

AMR (Autonomous Mobile Robot)

OL-series

Safety, Unpacking, and Assembly Guide

OL-450S2

OL-450S3

NOTE

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Introduction

Thank you for purchasing the OL-series Autonomous Mobile Robot (referred to as AMR in this document).

This guide is OMRON's original instructions describing the unpacking, assembly, and safety considerations of the AMR.

This document describes AMR functionality supported with FLOW v5.3.

This guide does not provide all AMR details, specifications, installation, operation, troubleshooting, or maintenance information. This guide is not a substitute for the *AMR (Autonomous Mobile Robot) OL-series User's Manual (Cat. No. M109)*. All personnel that work with the AMR must read and understand the *AMR (Autonomous Mobile Robot) OL-series User's Manual (Cat. No. M109)*.

Please read this guide and make sure you understand the unpacking, assembly, and safety considerations of the AMR before attempting to unpack or use it.

Keep this guide in a safe place where it will be available for reference for repacking purposes.

To download a digital copy of this manual, use the following QR code or visit the website listed below.



https://robotics.omron.com/browse-documents/?dir_id=37207

Intended Audience

This manual is intended for the following personnel, who must also have knowledge of factory automation (FA) systems and robotic control methods.

- Personnel in charge of introducing FA systems.
- Personnel in charge of designing FA systems.
- Personnel in charge of installing and maintaining FA systems.
- Personnel in charge of managing FA systems and facilities.

It is the end-user's responsibility to ensure that all personnel who will work with or around AMRs have attended an appropriate training and have a working knowledge of the system. The user must provide the necessary additional training for all personnel who will be working with the system.

As described in this document, you should allow only skilled persons or instructed persons to do certain procedures. Skilled persons have technical knowledge or sufficient experience to enable them to avoid either electrical or mechanical dangers. Instructed persons are adequately advised or supervised by skilled persons to enable them to avoid either electrical or mechanical dangers.

All personnel must observe industry-prescribed safety practices during the installation, operation, and testing of all electrically-powered equipment.

Before working with the AMR, every person must confirm that they:

- Have the necessary qualifications and training for normal, abnormal, and emergency situations.
- Have access to this document and other safety documentation.
- Have read and understand the related documentation.
- Have agreed work in the manner specified by the documentation.

Units

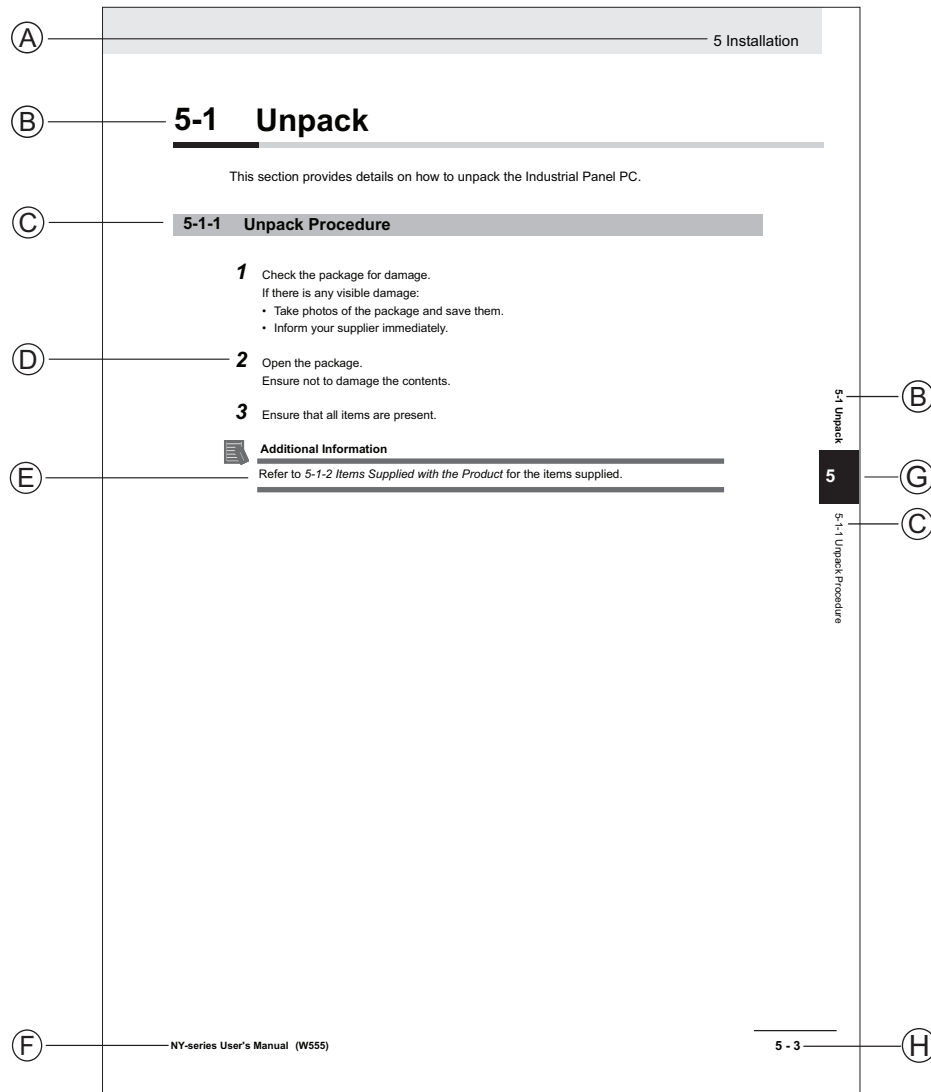
All units are metric unless otherwise noted.

Distances are provided in mm unless otherwise noted.

Manual Information

Page Structure

The following page structure is used in this manual.



Note: This illustration is provided as a sample. It will not literally appear in this manual.

Item	Explanation	Item	Explanation
A	Level 1 heading	E	Special Information
B	Level 2 heading	F	Manual name
C	Level 3 heading	G	Page tab with the number of the main section
D	Step in a procedure	H	Page number

Special Information

Special information in this manual is classified as follows:



Precautions for Safe Use

Precautions on what to do and what not to do to ensure safe usage of the product.



Precautions for Correct Use

Precautions on what to do and what not to do to ensure proper operation and performance.



Additional Information

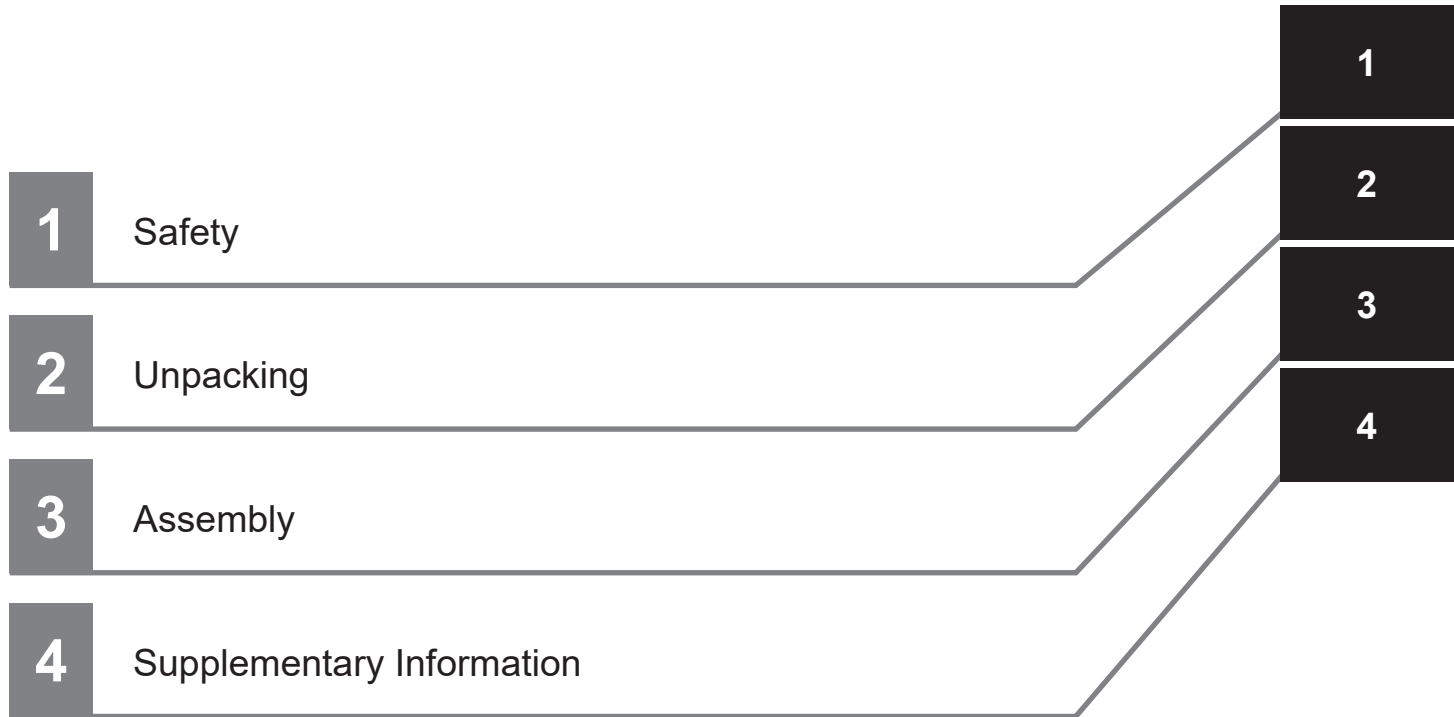
Additional information to read as required.
This information is provided to increase understanding or make operation easier.



Version Information

Information on differences in specifications and functionality between different versions.

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Terms and Conditions Agreement

Warranty and Limitations of Liability

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Omron's exclusive warranty is that the Products will be free from defects in materials and workmanship for a period of twelve months from the date of sale by Omron (or such other period expressed in writing by Omron). Omron disclaims all other warranties, expressed or implied.

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NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT(S) IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

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- Omron Companies shall not be responsible for the operation of the user accessible operating system (e.g. Windows, Linux), or any consequence thereof.

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Change in Specifications

Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron's representative at any time to confirm actual specifications of purchased Product.

Errors and Omissions

Information presented by Omron Companies has been checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors or omissions.

Regulations and Standards

Directives

The AMR system complies with the following Directives.

- 2006/42/EC
Machinery Directive
- 2023/1542/EU
EU Battery Regulation

Standards

The AMR system conforms to the following Standards.

AMR Standards

- EN ISO 12100
Safety of Machinery - General Principles for Design - Risk Assessment and Reduction.
- EN ISO 13849-1
Safety of Machinery - Safety Related Parts of Control Systems SRP/CS – Part 1, General Principles for Design.
- EN/IEC 60204-1
Safety of Machinery - Electrical equipment of machines, Part 1 General Requirements.
- EN ISO 3691-4 (except clause 4.12)
Industrial Trucks - Safety Requirements And Verification - Part 4: Driverless industrial trucks and their systems.
- EN 61000-6-2
EMC, Part 6-2: Immunity Standard for Industrial Environments.
- EN 61000-6-4
EMC, Part 6-4: Emissions Standard for Industrial Environments.
- KS C 9610-6-2
EMC Immunity Testing of Industrial Environments.
- KS C 9610-6-4
EMC Emission Testing of Industrial Environments.

Charging Station Standards

- EN 60335-2-29
Household and similar electrical appliances - Safety - Part 2-29: Particular requirements for battery chargers.
- EN 62311
Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz to 300 GHz).
- UL 1564
Standard for Industrial Battery Chargers.

- EN 55011
Industrial, scientific, and medical equipment standard - Assessment of radio frequency disturbance characteristics, limits and methods of measurement.
- EN 61000-6-2
Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments.

Battery Standards

- UN 38.3
Standard for transportation of lithium batteries.

Regulatory Markings

The following regulatory markings appear on the AMR.

- KC
- CE

The following regulatory markings appear on the Stationary Electronics and Stationary Coil.

- CE
- cMETus

The following regulatory marking appears on the battery.

- CE

Conformance to KC Certification

When you use this product in South Korea, observe the following precautions.

사용자안내문

이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.

This product meets the electromagnetic compatibility requirements for business use.

Related Manuals

Use the following related manuals for reference.

