB

Procedure –
1. With the system powered up and in TEACH mode, call up the MASTER JOB.
2. Select MAIN MENU on Programming Pendant touch screen.
4. Select CTRL MASTER on Programming Pendant touch screen.
5. Press SELECT twice to activate the MASTER JOB.
6. Select PLAY mode on Programming Pendant and press the PLAY ENABLE button on the controller door. Job playback operation is enabled.
7. Press SERVO ON button on the Programming Pendant.
8. Press START button on Programming Pendant. The MASTER JOB cycles, waiting for input from touch screen.

Note: If a drink is not requested, the robot may perform “dance” routine to indicate that RoboBar is active and ready to serve.
9. RoboBar_SoftPLC should auto run at this time.

The Modular RoboBar system is now ready for operation.

5.2.5  System Shutdown

Procedure –
1. Ensure that the robot is in HOME position.

Note: The robot returns to HOME position after serving a drink, or may perform a "dance" routine while waiting for the next drink order.
2. Turn off system servo power by pressing the E-Stop button on Programming Pendant.
3. Select TEACH mode on the Programming Pendant.
3.4 Pre First Article Build

5. Turn OFF computer's battery back-up supply. This supply "beeps" when main power is removed.
6. Move the lever on the electrical service disconnect box to OFF position.
7. Close regulator valve on CO₂ gas supply cylinder.
8. Turn off water supply.
9. Perform general cleaning in and around the Modular RoboBar cell.

The Modular RoboBar system is now shut down.

5.3 System Recovery

When a system error or alarm occurs, you must clear the error or alarm to return the Modular RoboBar system to normal operation. The paragraphs below describe the different types of alarms and errors you may encounter and how to remedy them.

5.3.1 Alarms and Errors

Alarms and errors will cause the program to stop. There are three levels of alarms and errors –

• Error Messages
• Minor Alarms
• Major Alarms

For additional information on alarm and error recovery, refer to the Motoman NXC-100 Controller Manual and the Motoman DA9IC Manipulator Manual that is included with your Modular RoboBar system documentation package (refer to Section 1.8).

5.3.1.1 Error Messages

These are simple errors such as pressing the START button when the robot is not in PLAY mode, or enabling the Programming Pendant when servo power is off. Clear these errors by pressing the CANCEL button on the Programming Pendant.

5.3.1.2 Minor Alarms

Minor alarms typically involve programming errors. Minor alarms might occur if a circle has been programmed with fewer than three circular points, etc. Clear these errors by pressing the CANCEL button on the Programming Pendant.

5.3.1.3 Major Alarms

Major alarms typically involve system hardware failures. Major alarms might occur because of a servo tracking error or an abnormal speed. To clear these alarms, you must turn off the NXC-100 Controller and then turn it on again.
5.3.2  E-Stop Recovery

An E-Stop can occur under any of the following conditions –

- Pressing the E-Stop button on the Programming Pendant.
- Opening a safety-interlocked access door or panel when the robot is **not** in TEACH mode.

To recover the Modular RoboBar system from an E-Stop condition, perform any of the following steps that apply –

- Release the Programming Pendant E-Stop button.
- Ensure that all safety-interlocked access doors and panels are closed.
- Press the SERVO ON button on the Programming Pendant.
- Press the START button.

The Modular RoboBar system is now ready to continue operation.
Chapter 6
Troubleshooting / Maintenance

6.1 Troubleshooting

6.1.1 Soda / Mix Tower (Soda and Juice)

6.1.1.1 Depleted Syrup Supply

CAUTION!
If replacing a syrup feed line or pressure line, use reinforced tubing that is rated for 200 psi or higher pressure.

Disconnect the fitting and connect new Syrup-in-Box container. If changing flavors, be sure to run plenty of syrup out of that line to avoid mixing flavors. Some flavors may leave an aftertaste in the tube. In that situation, replace the 3/8” ID syrup feed line to the pump, as well as the 1/4” ID pressurized line between the pump and the fountain head. Use appropriate fittings and clamps to ensure a tight connection.