Manual Title	Description
Advanced Robotics Command Language Enterprise Manager Integration Guide (Cat. No. I618)	Describes how to use the Advanced Robotics Command Language (ARCL) a text-based, command line operating language Use ARCL to integrate a fleet of AMRs with an external automation system.
Enterprise Manager 2100 User's Guide (Cat. No. I631)	Describes the installation of an EM2100 appliance, which runs the Fleet Operations Workspace software to manage a fleet of AMRs.
Fleet Operations Workspace Core User's Manual (Cat. No. I635)	Describes Fleet management, MobilePlanner software, the SetNetGo OS, and most of the configuration procedures for an AMR.
MobilePlanner Integrated Help	A repository of Help topics available in the MobilePlanner application. Help topics describe MobilePlanner software, the SetNetGo OS, and most of the configuration procedures for an AMR.
Fleet Operation Workspace Core Integration Toolkit User's Manual (Cat. No. I637)	Contains information that is necessary to use the Integration Toolkit facilitating integration between the AMR, the Fleet Manager and the end user's client application.
Fleet Operations Workspace Core Integration Toolkit MQTT API User's Manual (Cat. No. M107)	Contains information that is necessary to use the Integration Toolkit MQTT API facilitating integration between the AMR, the Fleet Manager and the end user's client application.
Fleet Operations Workspace iQ User's Manual (Cat. No. I665)	Describes functionality and operation of the Fleet Operations Workspace iQ application.
AMR (Autonomous Mobile Robot) OL-series User's Manual (Cat. No. M109)	Describes the functionality, operation, and maintenance of the OL-series AMR.
AMR (Autonomous Mobile Robot) OL-series Charging Station Safety, Unpacking , and Installation Guide (Cat. No. M111)	Describes safety, unpacking, and installation of the OL-series AMR Charging Station.
AMR (Autonomous Mobile Robot) OL-series Battery Safety, Unpacking, and Installation Guide (Cat. No. M112)	Describes safety, unpacking, and installation of the OL-series AMR Battery.

Revision History

A manual revision code appears as a suffix to the catalog number on the front and back covers of the manual.

Cat. No. M110-E-01

↑ Revision code

Revision code	Date	Revised content
01	March 2025	Original production

1

Safety

This section provides safety information for the OL-series AMR.

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1-1 Safety Precautions

1-1-1 Definition of Precautionary Information







The following notation is used in this manual to provide precautions required to ensure safe usage of the AMR. The safety precautions that are provided are extremely important to safety.

Always read and heed the information provided in all safety precautions.

The following notation is used.

 DANGER	Identifies an imminently hazardous situation which, if not avoided, is likely to result in serious injury, and might result in fatality or severe property damage.
 WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. Additionally, there may be severe property damage.
 CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage.

1-1-2 Symbols

	The circle and slash symbol indicates operations that you must not do. The specific operation is shown in the circle and explained in text. This example indicates prohibiting disassembly.
	The triangle symbol indicates precautions (including warnings). The specific operation is shown in the triangle and explained in text. This example indicates a precaution for electric shock.
	The triangle symbol indicates precautions (including warnings). The specific operation is shown in the triangle and explained in text. This example indicates a general precaution.
	The filled circle symbol indicates operations that you must do. The specific operation is shown in the circle and explained in text. This example shows a general precaution for something that you must do.
	The triangle symbol indicates precautions (including warnings). The specific operation is shown in the triangle and explained in text. This example indicates a precaution for high temperatures.
	The triangle symbol indicates precautions (including warnings). The specific operation is shown in the triangle and explained in text. This example indicates a precaution for laser radiation.

1-1-3 Dangers

DANGER

Operators must read this manual and operate the AMR and Charging Station within the defined specifications.



Only qualified personnel who have read and understood this manual should manually move, operate the AMR, or install accessories.



Do not charge a battery that has not been approved for the OL-series AMR. There is a risk of explosion when charging an incorrect battery. Failure to comply with the above mentioned instruction could result in damage to the Charging Station, battery, and AMR.



1-1-4 Warnings

WARNING

General

It is the end-user's responsibility to perform a task-based risk assessment and to implement appropriate safety measures at the point of use of the AMR in accordance with local regulations.



It is the end-user's responsibility to make sure that the AMR design and implementation complies with all local standards and legal requirements.



When lifting the AMR, take care to lift it from safe lifting points and secure it with safety straps for even weight distribution and to ensure that the AMR is level and stable when lifted. OMRON recommends using a mechanical lift.



Follow all unpacking safety instructions and use appropriate tools and equipment. Failure to do so could result in personal injury or property damage.



It is the user's responsibility to train operators and all other personnel on proper use of the AMR and AMR safety.



Equipment used to lift the AMR must be adequately rated. It is the end user's responsibility to review lifting equipment and apply appropriate safety factors before lifting.



Battery and Charging Station

Do not damage the battery by subjecting it to impacts or shocks. Using a damaged battery can result in fire or other dangerous conditions.



The following actions are strictly prohibited and could result in injury or damage to the equipment.

- Persons with cardiac pacemakers in the AMR charging zone.
 - Persons with metal implants in the AMR charging zone.
 - Holding, placing, or allowing objects between the charging coils.
-



Operating Environment

The Manual Mover must be used only to transport an OL-series AMR. Do not use the Manual Mover for any other purpose.



Inspect the Manual Mover for damage, deformation, and cracks before each use and do not lift a weight greater than the safe permissible working load indicated on the Manual Mover.



Do not operate the Manual Mover on sloping surfaces. The weight of the AMR can cause you to lose control on a sloping surface.



After transporting the AMR using the Manual Mover to a new location, ensure the workspace floor on which the AMR is deposited is clear and flat.



Cybersecurity

To maintain the security and reliability of the system, a robust cybersecurity defense program should be implemented, which may include some or all of the following:

Anti-virus protection

- Install the latest commercial-quality anti-virus software on the computer connected to the control system and keep the software and virus definitions up-to-date.
- Scan USB drives or other external storage devices before connecting them to control systems and equipment.

Security measures to prevent unauthorized network access

- Install physical controls so that only authorized personnel can access control systems and equipment.
- Reduce connections to control systems and equipment via networks to prevent access from untrusted devices.
- Install firewalls to block unused communications ports and limit communication between systems. Limit access between control systems and systems from the IT network.
- Control remote access and adopt multifactor authentication to devices with remote access to control systems and equipment.
- Set strong password policies and monitor for compliance frequently.

Data input and output protection

- Backup data and keep the data up-to-date periodically to prepare for data loss.
- Validate backups and retention policies to cope with unintentional modification of input/output data to control systems and equipment.
- Validate the scope of data protection regularly to accommodate changes.
- Check validity of backups by scheduling test restores to ensure successful recovery from incidents.
- Safety design, such as emergency shutdown and fail-soft operations in case of data tampering and incidents.

Additional recommendations

- When using an external network environment to connect to an unauthorized terminal such as a SCADA, HMI or to an unauthorized server may result in network security issues such as spoofing and tampering.
- You must take sufficient measures such as restricting access to the terminal, using a terminal equipped with a secure function, and locking the installation area by yourself.
- When constructing network infrastructure, communication failure may occur due to cable disconnection or the influence of unauthorized network equipment.
- Take adequate measures, such as restricting physical access to network devices, by means such as locking the installation area.
- When using devices equipped with an SD Memory Card, there is a security risk that a third party may acquire, alter, or replace the files and data in the removable media by removing or unmounting the media.
- Please take sufficient measures, such as restricting physical access to the Controller or taking appropriate management measures for removable media, by means of locking and controlling access to the installation area.
- Educate employees to help them identify phishing scams received via email on systems that will connect to the control network.



1-1-5 Cautions



Never connect electric loads directly to the battery bypassing protective circuits.



When placing the AMR back on the floor after lifting, you must make sure that all safety precautions have been taken to prevent personal injury or property damage.



The Manual Mover should be used to move the AMR when needed. Avoid pushing the AMR.



The Service Charger cables pose a tripping hazard. Place cables in a manner that prevents tripping or isolate the area to prevent people from interacting with cables.



1-2 Precautions for Safe Use

- The AMR must be powered ON in order to charge the battery while at the Charging Station.
- Do not attempt to lift the AMR from the bottom with a forklift or similar devices. Doing so could damage the AMR.
- Carefully tilt the mast over so that the cables on the inside are not trapped.
- Do not operate the AMR without all skins fastened correctly. Moving parts are exposed when the AMR is in motion.
- Ensure the AMR is OFF when manually moving or conducting any maintenance on the AMR.
- Do not use the Manual Mover to transport people.
- Do not perform maintenance tasks on the AMR when it is suspended in the Manual Mover.
- Ensure the AMR is properly attached to the Manual Mover before transporting the AMR.
- Always remove the payload or payload carrier from the AMR before attaching the AMR to the Manual Mover and operating the Manual Mover.
- Do not leave the Manual Mover unattended and always engage the brake to keep the device stationary.
- Ensure there is enough clearance for the movement of the AMR's Lifting Plate when using the Lift Bridge.
- To avoid a potential short circuit, do not press the button on the Lift Bridge unless the Lift Bridge is connected to the AMR.
- Do not touch the AMR charging coils. Coils get very hot during and after charging.
- Keep fingers clear of mast joints when raising or lowering the mast.

1-3 Precautions for Correct Use

- When using the Manual Mover to move the AMR, the AMR must be turned OFF.
- The Lifting Plate must be placed at the lowest position before lifting the AMR.
- The Lifting Rings and Slings must be removed before operating the AMR.
- IATA regulations (UN 3480, PI 965) require that air freight shipped lithium ion batteries not installed in the AMR must be transported at a state of charge not exceeding 30%. To avoid total discharge, fully charge the battery immediately upon receipt. The battery might arrive fully charged if it is not shipped by air freight.
- Implementing methods to circumvent the need for a person to enable the AMR's motor power at start-up is prohibited.
- Always lift the battery using the two handles on top of the battery enclosure.

2

Unpacking

This section provides information about unpacking the OL-series AMR.

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2-1 Introduction

A partially assembled AMR is packaged along with the Charging Station components in a wooden shipping box. The wooden shipping box contains the following items:

- The AMR
- Charging Station components
 - Charging Ramp
 - Stationary Electronics
 - Stationary Coil and cables

Make the following considerations before unpacking the AMR.

- The AMR must be unpacked and assembled before the battery can be installed in the AMR.
- The battery must be charged soon after receipt. This will require an installed and commissioned Charging Station. Refer to *AMR (Autonomous Mobile Robot) OL-series Charging Station Safety, Unpacking, and Installation Guide (Cat. No. M111)* and *AMR (Autonomous Mobile Robot) OL-series Battery Safety, Unpacking, and Installation Guide (Cat. No. M112)* for more information.

DANGER

- Only qualified personnel who have read and understood this manual and *AMR (Autonomous Mobile Robot) OL-series User's Manual (Cat. No. M109)* should manually move, operate the AMR, or install accessories.
- Operators must read the *AMR (Autonomous Mobile Robot) OL-series User's Manual (Cat. No. M109)* and operate the AMR and Charging Station within the defined specifications.



WARNING

- Follow all unpacking safety instructions and use appropriate tools and equipment. Failure to do so could result in personal injury or property damage.
- When lifting the AMR, take care to lift it from safe lifting points and secure it with safety straps for even weight distribution and to ensure that the AMR is level and stable when lifted. OMRON recommends using a mechanical lift.



WARNING

Equipment used to lift the AMR must be adequately rated. It is the end user's responsibility to review lifting equipment and apply appropriate safety factors before lifting.



CAUTION

When placing the AMR back on the floor after lifting, you must make sure that all safety precautions have been taken to prevent personal injury or property damage.



Precautions for Safe Use

Do not attempt to lift the AMR from the bottom with a forklift or similar devices. Doing so could damage the AMR.

2-2 Unpacking Procedure

Follow the procedure below to unpack the AMR.



Precautions for Correct Use

- The Lifting Plate must be placed at the lowest position before lifting the AMR.
- The Lifting Rings and Slings must be removed before operating the AMR.

The following items are required for this procedure.

- 4 Lifting Rings (supplied with AMR).
- 4 Lifting Slings (user-supplied).
- Personal Protective Equipment (eye protection, toe protection, gloves).
- Overhead hoist or forklift rated for a minimum of 400 kg.
- Scissors or box cutter for cutting the strapping tapes.
- Star bit T25 for removing the wooden shipping box screws.
- Star bit T30 for removing the wooden planks screws.

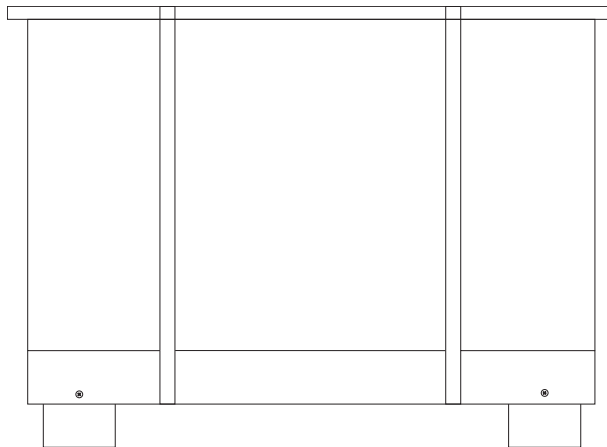
Two people may be needed for completing this procedure.



Additional Information

The Lifting Slings to lift the AMR are not included. Use Lifting Slings rated for overhead lifting of at least 500 kg.

- 1 Remove the plastic shrink wrap around the wooden shipping box.
- 2 Cut the strapping tapes around the wooden box.



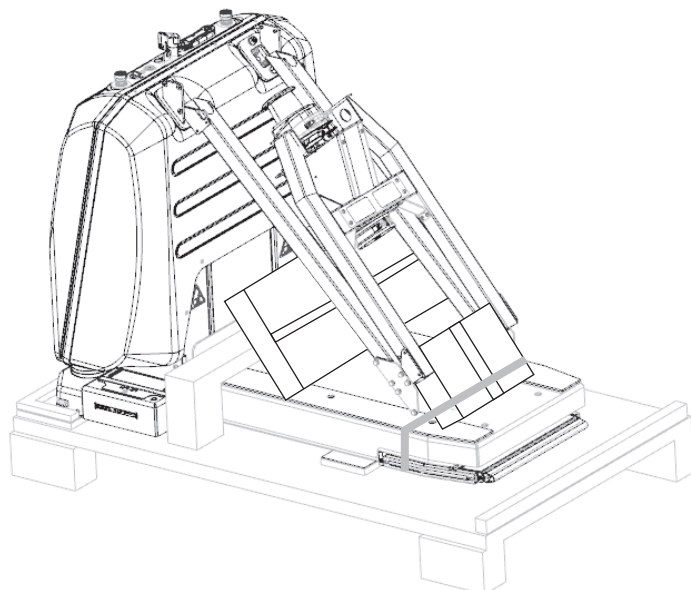
- 3 Remove the Charging Ramp package from the top of the wooden box and keep it aside.



- 4** Unscrew the four screws (two on each side) that attach the top lid frame to the bottom deck.

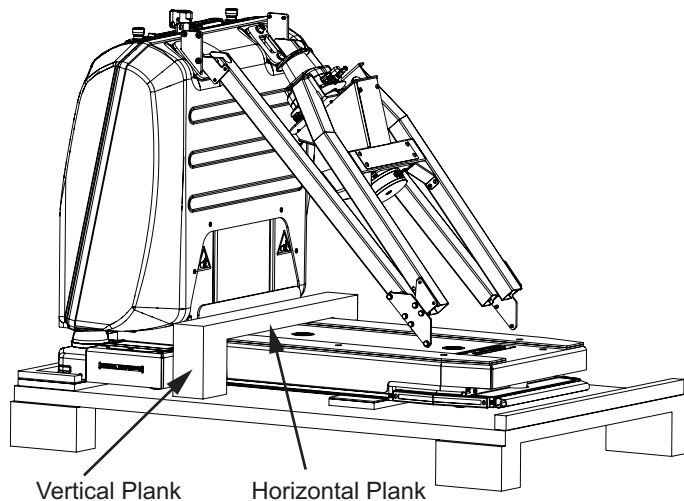


- 5** Lift up and remove the top lid frame from the bottom deck.

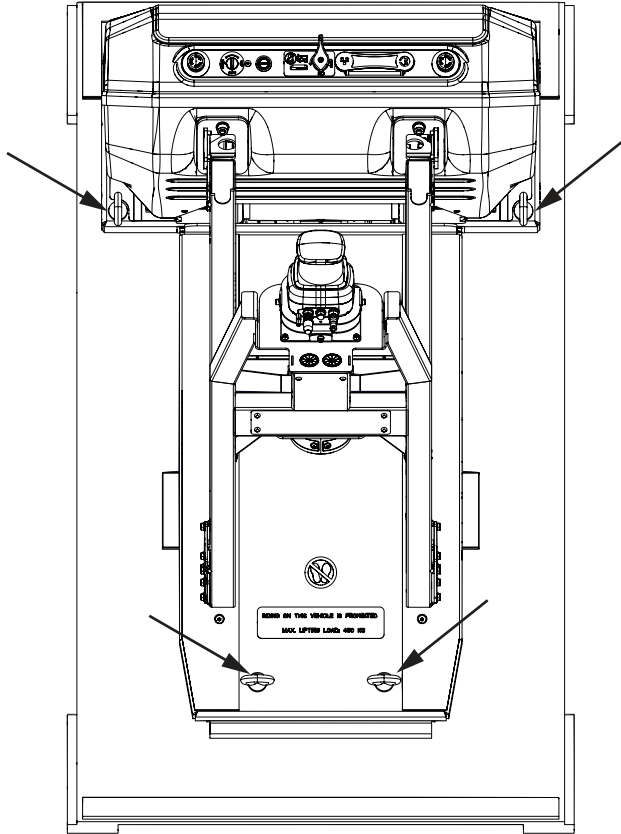


The Stationary Coil and the Stationary Electronics are packaged in separate boxes and placed on the Lifting Plate of the AMR.

- 6** Cut the tape around the Lifting Plate of the AMR and remove the Stationary Coil and the Stationary Electronics boxes.
- 7** Visually inspect the AMR for any transport damage.
Check the exterior of the AMR for damage that may have occurred during transport. Inspect for scratches, loose or displaced items, impacts, or other signs of damage. If any signs of damage are present, stop this procedure and contact the shipping company immediately to report the damage.
- 8** Unscrew the four screws (two on each side) that hold the wooden plank (horizontal) which secures the AMR's Lifting Plate to the bottom deck.



- 9** Remove the wooden plank and save the plank and screws for future use.
- 10** Unscrew the two screws (one on each side) that hold the short wooden planks (vertical) on the bottom deck.
- 11** Remove the wooden planks (vertical) and save the planks and screws for future use.
- 12** Attach the supplied Lifting Rings to the locations shown in the figure below.



- 13** Attach the Lifting Slings to the Lifting Rings.
- 14** Using an overhead hoist or a forklift, lift the AMR.
- 15** Place the AMR on the workspace floor gently.
- 16** Remove the Lifting Rings and Slings from the AMR to complete this procedure.
Save the Lifting Slings, Lifting Rings, shipping box, and other packaging materials for future use.

3

Assembly

This section describes how to assemble the OL-series AMR.

3-1	Introduction	3-2
3-2	Assembly Procedure	3-3

3-1 Introduction

After unpacking the AMR, the following actions must be completed. The procedure for assembling the AMR is provided in the following section.

1. Assemble the top and bottom portions of the AMR's mast.
2. Install the battery in the AMR.
3. Install the Charging Station.
4. Charge the battery.

Refer to *AMR (Autonomous Mobile Robot) OL-series Charging Station Safety, Unpacking, and Installation Guide (Cat. No. M111)*, *AMR (Autonomous Mobile Robot) OL-series Battery Safety, Unpacking, and Installation Guide (Cat. No. M112)* and *AMR (Autonomous Mobile Robot) OL-series User's Manual (Cat. No. M109)* for more information.

WARNING

- It is the end-user's responsibility to perform a task-based risk assessment and to implement appropriate safety measures at the point of use of the AMR in accordance with local regulations.
- It is the end-user's responsibility to make sure that the AMR design and implementation complies with all local standards and legal requirements.
- It is the user's responsibility to train operators and all other personnel on proper use of the AMR and AMR safety.



3-2 Assembly Procedure

Follow the procedure below to raise the bottom and top portions of the AMR mast.

The following tools are required for this procedure.

- 4 mm hex bit
- 10 mm socket wrench



Precautions for Safe Use

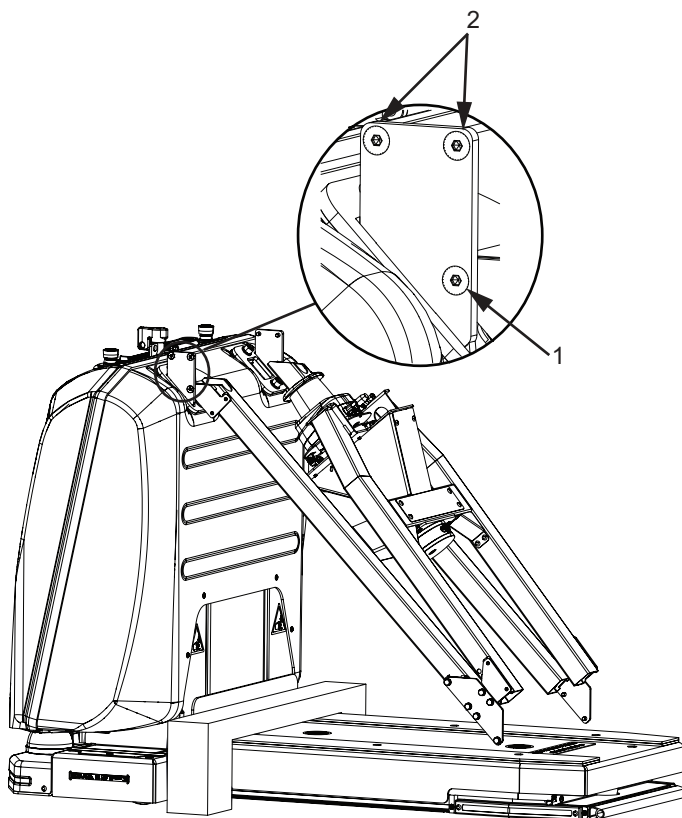
- Carefully tilt the mast over so that the cables on the inside are not trapped.
- Keep fingers clear of mast joints when raising or lowering the mast.



Precautions for Correct Use

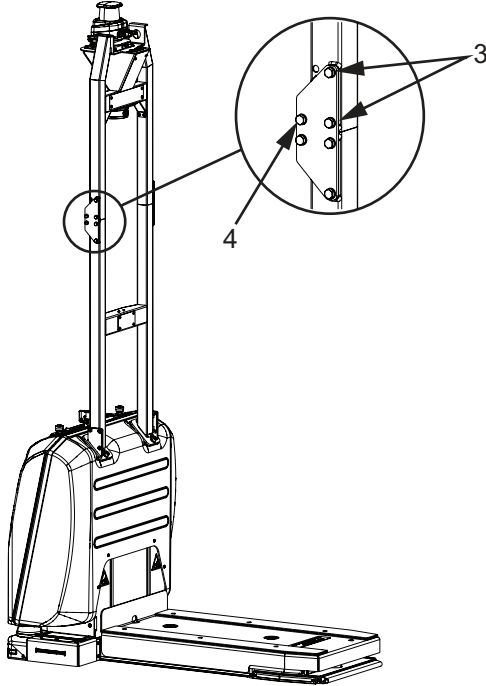
During AMR assembly, ensure a second person holds the mast while you tighten the bolts.

- 1 Unscrew and remove the two top flat-head screws [2] in the bottom portion of the mast. The AMR is shipped with the screws in the holes. If the screws came in a separate bag, then you can skip this and the next two steps.



- 2 Ensure the bottom flat-head screw [1] is loosened.
- 3 Repeat the above steps for the screws on the other side.
- 4 Carefully lift and raise the underside of the bottom portion of the mast vertically.

- 5** Tighten the bottom flat-head screw [1]. Repeat on the other side.
- 6** Insert the two top flat-head screws [2] and tighten. Repeat on the other side.
- 7** Unscrew and remove the two top bolts and washers [3].
The AMR is shipped with the bolts in the holes. If they came in a separate bag, then you can skip this and the next two steps.