6.1.1.2 Depleted Carbon Dioxide (CO₂) Supply Cylinder

1. Disconnect power to the carbonator.
2. Turn off water and CO₂ gas supply.
3. Vend soda until pressure is reduced to zero in the carbonator tank and gas lines.
4. Turn main valve on CO₂ supply cylinder fully clockwise to OFF.
5. Disconnect the regulator from the CO₂ supply cylinder.
6. Attach regulator to the new CO₂ supply cylinder (refer to Section 4.6.1).

Note: Be sure to replace the plastic washer that is fitted between the regulator and the main output valve of the CO₂ supply cylinder. Your CO₂ supply cylinder vendor can supply this item.
6.1.1.3 Incorrect Soda Taste and Consistency

Calibrate the Wunderbar® soda / mix tower as follows (see Figure 13) –

*Note: You will need a Brix cup and syrup separator for this procedure.*

1. Remove nozzle from fountain valve.
2. Insert syrup separator into fountain, ensuring a good seal.
3. Determine mix ratio (located on syrup box).
4. Place Brix cup as tight as possible against bottom of valve with separator in correct ration cup.

![Figure 13 Calibration of Soda / Mix Tower](image)

5. Vend soda until syrup or soda has reached the marked location on the brix cup and stop vending. Let everything settle and examine the relative levels. If the syrup is higher than the soda water, you will need to adjust the syrup concentration.

*Note: Tinted soda water (typically brown in the case of rootbeer, cola, etc) indicates an inadequate seal on the syrup separator. This will cause the ratio to be incorrect. Reseat the separator and try again.*

6. Remove front cover of mix tower exposing the syrup concentration controls (see Figure 14).
7. Carefully adjust syrup concentrations by 1/5 to 1/6 of a turn.
8. Purge the syrup line after each adjustment to avoid faulty readings of mix ratio.
9. Continue adjusting each line until correct ratio is achieved.

*Note: If your local water supply contains a lot of chlorine or chemicals, it can alter the taste of the soda. Water filtration can eliminate this problem. A simple cartridge filter will work for most applications.*
6.2 Maintenance

<table>
<thead>
<tr>
<th>FREQUENCY</th>
<th>COMPONENT(S)</th>
<th>PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>Consumables</td>
<td>Check and stock consumables as needed.</td>
</tr>
<tr>
<td>Every three months or on condition</td>
<td>Coffee Machine</td>
<td>Clean and descale according to vendor recommendations and instructions.</td>
</tr>
<tr>
<td>Monthly or on condition</td>
<td>Modular RoboBar Cell</td>
<td>Inspect gas and syrup hoses for leaks and kinks.</td>
</tr>
<tr>
<td>Monthly or on condition</td>
<td>Modular RoboBar Cell</td>
<td>Clean dirt and debris from work cell.</td>
</tr>
<tr>
<td>On condition</td>
<td>DA9IC Manipulator (Robot)</td>
<td>Refer to DA9IC Manipulator Manual</td>
</tr>
</tbody>
</table>

6.2.1 Cleaning

6.2.1.1 Soda / Mix Tower (Soda and Juice)

Most public health codes require machines and syrup systems to be cleaned at regular intervals. Follow published state and local health codes applicable for your part of the world.

1. Clean and flush the ice maker / dispenser.
2. Flush syrup lines and heads as follows –
a. Disconnect the bag-in-box connector from the end of the syrup line.
b. Place hose into a bucket of cleaning solution.

Note: Always use a cleaning solution that is safe around food supplies and specifically approved for this application. Please contact Motoman Customer Support if you have any questions regarding the correct cleaning solution (refer to Section 1.9).

c. Vend until cleaning solution comes out of dispense head.
d. Let cleaning solution sit for three minutes, then rinse thoroughly with clean, clear water.
e. Reconnect syrup lines.

3. If not using filtered water, clean Y-strainer on fountain pump head.
   a. Shut off incoming water.
   b. Loosen hex nut on inlet side of pump and remove the screen.
   c. Clean off any scaling or mold that has built up. It's a good idea to do this every few months, as a clogged strainer can starve the pump and result in permanent damage to the pump.

6.2.1.2 Coffee Machine (RoboBar–NA Model)

Refer to Coffee Machine documentation that is provided with your Modular RoboBar system documentation package (refer to Section 1.8).

6.2.1.3 Beer Dispensing System (RoboBar–E Model)

Refer to Section 7.2.5.2 for details on flushing and cleaning of the draft beer dispensing system.
Chapter 7

Order Entry Panel and Software

The Order Entry Panel (see Figure 2) provides an access point, or Human Machine Interface (HMI), where customers can intuitively and easily communicate drink orders to the Modular RoboBar system.

The Order Entry Panel also provides a second important function that is normally not seen by drink customers. The Order Entry Panel is also used as a Command Center HMI for programming, operation, and maintenance personnel. Through this HMI, these qualified personnel groups can monitor and change Modular RoboBar system configuration and operating parameters. Some examples include –

- Setup available drink options
- View inventory history
- Diagnose gripper malfunctions
- Collect and store other system information

Note: Screen graphics shown in this chapter are representative examples. Due to minor software changes and updates, actual RoboBar screen presentations may differ slightly from those shown here.

7.1 Initial Modular RoboBar System Start-up

An opening ("splash") screen appears on the HMI display panel after initial start-up of the computer and the Windows® Operating System (see Figure 15).

Figure 15 Opening "Splash" Screen

After a brief period, the splash screen disappears to reveal the RoboBar Master Control Panel screen (see Figure 16).
7.2 **RoboBar Master Control Panel**

The *Master Control Panel* screen provides primary system information for diagnosis and setup of the Modular RoboBar system.

**Figure 16** Master Control Panel
7.2.1 System I/O

System I/O provides troubleshooting and diagnostic information for the Modular RoboBar system (see Figure 16).

7.2.2 Drink Order Control

The Drink Order Control pane on the Master Control Panel provides the following options associated with Drink Order Control (see Figure 16) –

- **HMI WITH CARD READER** – Selecting this button initiates the customer HMI screen that requires the magnetic credit / debit card reader for accepting customer payments for drinks.
- **HMI WITHOUT CARD READER** – Selecting this button initiates the customer HMI screen that does not include the magnetic credit / debit card reader.
- **CLOSE DRINK ORDER FORM** – This button closes the main drink selection menu on the customer HMI.
- **DRINK QUEUE VIEW** – This button selects a function that enables the operator to view information on the following –
  - Which drink in the queue is currently being prepared
  - Drink preparation history and a list of drinks ordered

7.2.3 Gripper / Slide / Demo

The Gripper / Slide / Demo pane on the Master Control Panel (see Figure 16 and Figure 17) provides access to screens for control of –

- Grippers
- Drink Delivery Slide
- Demo / Normal RoboBar Operation

![Gripper / Slide / Demo Panel](image)

**Figure 17** Gripper / Slide / Demo Panel
7.2.3.1 Gripper Modules

The *Hiding Servo Gripper Status* button opens a Servo Gripper window (see Figure 17 and Figure 18). This window provides diagnostic and setup information for the two grippers on the DA9IC robot. Access to the Schunk Gripper Maintenance/Operation Manual is also available from this screen.

![Figure 18 Servo Grippers — Diagnostic and Setup Window](image)

7.2.3.2 Slide Control

The *Hiding Slide Control* button on the Gripper / Slide / Demo pane opens a Drink Delivery Slide window (see Figure 17 and Figure 19). This window provides for manual control of the Drink Delivery Slide, and eliminates the need for the operator to use the NXC100 Programming Pendant to control slide motion.

![Figure 19 Drink Delivery Slide — Diagnostic and Setup Window](image)
7.2.3.3 Demo / Normal Operation

The Demo / Normal button on the Gripper / Slide / Demo pane, toggles between NORMAL and DEMO operation (see Figure 17). The **system defaults to NORMAL operation mode**. Press the button to toggle operation states.

Note: DEMO mode operation prevents the robot from formulating and dispensing a drink. In DEMO mode, the robot makes a "dry" run through the motions and actions that would normally produce a drink.

7.2.4 Shutdown RoboBar

**CAUTION!**

Always use the SHUTDOWN ROBOBAR button on the Master Control Panel to stop the Modular RoboBar software. Other methods of stopping the software may cause loss of data or problems at the next system start-up.

Select the SHUTDOWN ROBOBAR button to safely exit the Modular RoboBar Master Control Panel (see Figure 20).

![Figure 20 RoboBar Shutdown Button](image-url)
7.2.5 **Advanced Diagnostics Options**

Selecting the *Advanced Options* check box on the RoboBar Master Control Panel (see Figure 16) brings up another selection box that displays additional testing and diagnostics functions for troubleshooting the Modular RoboBar system and communicating with the DA9IC robot / NXC100 controller (see Figure 21).