- 8** Loosen the bottom bolt and washer [4].
- 9** Repeat the above steps for the bolts on the other side.
- 10** Lift and raise the top portion of the mast vertically making sure that the cables do not get trapped.
- 11** Tighten the bottom bolt and washer [4]. Repeat on the other side.
- 12** Insert the two top washers and bolts [3] and tighten. Repeat on the other side to complete this procedure.
The AMR is now fully assembled.

4

Supplementary Information

This section contains information to support the AMR assembly details.

4

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4-1 Battery Installation

Installation or removal of the battery must be performed by persons who have read and understood this manual.

Before you begin, turn the AMR OFF: place the Selection Switch and the Main Disconnect Switch in the OFF position.

WARNING

Do not damage the battery by subjecting it to impacts or shocks. Using a damaged battery can result in fire or other dangerous conditions.



Additional Information

Inspect the empty battery compartment and remove any foreign objects before attempting to install a battery.



Precautions for Correct Use

Always lift the battery using the two handles on top of the battery enclosure.

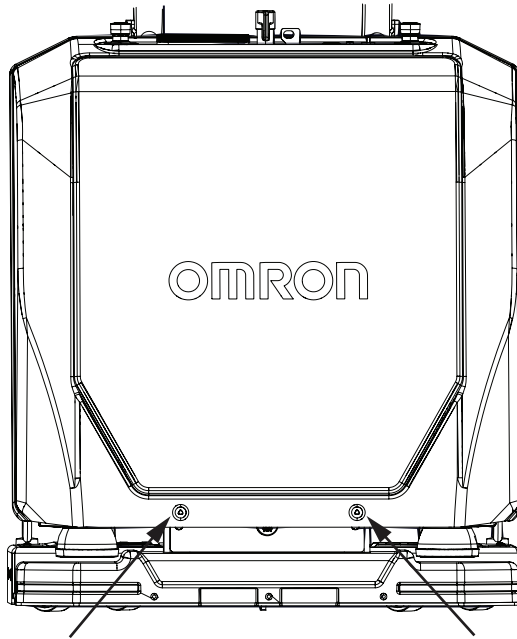
4-1-1 Battery Installation and Connection Procedure

Use the following procedure to install the battery and connect it to the AMR.

The following items are required for this procedure.

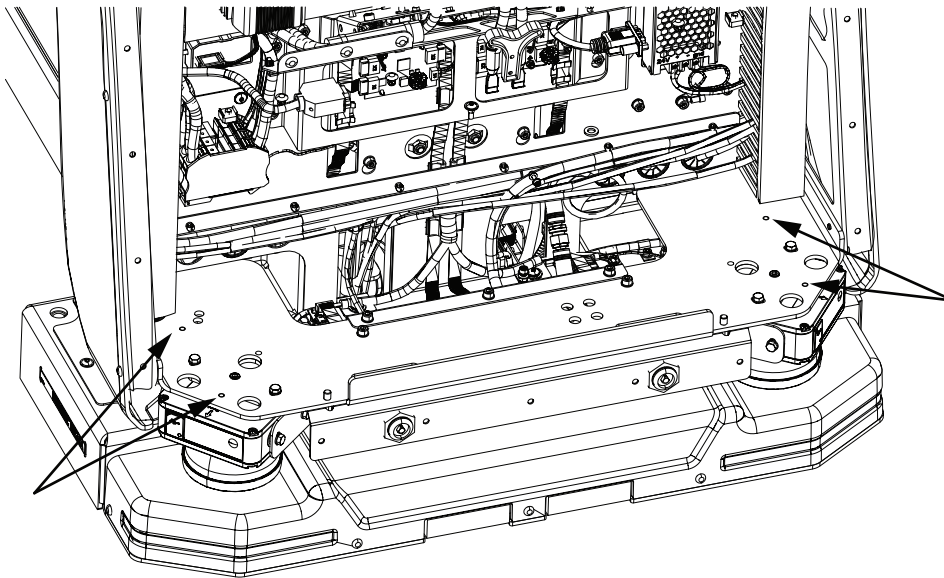
- The battery assembly (part number 28110-020)
- Triangle spanner key (included)
- Four bolts to attach the battery (included)
- 3 mm hex bit

- 1** Turn the AMR OFF. Refer to *4-4 AMR Shut-down Procedure* on page 4-10 for more information.
- 2** Remove the Front Skin by loosening the two machine locks with the triangle spanner key.

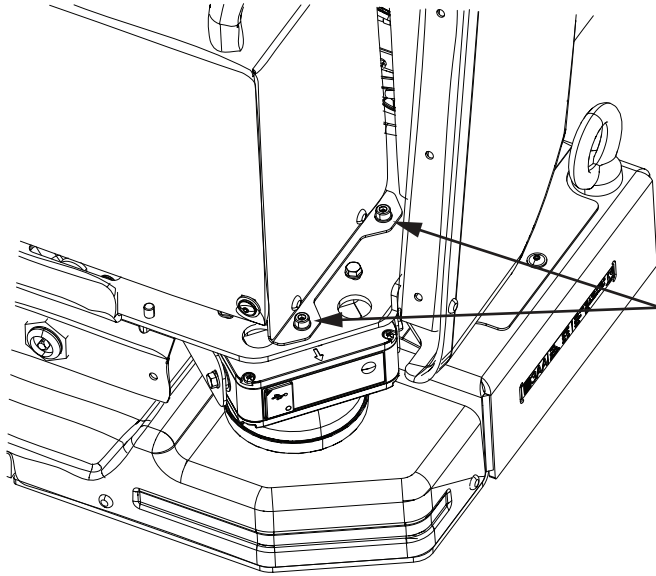


Refer to 4-10 *Removing and Replacing Skins* on page 4-25 for more information.

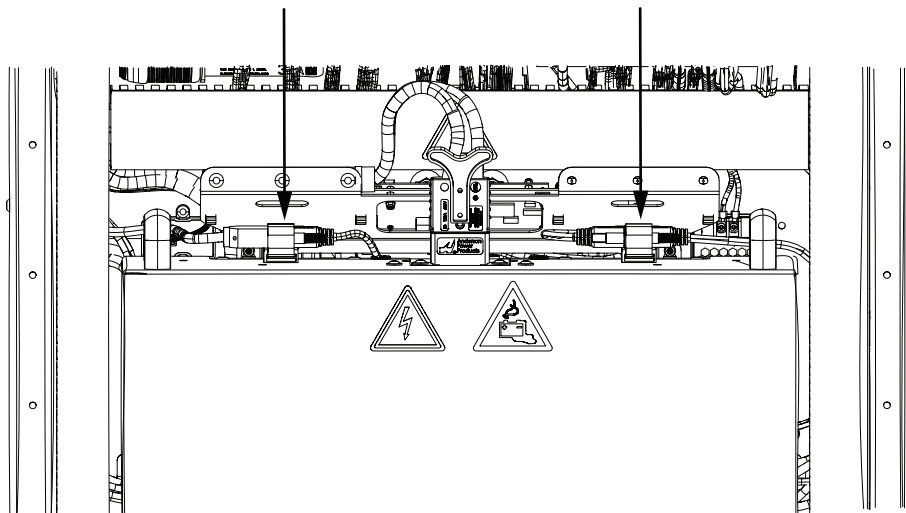
- 3** Carefully place the battery on the base plate of the AMR by aligning the holes on the battery over the four holes on the base plate.



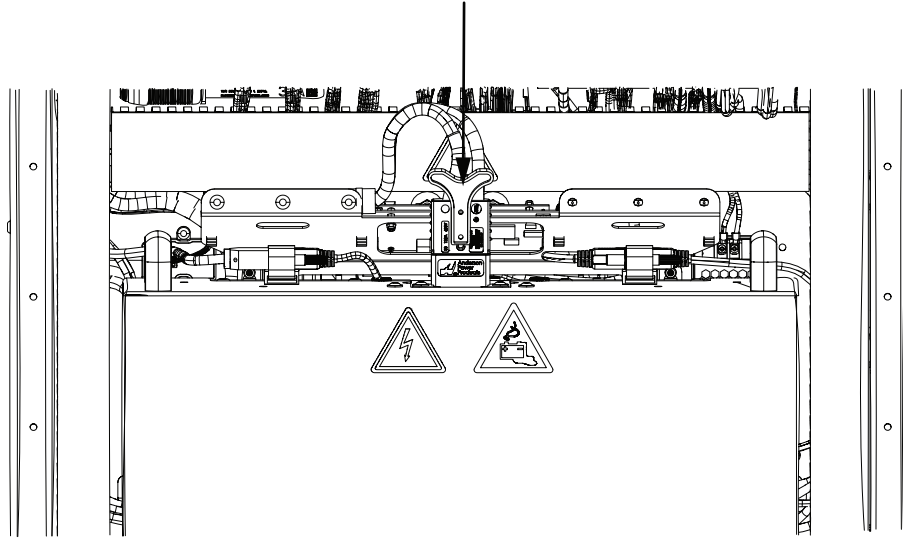
- 4** Insert the four bolts (two on each side) and tighten to a torque of 7 N-m to secure the battery to the base plate.



- 5** Connect the two CAN connectors of the battery with the DB9 connectors of the AMR and tighten the straps.



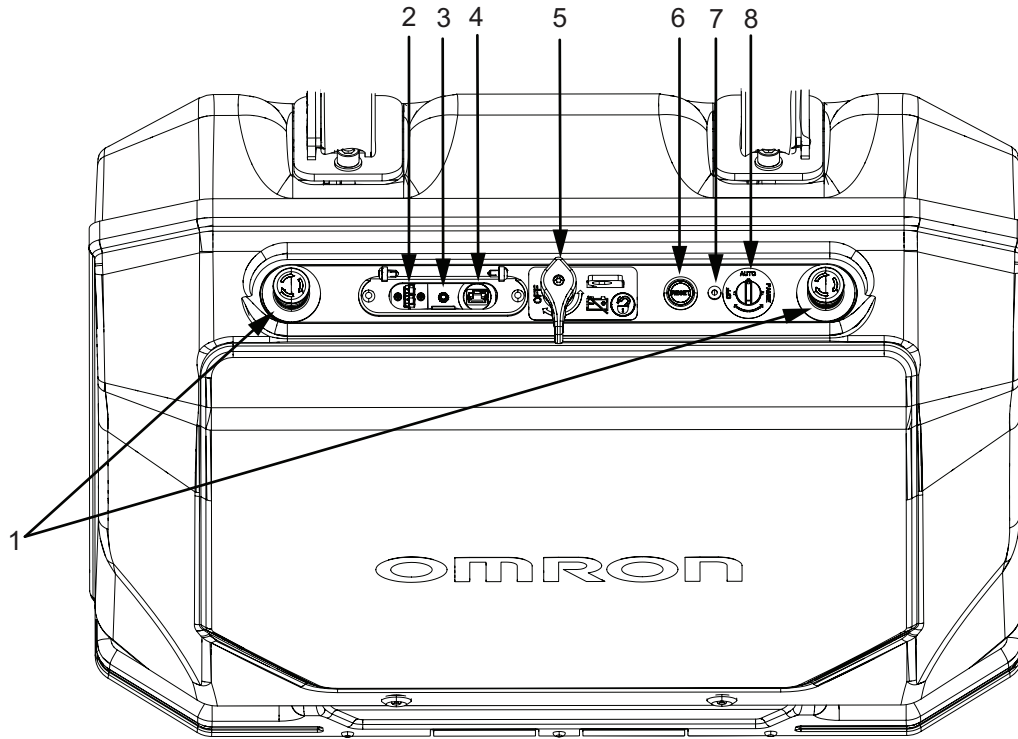
- 6** Insert the battery power connector of the AMR into the Anderson Powerpole socket in the battery.



- 7** Replace the Front Skin and tighten the two machine locks to complete this procedure.

4-2 Control Strip

The Control Strip features are described below.



Item	Description	Item	Description
1	Emergency Stop (E-STOP) buttons	2	Service Charger Connector
3	Manual Lift Control Connector	4	Maintenance Ethernet Port
5	Main Disconnect Switch	6	Reset Button
7	Power LED	8	Selection Switch

4-2-1 Emergency Stop Button

The AMR is equipped with two E-STOP buttons on either side of the Control Strip. Pressing the E-STOP button activates the emergency stop circuit and the AMR comes to a stop immediately.