![Selection Box — Advanced Diagnostics Options](image-url)
### 7.2.5.1 Adjust Drink Graphics

The *Adjust Drink Button Graphics* button on the RoboBar Master Control Panel brings up a screen that allows changes or modifications to the graphic that is displayed for each drink selection button (see Figure 21 and Figure 22).

*Note: These settings need modification only during initial commissioning or if product selection is changed.*

![Figure 22 Drink Button Configuration](image)

#### 7.2.5.1.1 Soda/Juice Settings

The *Soda/Juice Settings* button on the Drink Button Configuration screen brings up the following configuration screen –

![Figure 23 Soda/Juice Settings Configuration Screen](image)
7.2.5.1.2 Beer Tap Settings

The Beer Tap Settings button on the Drink Button Configuration screen brings up the following configuration screen –

![Figure 24 Beer Tap Settings Configuration Screen]

7.2.5.1.3 Liquor / Bottle Settings

The Liquor / Bottle Settings button on the Drink Button Configuration screen brings up the following configuration screen –

![Figure 25 Liquor / Bottle Settings Configuration Screen]
7.2.5.1.4 Example Button Setup

Figure 26 Example Button Setup Screen
7.2.5.2 Beer Valve Cleaning Utility

The *Beer Valve Cleaning Utility* button on the RoboBar Master Control Panel enables a screen that allows control of beer valve draining and cleaning (see Figure 21 and Figure 27).

![Beer Valve Cleaning Utility](image)

**Figure 27** Beer Valve Cleaning Utility — Configuration Screen

7.2.5.2.1 Draining Procedure

1. Place a drain bucket under the appropriate beer valve / tap to catch liquid flow from the cleaning process.
2. Select the appropriate button to begin a 10-count dispense.

*Note: The BEER VALVE CLEANING UTILITY eliminates the need to use the NXC100 controller to initiate the multiple draining dispenses.*

7.2.5.2.2 Cleaning and Preventive Maintenance

**CAUTION!**

Regular cleaning of each dispensing faucet, beer hose, and keg coupler is extremely important. Lack of regular cleaning will cause the draft beer to foam excessively when dispensed. Additionally, bacteria, yeast, mold, and beer stone will build up and quickly degrade the quality of the draft beer.

**CAUTION!**

When cleaning beer lines and components, use chemicals that are specifically manufactured for beer line cleaning.

1. Disconnect keg coupler from the beer keg.
2. Pressurize the beer hose with a suitable water / cleaning chemical mix and allow it to soak for the time prescribed by the cleaning chemical manufacturer.
3. After the prescribed amount of soak time, thoroughly flush the beer hose with water to remove all traces of the cleaning chemical.

4. Soak each keg coupler and beer dispensing faucet in the water/cleaning chemical solution, then brush them clean with a suitable cleaning brush (see Figure 28).

5. Thoroughly rinse each keg coupler and beer dispensing faucet with clean, clear water to remove all traces of the cleaning chemical.

6. After completing the cleaning procedures, perform the following preventive maintenance procedures (see Figure 28) –
   - Inspect the probe o-rings and bottom seal of each keg coupler. Replace if worn or defective.
   - Inspect the friction washer, coupling washer, and shaft seat on each beer dispensing faucet. Replace worn or defective components.
   - Lubricate the probe o-rings of each keg coupler with a food-grade lubricant. This will help prevent premature o-ring wear, and will enable the keg coupler to work freely when it is tapped and untapped to the beer keg.

![Figure 28 Typical Beer Dispensing Faucet and Keg Coupler](image_url)
7.3 Customer HMI Interaction Screens

When the HMI is functioning as an Order Entry Panel, the customer is presented with several intuitive order selection / order entry screens. The first to appear is the Order Processing Instructions screen (see Figure 29).

![Order Processing Instructions Screen](image)

**Example Card**

**Card Swipe Status**

**NOTE –**

The customer can customize this screen with desired graphics and instructions.

Figure 29 Order Processing Instructions Screen

7.4 Operation

Procedure –

1. Scan drink card as instructed on the Order Processing Instructions screen (see Figure 29).
2. Wait for the Main Drink Selection screen to appear (see Figure 30).
3. From the Main Drink Selection screen, select your choice of a male or female robot personality. Depending upon your choice, a male or female countenance will appear on the LCD display at the top of the DA9IC robot.

Note: A short-length, full-motion video appears on the HMI screen while your previous selections are processed by the Modular RoboBar system.

4. From the Main Drink Selection screen, select your drink from the available beverage types (see Figure 30).
Figure 30  Main Drink Selection Screen
7.4.1 Soda / Juice

Procedure –

1. Press the Soda / Juice button on the Main Drink Selection screen (see Figure 30).
2. Select your choice of beverage from those displayed on Soda / Juice Selection screen (see Figure).
3. Select the ICE option if desired.

![Soda/Juice Selection Screen]

*Figure 31  Soda/Juice Selection Screen*
7.4.2 Beer

Procedure –

1. Press the Beer button on the Main Drink Selection screen (see Figure 30).
2. Select your choice of beverage from those displayed on Beer Selection screen (see Figure ).

Figure 32 Beer Selection Screen
7.4.3 Coffee-Based Drinks (RoboBar–NA Model)

Select the desired coffee drink from the Coffee-Based Drinks screen (see Figure 33).

![Coffee-Based Drinks Selection Screen]

**Figure 33** Coffee-Based Drinks Selection Screen
7.4.4 **Administration During Order Entry**

Double click the Motoman graphic to access the Administration Password Entry screen.

![Figure 34](image_url) *How to Access the Modular RoboBar Administration Password Entry Screen*

![Figure 35](image_url) *Administration Password Entry Screen*
# 7.5 Robot Customizing