Additional Information

Refer to *4-11 Emergency Stop Recovery Procedure* on page 4-27 for more information about restarting the AMR after an emergency stop.

4-2-2 Service Charger Connector

Use this port for connecting the optional Service Charger when charging the AMR manually.

4-2-3 Manual Lift Control Connector

This port is used for connecting an optional Lift Bridge device to lower the Lifting Plate manually in the event that the AMR runs out of power.

4-2-4 Maintenance Ethernet Port

Use the Maintenance Ethernet port to connect a PC directly to the AMR with a pass-through or cross-over CAT5 (or better) Ethernet cable for configuration or troubleshooting.

4-2-5 Main Disconnect Switch

Use the Main Disconnect Switch to remove all battery power from the AMR for maintenance, transport, or other abnormal situations. A locking tab is provided to secure the switch to the tab with a padlock.

4-2-6 Reset Button

The reset button returns the AMR to an operational state after an interruption during normal operation.

4-2-7 Power LED

The Power LED provides a visual indication of the AMR's operating state.

4-2-8 Selection Switch

Use the three-way Selection Switch to set the AMR's operational state to AUTO, PAUSE, or OFF.

4-3 AMR Start-up

This section provides details about AMR start-up procedure.

Ensure the following conditions are met before attempting to start-up the AMR.

- The battery is sufficiently charged. Refer to *4-7 Charging AMR Battery* on page 4-13 for more information.
- Ensure the Front and Rear Skins are closed.
- Check the workspace of the AMR for improper objects and remove them.
- Ensure the Front Safety Scanners, the Rear Scanner and the 360-degree Scanner are clean and functional.
- Keep the Lifting Plate clean and free of conductive objects such as metals, carbon etc.



Precautions for Safe Use

Do not operate the AMR without all skins fastened correctly. Moving parts are exposed when the AMR is in motion.



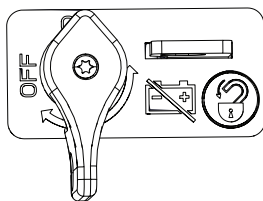
Precautions for Correct Use

Implementing methods to circumvent the need for a person to enable the AMR's motor power at start-up is prohibited.

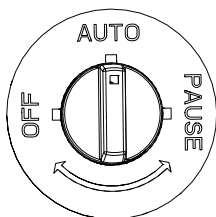
4-3-1 AMR Start-up Procedure

At start-up, the AMR powers all of its systems, including all factory and user configurations. It then automatically runs its on-board software and customer integrated processes to provide an application-ready AMR. If a map has been created and stored, and the AMR is localized, the AMR will be capable of operating autonomously. Refer to *Fleet Operations Workspace Core User's Manual (Cat. No. 1635)* for information on map creation and localization.

- 1 Turn the Main Disconnect Switch to the ON position.



- 2 Turn the Selection Switch to the AUTO position to complete the procedure.



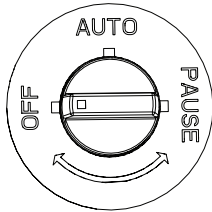
The Power LED lights up and the LED Signal Lamp, Front and Rear Light Strips turn ON.

It takes about one minute for all the systems to start-up and make their various interconnections. The AMR's Computing System and navigation lasers automatically start when the AMR turns ON.

4-4 AMR Shut-down Procedure

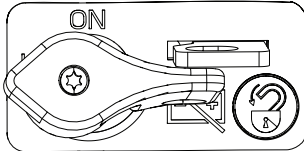
Follow the procedure below to shut down the AMR in a controlled manner. The system will save the AMR's last known location so it can automatically localize when it is powered ON later.

- 1 Turn the Selection Switch to the OFF position.



The Power LED, the Front and Rear Light Strips, and the LED Signal Lamp turn OFF.

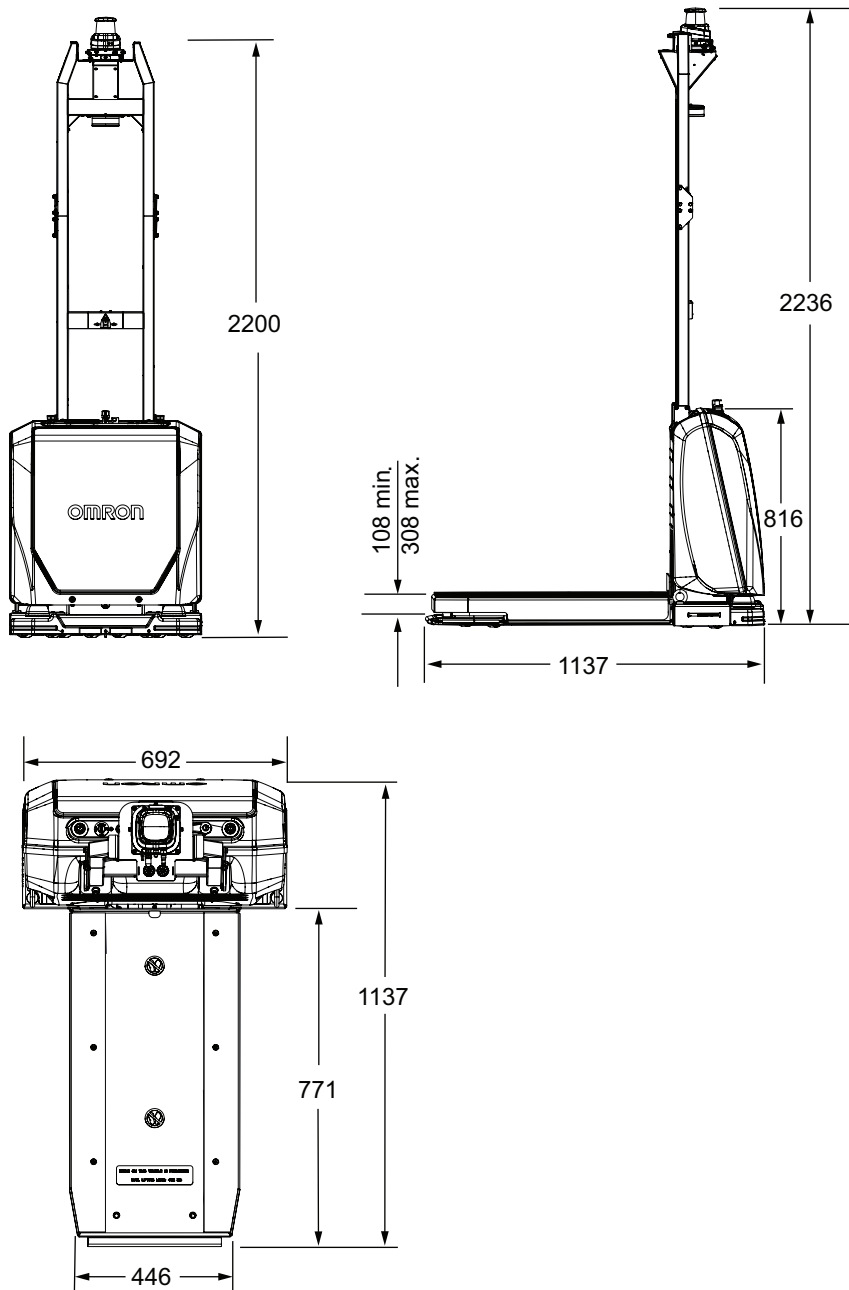
- 2 Turn the Main Disconnect Switch to the OFF position.



This completes the procedure.

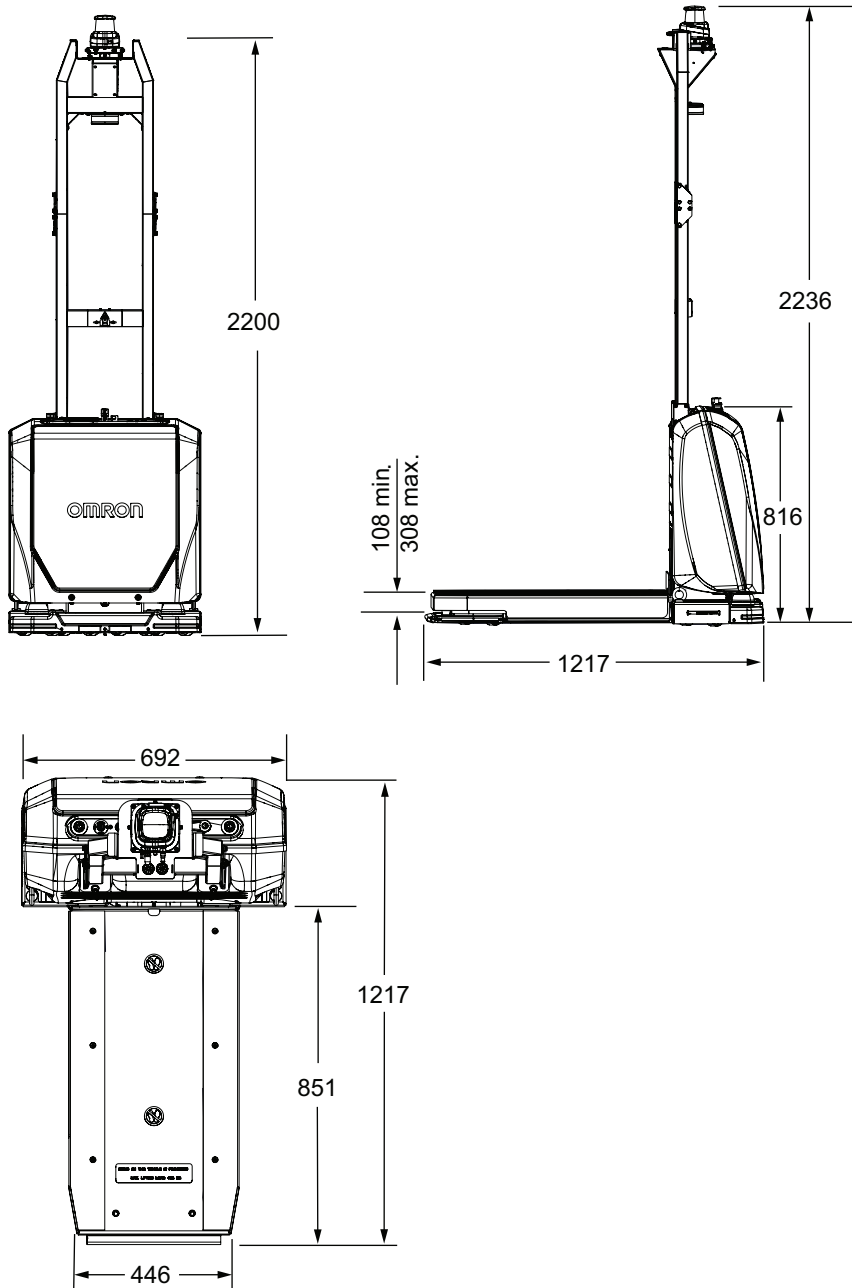
4-5 Overall AMR S2 Dimensions

The overall dimensions of the AMR model S2 are provided below.



4-6 Overall AMR S3 Dimensions

The overall dimensions of the AMR model S3 are provided below.



4-7 Charging AMR Battery

The AMR features a coil (Mobile Coil) under the unit for wireless charging. When the AMR positions itself over the the Stationary Coil, current in the Stationary Coil generates a magnetic field between the two coils. This induces a current in the Mobile Coil and the battery charges wirelessly. This process is called induction charging.

The Charging Station is equipped with infrared communication for detection of the AMR at the charging position and communication between the Stationary Electronics and the Mobile Electronics in the AMR. When the Stationary and Mobile coils are aligned correctly, the system switches to charging mode and battery charging is initialized. When the Mobile Coil in the AMR moves away from the Stationary Coil, the connection is interrupted and the charging process stops automatically.

The AMR battery supplies adequate power for the motors, electronics, and accessories.

Typical runtime with no load is approximately 11 hours and typical fully loaded runtime is approximately 7 hours. The primary factors that affect runtime are AMR speed, acceleration, idle time at Goal locations, payload amount, and power consumed by accessories.

Check the battery's state-of-charge (SOC) percentage (%) using MobilePlanner.

DANGER

Do not charge a battery that has not been approved for the OL-series AMR. There is a risk of explosion when charging an incorrect battery. Failure to comply with the above mentioned instruction could result in damage to the Charging Station, battery, and AMR.



WARNING

The following actions are strictly prohibited and could result in injury or damage to the equipment.

- Persons with cardiac pacemakers in the AMR charging zone.
- Persons with metal implants in the AMR charging zone.
- Holding, placing, or allowing objects between the charging coils.



CAUTION

Never connect electric loads directly to the battery bypassing protective circuits.



Precautions for Safe Use

- The AMR must be powered ON in order to charge the battery while at the Charging Station.
- Do not touch the AMR charging coils. Coils get very hot during and after charging.

4-8 Charging Battery for the First Time

OMRON recommends that you charge the battery immediately after unpacking and installing the battery in the AMR for the first time. The battery is shipped with 30% state of charge (SOC) and discharging may have occurred during transport.



Precautions for Correct Use

IATA regulations (UN 3480, PI 965) require that air freight shipped lithium ion batteries not installed in the AMR must be transported at a state of charge not exceeding 30%. To avoid total discharge, fully charge the battery immediately upon receipt. The battery might arrive fully charged if it is not shipped by air freight.

There are two ways to charge the battery for the first time before a map of the workspace has been created for the AMR.

- Charge the battery using the Service Charger.
- Drive the AMR in Automatic Drive mode to the Charging Station for charging the battery.

Depending on the distance of the Charging Station set up in your facility, choose one of the two methods above to charge the battery.

4-8-1 Charge Using Service Charger

Follow the steps below to charge the battery using the Service Charger. The Service Charger can be used to charge the AMR battery for the first time or when the battery SOC is too low to drive the AMR to the Charging Station.

The Service Charger is rated to operate within a voltage range of 220 to 240 VAC at 50 to 60 Hz. Refer to *4-12 Service Charger Specifications* on page 4-28 for more information.

If the Service Charger is supplied with power outside the rated voltage range, use a step-up transformer rated for a minimum of 750 W. OMRON recommends the Bronson++ WTI-4000 Voltage Converter.

CAUTION

The Service Charger cables pose a tripping hazard. Place cables in a manner that prevents tripping or isolate the area to prevent people from interacting with cables.



Precautions for Correct Use

Use only OMRON supplied Service Charger when the AMR state of charge is too low to allow docking.

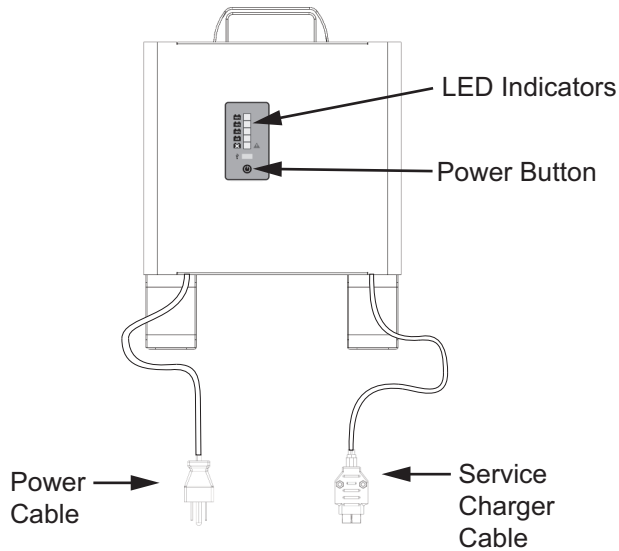


Additional Information

After charging is complete, disconnect the Service Charger from the AMR and do not leave it connected to the AMR. The Service Charger will stop delivering current after the battery is fully charged.

- 1 Turn the Main Disconnect Switch to the ON position.
The AMR should remain powered ON during charging.

- 2 Set the Selection Switch to PAUSE to prevent any automatic or manual control of the AMR.
- 3 Connect the Service Charger cable to the Service Charger connector on the Control Strip of the AMR.



- 4 Connect the power cable of the Service Charger to a wall socket.
- 5 Press the Power button on the Service Charger.
The AMR battery begins charging.
The LED indicators on the Service Charger show the battery SOC.
The charging process takes approximately 2.5 hours to complete.

4-8-2 Automatic Drive Mode Charging

For initial charging before a workspace map has been created for the AMR, you can drive the AMR in Automatic Drive mode through MobilePlanner to the Charging Station for charging the battery. Refer to

- *Fleet Operations Workspace Core User's Manual (Cat. No. 1635)* for more information about installing and accessing MobilePlanner.
- *MobilePlanner Integrated Help* for more information about driving the AMR on Automatic Drive mode.

4-9 Manually Moving the AMR

If the AMR becomes immobilized (such as a depleted battery situation), it may need to be manually moved to a new location. The AMR can be lifted and moved to another location using an overhead hoist or forklift. Refer to *4-13 Lifting the AMR* on page 4-29 for more information.

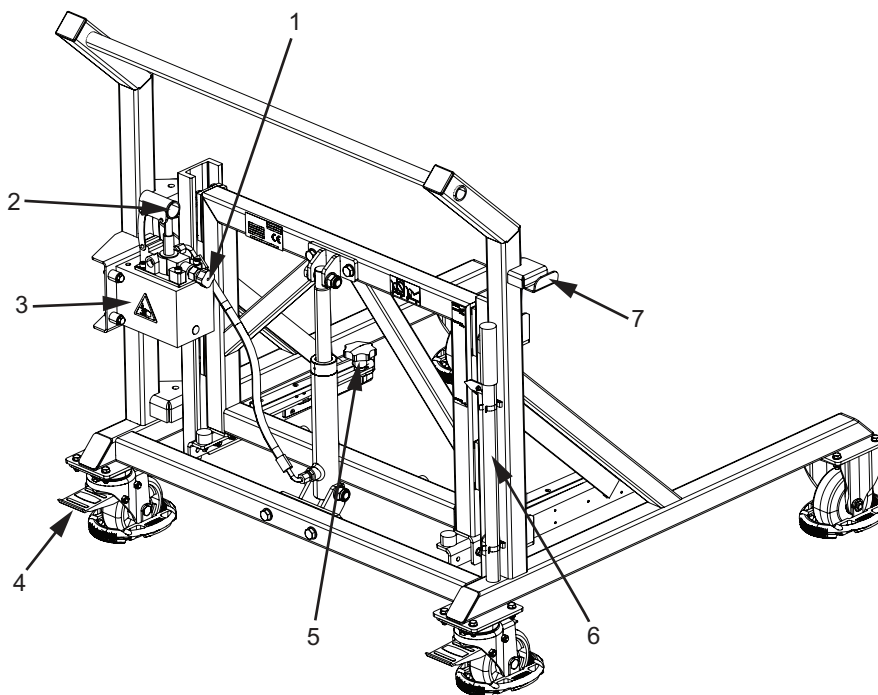
Alternatively, the Manual Mover can be used to move the AMR over a short distance.

A fully assembled Manual Mover is shipped.



Precautions for Safe Use

At least two people are needed to roll out the Manual Mover from the wooden box after unpacking.



Item	Detail
1	Knob for lowering the level of the Manual Mover
2	Sleeve for Lever
3	Hydraulic box
4	Brake
5	Star Knob for attaching the AMR
6	Lever for raising the level of the Manual Mover
7	Hook for hanging the Lift Bridge

4-9-1 Safety Considerations

Observe the following safety considerations when using the Manual Mover to transport the AMR.

DANGER

Only qualified personnel who have read and understood this manual should manually move, operate the AMR, or install accessories.



WARNING

- The Manual Mover must be used only to transport an OL-series AMR. Do not use the Manual Mover for any other purpose.
- Inspect the Manual Mover for damage, deformation, and cracks before each use and do not lift a weight greater than the safe permissible working load indicated on the Manual Mover.
- Do not operate the Manual Mover on sloping surfaces. The weight of the AMR can cause you to lose control on a sloping surface.
- After transporting the AMR using the Manual Mover to a new location, ensure the workspace floor on which the AMR is deposited is clear and flat.



CAUTION

The Manual Mover should be used to move the AMR when needed. Avoid pushing the AMR.



Precautions for Safe Use

- Ensure the AMR is OFF when manually moving or conducting any maintenance on the AMR.
- Do not use the Manual Mover to transport people.
- Do not perform maintenance tasks on the AMR when it is suspended in the Manual Mover.
- Ensure the AMR is properly attached to the Manual Mover before transporting the AMR.
- Always remove the payload or payload carrier from the AMR before attaching the AMR to the Manual Mover and operating the Manual Mover.
- Do not leave the Manual Mover unattended and always engage the brake to keep the device stationary.



Precautions for Correct Use

When using the Manual Mover to move the AMR, the AMR must be turned OFF.

The next sub-sections describe moving the AMR under the following circumstances:

- Moving the AMR with a raised Lifting Plate (with or without a payload resting on it).
- Moving the AMR with Lifting Plate down.

4-9-2 Moving AMR with Lifting Plate Up

Follow the procedure below to manually move the AMR and lower the Lifting Plate (with or without a payload carrier resting on the Lifting Plate) using the Manual Mover and the Lift Bridge.

The following accessories are required for this procedure:

- Manual Mover (part number 28110-501)
- Lift Bridge (part number 28110-503)

Make the following considerations before attempting this procedure:

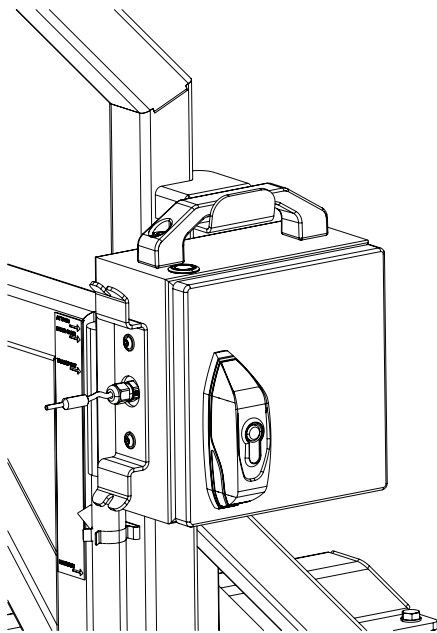
- Ensure that the area you will be working in is adequately protected and cannot be interrupted by other AMRs.
- Ensure the AMR is powered-OFF. Refer to *4-4 AMR Shut-down Procedure* on page 4-10.
- Ensure a fully charged battery is installed in the Lift Bridge.



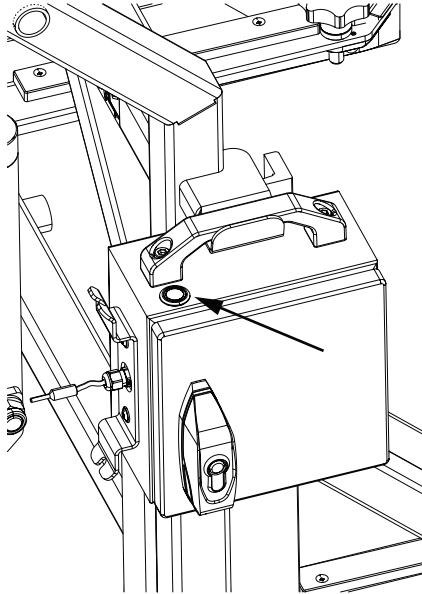
Precautions for Safe Use

- Ensure there is enough clearance for the movement of the AMR's Lifting Plate when using the Lift Bridge.
 - To avoid a potential short circuit, do not press the button on the Lift Bridge unless the Lift Bridge is connected to the AMR.
-

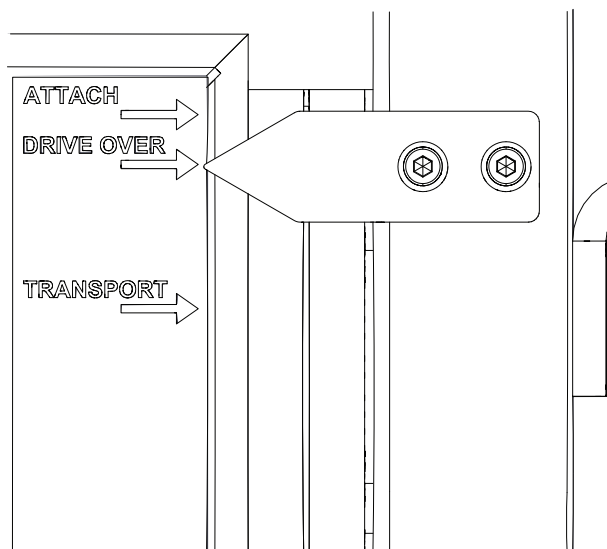
- 1** Hang the Lift Bridge on the designated hook on the Manual Mover.