## 7.5.1 Jobs

<table>
<thead>
<tr>
<th>Job Code</th>
<th>Job Name</th>
<th>Option 1</th>
<th>Option 2</th>
<th>Option 3</th>
<th>Option 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>G2CLOSE</td>
<td>Close Gripper #2 looking for Cup</td>
<td>NonGroup</td>
<td>any</td>
<td>Slide &amp; get cup - looking for</td>
<td></td>
</tr>
<tr>
<td>G1CLOSE</td>
<td>Close Gripper #1 looking for Bottle</td>
<td>NonGroup</td>
<td>any</td>
<td>Close &amp; get bottle - looking for</td>
<td></td>
</tr>
<tr>
<td>BOTTLE6</td>
<td>Juice #6</td>
<td>NonGroup</td>
<td>1</td>
<td>Run from home position - gets cup, ice (optional), pours beverage, and outfeeds the cup.</td>
<td></td>
</tr>
<tr>
<td>LIQUOR8</td>
<td>Crown Royal</td>
<td>NonGroup</td>
<td>1</td>
<td>This job handles bottle grab, pour, eject/restock if needed, and replace.</td>
<td></td>
</tr>
<tr>
<td>LIQUOR5</td>
<td>Beefeater</td>
<td>NonGroup</td>
<td>1</td>
<td>This job handles bottle grab, pour, eject/restock if needed, and replace.</td>
<td></td>
</tr>
<tr>
<td>LIQUOR4</td>
<td>Jack Daniels</td>
<td>NonGroup</td>
<td>1</td>
<td>This job handles bottle grab, pour, eject/restock if needed, and replace.</td>
<td></td>
</tr>
<tr>
<td>MIXER10</td>
<td>Fill cup with Soda Water</td>
<td>NonGroup</td>
<td>1</td>
<td>This job handles cup positioning and button pushing, returning to home position.</td>
<td></td>
</tr>
<tr>
<td>MASTER</td>
<td>Main job for all drink creation. Also calls Main job, this should be started from the Robot's home position, it runs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIXER9</td>
<td>Fill cup with Water</td>
<td>NonGroup</td>
<td>1</td>
<td>This job handles cup positioning and button pushing, returning to home position.</td>
<td></td>
</tr>
<tr>
<td>MIXER7</td>
<td>Fill cup with C</td>
<td>NonGroup</td>
<td>1</td>
<td>This job handles cup positioning and button pushing, returning to home position.</td>
<td></td>
</tr>
<tr>
<td>MIXER2</td>
<td>Fill cup with O</td>
<td>NonGroup</td>
<td>1</td>
<td>This job handles cup positioning and button pushing, returning to home position.</td>
<td></td>
</tr>
<tr>
<td>MIXER1</td>
<td>Fill cup with M</td>
<td>NonGroup</td>
<td>1</td>
<td>This job handles cup positioning and button pushing, returning to home position.</td>
<td></td>
</tr>
<tr>
<td>DANCE3</td>
<td>Dance #3 R1+R2+S2</td>
<td>any</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R1+R2+S2</td>
<td>Get plastic cup - stack #1 R2</td>
<td>11</td>
<td></td>
<td>get a plastic cup stack #1</td>
<td></td>
</tr>
<tr>
<td>Coffee: Button 5 - Latte</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R1+R2+S2</td>
<td>Get plastic cup - stack #1 R2</td>
<td>12</td>
<td></td>
<td>get a plastic cup stack #2</td>
<td></td>
</tr>
<tr>
<td>Coffee: Button 3 - Cappuccino</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R1+R2+S2</td>
<td>Get plastic cup - stack #1 R2</td>
<td>10</td>
<td></td>
<td>get a plastic cup stack #3</td>
<td></td>
</tr>
<tr>
<td>Bottle Juice 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bottle Juice 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beer #3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soda #4 - L</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soda #3 - C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R1 Grab Bottle #5 - Beefeater R1</td>
<td>5</td>
<td></td>
<td>Pick up bottle, set B002 = 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R1 Grab Bottle #1 - Captain Morgan R1</td>
<td>5</td>
<td></td>
<td>Pick up bottle, set B002 = 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R1 Select Flavor #9 (Water)</td>
<td>2</td>
<td></td>
<td>Button push, adjust timer for various water pressure setups</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R1 Select Flavor #2 (O) - Juice #2</td>
<td>2</td>
<td></td>
<td>Button push, adjust timer for various water pressure setups</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Empty Bottle R1</td>
<td>9</td>
<td></td>
<td>put bottle into empty position</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R2 Grab Cup - Right Side (opposite) R2</td>
<td>1</td>
<td></td>
<td>call to get a plastic cup - automatically controls alternating between stacks 1-2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R1+R2+S2</td>
<td>Grab 2nd Bottle #8 - Crown Royal R1</td>
<td>4</td>
<td></td>
<td>Moves bottle from reserve position forward - if bottle not found alert shown on screen</td>
<td></td>
</tr>
<tr>
<td>R1+R2+S2</td>
<td>Grab 2nd Bottle #5 - Beefeater R1</td>
<td>5</td>
<td></td>
<td>Moves bottle from reserve position forward - if bottle not found alert shown on screen</td>
<td></td>
</tr>
<tr>
<td>R1 Return Bottle #9 - J&amp;B Rare R1</td>
<td>4</td>
<td></td>
<td>Return bottle from robot hand to bottle rack</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R1 Return Bottle #7 - Absolut R1</td>
<td>4</td>
<td></td>
<td>Return bottle from robot hand to bottle rack</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R1+R2+S2</td>
<td>Outfeed Coffee Cup</td>
<td>7</td>
<td></td>
<td>Coffee placement</td>
<td></td>
</tr>
<tr>
<td>R1+R2+S2</td>
<td>Outfeed Cup - Plastic Cup</td>
<td>7</td>
<td></td>
<td>Soda/Juice placement, calls EJECT CUP</td>
<td></td>
</tr>
<tr>
<td>R1+R2+S2</td>
<td>Outfeed Coffee Cup</td>
<td>7</td>
<td></td>
<td>Coffee placement</td>
<td></td>
</tr>
<tr>
<td>R1+R2+S2</td>
<td>Outfeed Cup - Plastic Cup</td>
<td>7</td>
<td></td>
<td>Soda/Juice placement, calls EJECT CUP</td>
<td></td>
</tr>
<tr>
<td>R1+R2+S2</td>
<td>Outfeed Coffee Cup</td>
<td>7</td>
<td></td>
<td>Coffee placement</td>
<td></td>
</tr>
<tr>
<td>R1+R2+S2</td>
<td>Outfeed Cup - Plastic Cup</td>
<td>7</td>
<td></td>
<td>Soda/Juice placement, calls EJECT CUP</td>
<td></td>
</tr>
<tr>
<td>R1+R2+S2</td>
<td>Outfeed Coffee Cup</td>
<td>7</td>
<td></td>
<td>Coffee placement</td>
<td></td>
</tr>
<tr>
<td>R1+R2+S2</td>
<td>Outfeed Cup - Plastic Cup</td>
<td>7</td>
<td></td>
<td>Soda/Juice placement, calls EJECT CUP</td>
<td></td>
</tr>
<tr>
<td>R1+R2+S2</td>
<td>Outfeed Coffee Cup</td>
<td>7</td>
<td></td>
<td>Coffee placement</td>
<td></td>
</tr>
<tr>
<td>R1+R2+S2</td>
<td>Outfeed Cup - Plastic Cup</td>
<td>7</td>
<td></td>
<td>Soda/Juice placement, calls EJECT CUP</td>
<td></td>
</tr>
</tbody>
</table>
## 7.5.2 Variable List