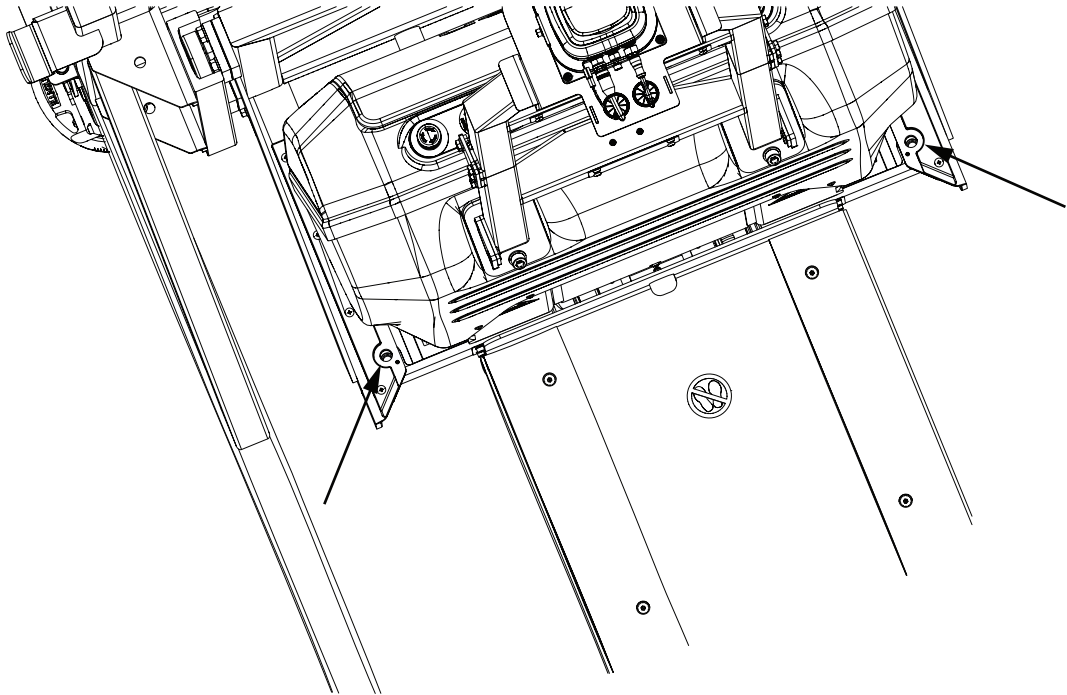
- 2** Push the Manual Mover close to the AMR.
- 3** Connect the cable from the Lift Bridge to the Manual Lift Control Connector on the Control Strip of the AMR. Refer to *4-2 Control Strip* on page 4-6 for more information.
- 4** Press the button on the Lift Bridge and hold until the Lifting Plate cannot be lowered any further.



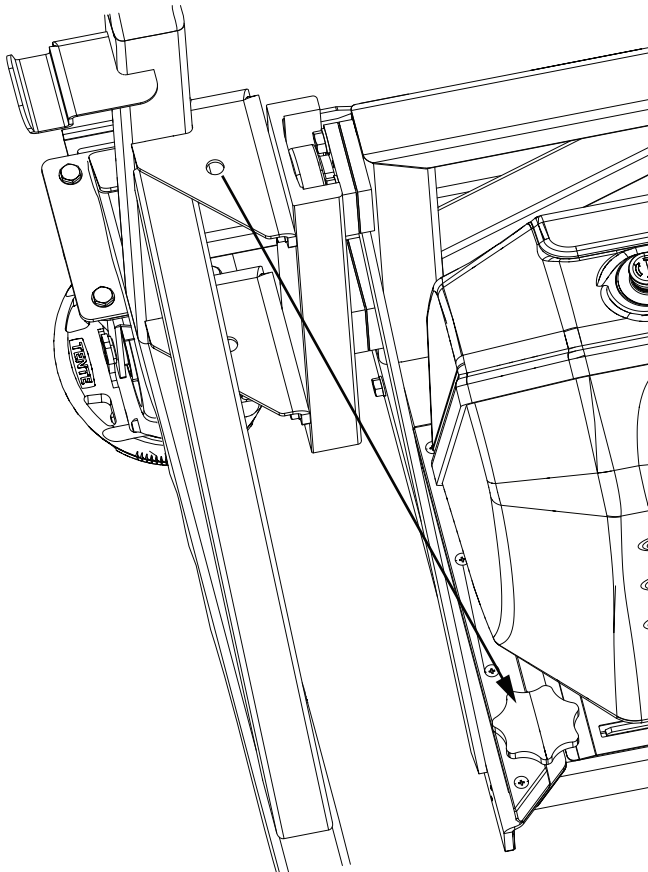
- 5** Disconnect the cable between the Lift Bridge and the AMR.
- 6** Raise or lower the Manual Mover to place the pointer in the *Drive Over* position.
 - 1) Attach the Lever to the Hydraulic Box and pump up the Lever to raise the Manual Mover or
 - 2) Turn the knob on the hydraulic box to lower the Manual Mover.



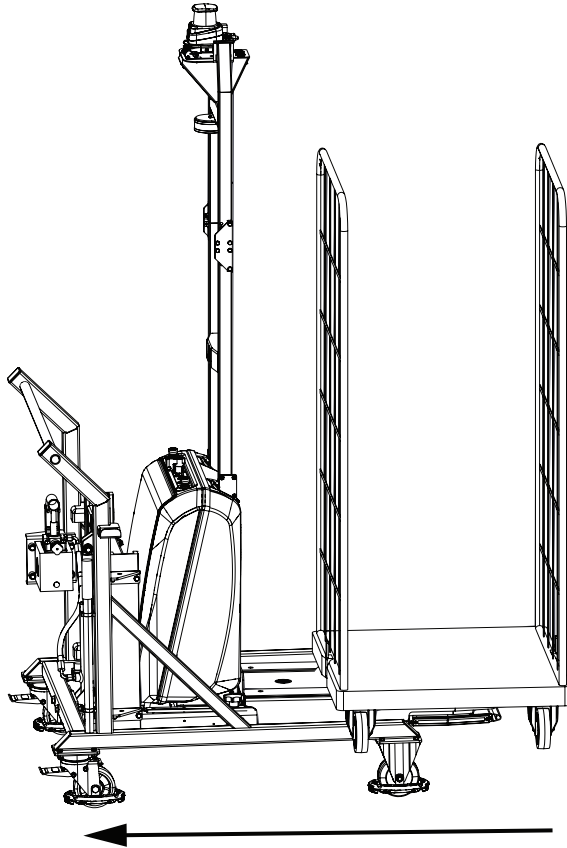
- 7** Position the Manual Mover over the AMR in such a way that the two holes in the Manual Mover frame align with the two holes on either side of the AMR.



- 8** Use the Knob of the Manual Mover to place the pointer in the *Attach* position. The Manual Mover is now at the right level for attaching the AMR.
- 9** Unscrew the two star screws from their storage position on the Manual Mover and screw them into the holes on the AMR.



- 10** If your AMR does not have a payload carrier resting on it, skip to step 16.
- 11** Use the Lever of the Manual Mover to raise the AMR until the AMR is just high enough to be moved without the Lifting Plate making contact with the bottom of the payload carrier.
- 12** Carefully pull the Manual Mover backwards so that the AMR comes out from under the payload carrier.



- 13** Move the payload carrier to a safe storage area.
- 14** Use the Lever of the Manual Mover to place the pointer in the *Transport* position.
The AMR is now lifted high enough to be wheeled.
- 15** Move the Manual Mover (attached to the AMR) to your desired location.
- 16** Use the Knob of the Manual Mover to place the pointer in the *Attach* position.
The Manual Mover is now at the correct level to be detached from the AMR.
- 17** Unscrew the two star screws from the AMR and screw them back into their storage positions on the Manual Mover.
- 18** Detach the Manual Mover from the AMR and move it away to complete this procedure.

4-9-3 Moving AMR with Lifting Plate Down

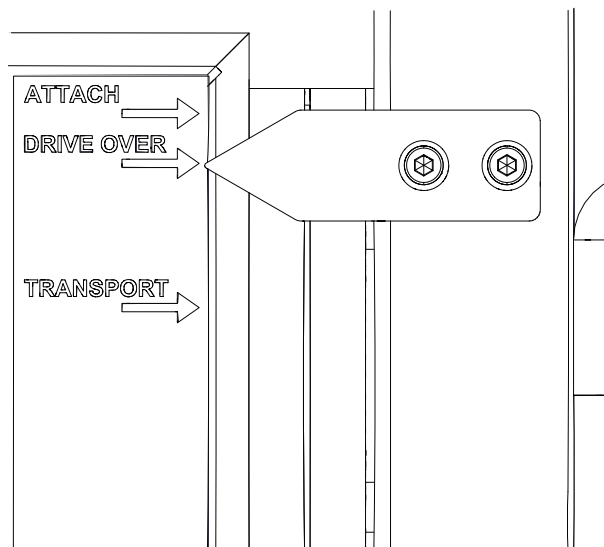
Follow the procedure below to manually move the AMR (with Lifting Plate lowered) with or without a payload carrier resting on the Lifting Plate.

The Manual Mover (part number 28110-501) is required for this procedure.

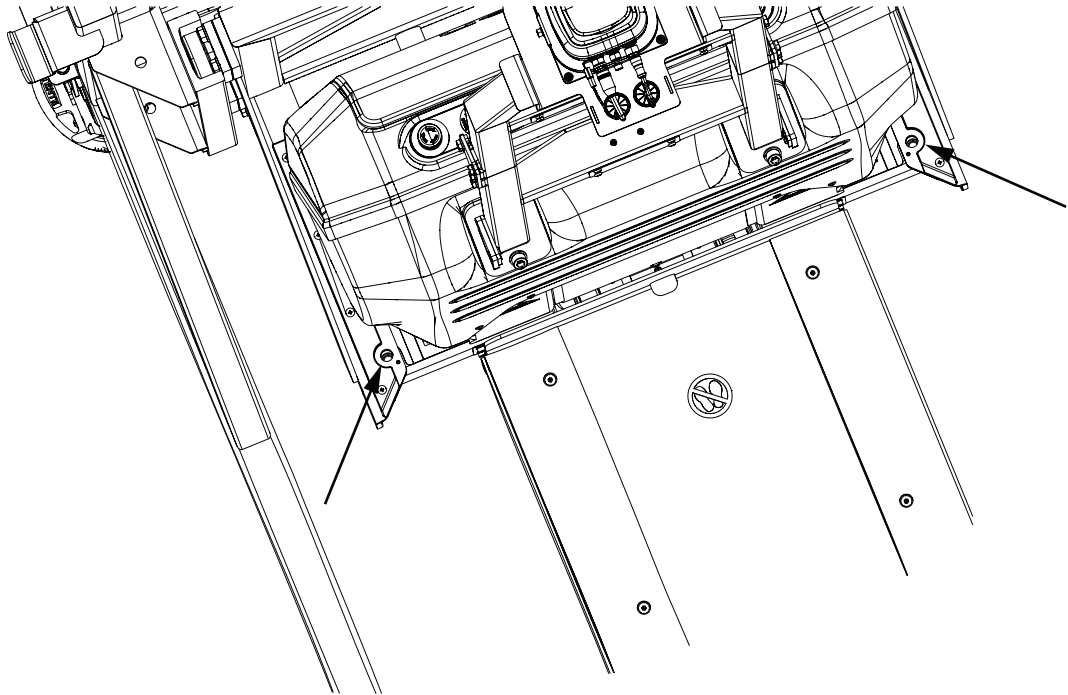
Make the following considerations before attempting this procedure:

- Ensure that the area you will be working in is adequately protected and cannot be interrupted by other AMRs.
- Ensure the AMR is powered-OFF. Refer to *4-4 AMR Shut-down Procedure* on page 4-10.