<table>
<thead>
<tr>
<th>Byte Variables</th>
<th>Description</th>
<th>Integer Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B000</td>
<td></td>
<td>I000</td>
<td>Total Bottle #1 shots remaining</td>
</tr>
<tr>
<td>B001</td>
<td>Is Ice Required for Current Drink?</td>
<td>I001</td>
<td>Total Bottle #2 shots remaining</td>
</tr>
<tr>
<td>B002</td>
<td>Current Bottle ID held by Robot</td>
<td>I002</td>
<td>Total Bottle #3 shots remaining</td>
</tr>
<tr>
<td>B003</td>
<td>Current Drink's Mixer ID</td>
<td>I003</td>
<td>Total Bottle #4 shots remaining</td>
</tr>
<tr>
<td>B004</td>
<td></td>
<td>I004</td>
<td>Total Bottle #5 shots remaining</td>
</tr>
<tr>
<td>B005</td>
<td>Cup Alternater Byte</td>
<td>I005</td>
<td>Total Bottle #6 shots remaining</td>
</tr>
<tr>
<td>B006</td>
<td></td>
<td>I006</td>
<td>Total Bottle #7 shots remaining</td>
</tr>
<tr>
<td>B007</td>
<td></td>
<td>I007</td>
<td>Total Bottle #8 shots remaining</td>
</tr>
<tr>
<td>B008</td>
<td></td>
<td>I008</td>
<td>Total Bottle #9 shots remaining</td>
</tr>
<tr>
<td>B009</td>
<td></td>
<td>I010</td>
<td>Total Bottle #1 - Captain Morgan usage</td>
</tr>
<tr>
<td>B010</td>
<td></td>
<td>I011</td>
<td>Total Bottle #2 - El Toro usage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I012</td>
<td>Total Bottle #3 - Bacardi usage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I013</td>
<td>Total Bottle #4 - Jack Daniels usage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I014</td>
<td>Total Bottle #5 - Beefeater usage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I015</td>
<td>Total Bottle #6 - Wild Turkey usage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I016</td>
<td>Total Bottle #7 - Absolut usage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I017</td>
<td>Total Bottle #8 - Crown Royal usage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I018</td>
<td>Total Bottle #9 - J&amp;B Rare usage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I019</td>
<td>Total Beer #1 Pours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I020</td>
<td>Total Beer #2 Pours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I021</td>
<td>Total Beer #3 Pours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I022</td>
<td>Total Juice #1 ( pump M / Sour Mix ) pours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I023</td>
<td>Total Juice #2 ( pump O / Orange ) pours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I024</td>
<td>Total Juice #3 ( pump D / Cranberry ) pours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I025</td>
<td>Total Juice #4 ( pump G / Grapefruit ) pours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I026</td>
<td>Total Soda #1 ( pump Q / Tonic ) pours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I027</td>
<td>Total Soda #2 ( pump T / Diet Coke ) pours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I028</td>
<td>Total Soda #3 ( pump C / Coke ) pours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I029</td>
<td>Total Soda #4 ( pump L / Lemon Lime ) pours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I030</td>
<td>Total Water pours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I031</td>
<td>Total Soda Water pours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I032</td>
<td>Total Ice Dispenses</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I033</td>
<td>Total Drinks Served</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I034</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>I035</td>
<td></td>
</tr>
<tr>
<td></td>
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