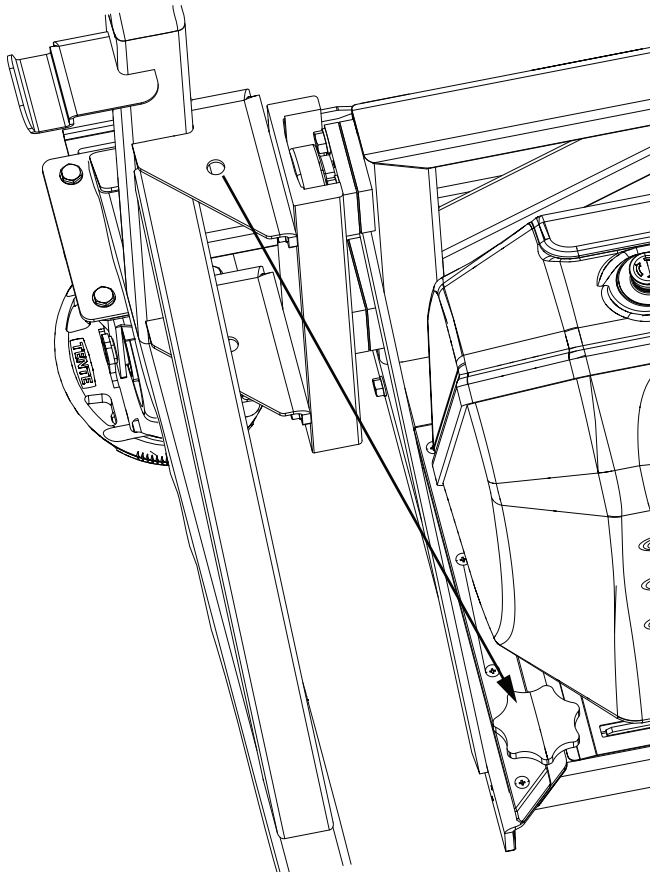
- 1** If there is a payload carrier resting on the Lifting Plate of the AMR, move the payload carrier away from the AMR to a safe storage area.
- 2** Push the Manual Mover close to the AMR.
- 3** Raise or lower the Manual Mover to place the pointer in the *Drive Over* position.
 - 1) Attach the Lever to the Hydraulic Box and pump up the Lever to raise the Manual Mover or
 - 2) Turn the knob on the hydraulic box to lower the Manual Mover.



- 4** Position the Manual Mover over the AMR in such a way that the two holes in the Manual Mover frame align with the two holes on either side of the AMR.



- 5** Use the Knob of the Manual Mover to place the pointer in the *Attach* position. The Manual Mover is now at the right level for attaching the AMR.
- 6** Unscrew the two star screws from their storage position on the Manual Mover and screw them into the holes on the AMR.



- 7** Use the Lever of the Manual Mover to place the pointer in the *Transport* position.
The AMR is now lifted high enough to be wheeled.
- 8** Move the Manual Mover (attached to the AMR) to your desired location.
- 9** Use the Knob of the Manual Mover to place the pointer in the *Attach* position.
The Manual Mover is now at the correct level to be detached from the AMR.
- 10** Unscrew the two star screws from the AMR and screw them back into their storage positions on the Manual Mover.
- 11** Detach the Manual Mover from the AMR and move it away to complete this procedure.

4-10 Removing and Replacing Skins

The Front and Rear Skins need to be removed or replaced during various maintenance and installation procedures.

The following sections gives details about removal and replacement of the Front Skin.



Additional Information

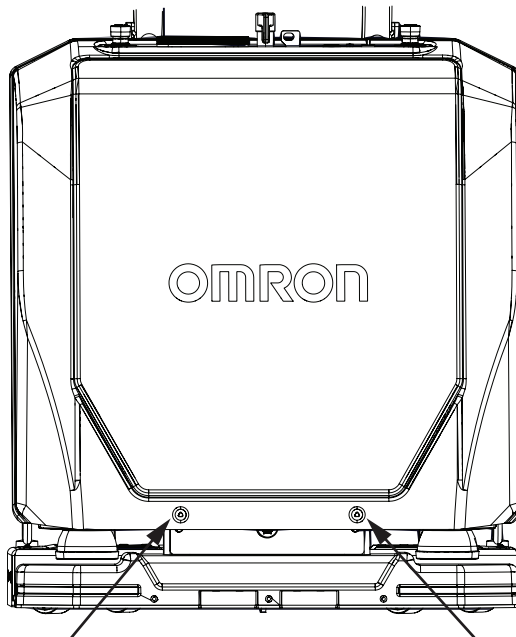
The Rear Skin is not a user-replaceable part. To remove or replace the Rear Skin, contact your local OMRON service representative.

4-10-1 Remove Front Skin

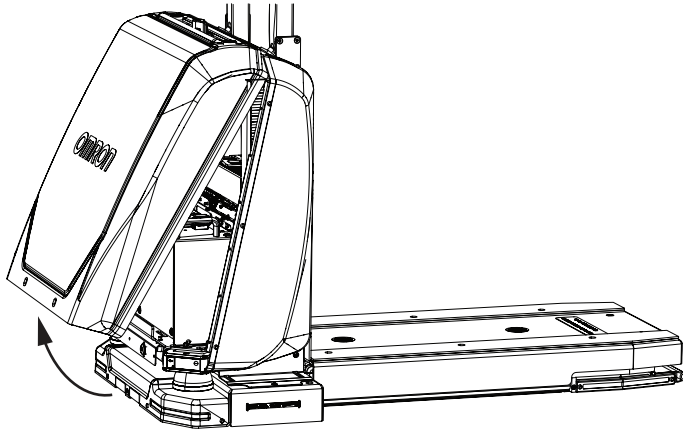
Follow the procedure below to remove the Front Skin from the AMR.

A triangle spanner key (included) is required for this procedure.

- 1 Turn the AMR OFF. Refer to *4-4 AMR Shut-down Procedure* on page 4-10 for more information.
- 2 Loosen the two machine locks with the triangle spanner key (quarter turn to the left).



- 3 Lift up the Front Skin and remove it to complete this procedure.



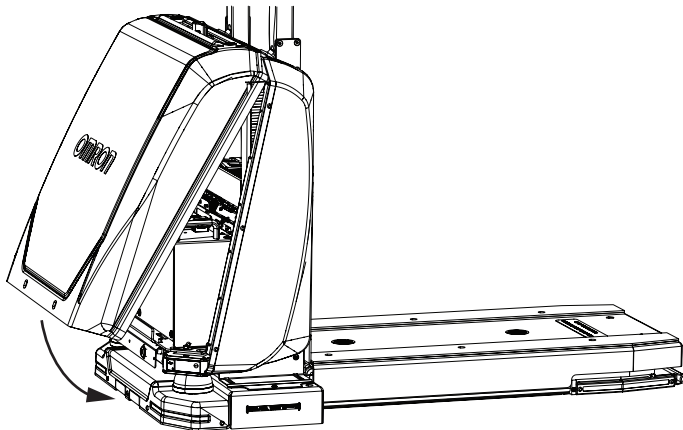
4-10-2 Replace Front Skin

Follow the procedure below to replace the Front Skin.

The following items are required for this procedure.

- A triangle spanner key (included)
- Replacement Front Skin (28110-726F)

- 1** Hook the Front Skin over the Control Strip to position it on the front of the AMR.



- 2** Tighten the two machine locks with the triangle spanner key (quarter turn to the right) to complete the procedure.

4-11 Emergency Stop Recovery Procedure

Recovery from an emergency stop requires additional manual actions only after the operator has confirmed that it is safe to return the AMR to operation. The AMR's drive motors remain disabled until the procedure below is executed.

Use the following procedure to recover from an emergency stop event.

- 1** Reset (pull up) the E-STOP button.
- 2** Make sure that all surrounding areas are clear so the AMR has room to maneuver.
- 3** Press the Reset button on the Control Strip.



Additional Information

There is approximately a 2 second delay between when the Reset button is pressed and the AMR resumes its activity. During this time, the AMR scans its path for potential obstacles and will resume its commanded motion if there is adequate space to maneuver.

4-12 Service Charger Specifications

Specifications for the Service Charger are provided below.

Item	Specification
Input Voltage	220 to 240 VAC, 50 to 60 Hz
Maximum Input Current	2.2 A at 230 VAC
Output Voltage	24 VDC
Output Current	15 A (fused to 20 A)
Ambient Operating Temperature	0° to 35°C
Ingress Protection	IP21
Weight	3.5 kg

4-13 Lifting the AMR

Use the following procedure to lift the AMR. Four Lifting Rings are included in the package in which your AMR arrived. You must obtain Lifting Slings or Straps to lift the AMR.

 WARNING	
<ul style="list-style-type: none"> • When lifting the AMR, take care to lift it from safe lifting points and secure it with safety straps for even weight distribution and to ensure that the AMR is level and stable when lifted. OMRON recommends using a mechanical lift. • Equipment used to lift the AMR must be adequately rated. It is the end user's responsibility to review lifting equipment and apply appropriate safety factors before lifting. 	
 CAUTION	
<p>When placing the AMR back on the floor after lifting, you must make sure that all safety precautions have been taken to prevent personal injury or property damage.</p>	



Precautions for Safe Use

Do not attempt to lift the AMR from the bottom with a forklift or similar devices. Doing so could damage the AMR.



Precautions for Correct Use

- The Lifting Plate must be placed at the lowest position before lifting the AMR.
- The Lifting Rings and Slings must be removed before operating the AMR.



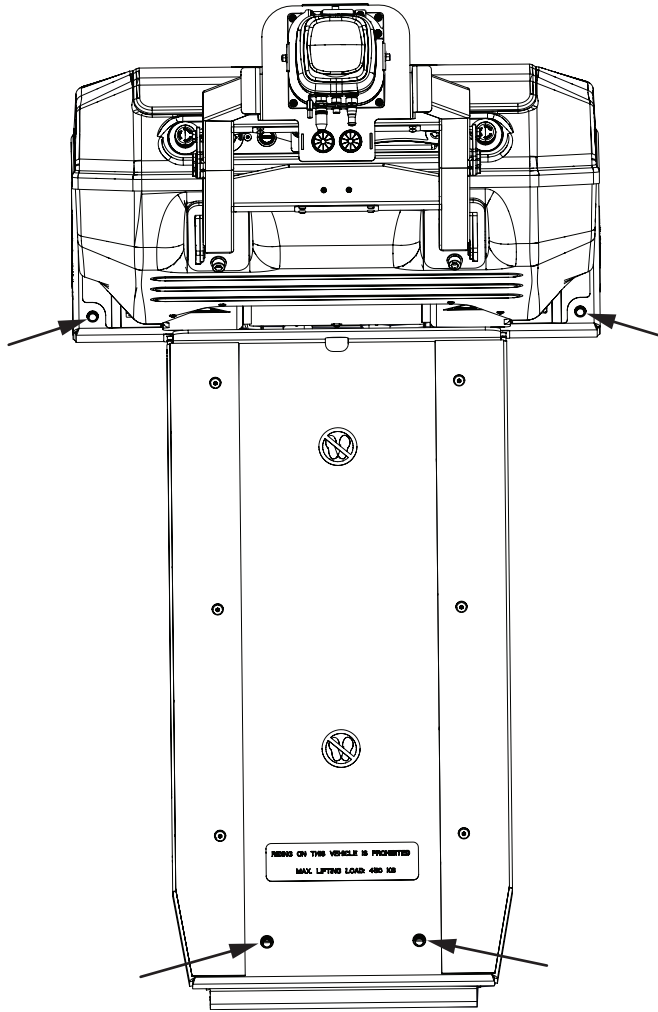
Additional Information

The Lifting Slings to lift the AMR are user-supplied. Use Lifting Slings rated for overhead lifting of at least 500 kg.

The following items are required for this procedure.

- 4 Lifting Rings (supplied with AMR)
- 4 Lifting Slings (user-supplied)
- Personal Protective Equipment (eye protection, toe protection, gloves).
- Overhead hoist or forklift rated for a minimum of 400 kg.

- 1** Perform the appropriate Lock-out Tag-out procedures.
Refer to *4-14 AMR Lock-out Tag-out Procedure* on page 4-31 for more information.
- 2** Attach the OMRON-supplied Lifting Rings to the locations shown in the figure below.



- 3** Attach the Lifting Slings to the Lifting Rings.
- 4** Using an overhead hoist or a forklift, lift the AMR.
- 5** Gently lower the AMR and place it on the workspace floor or the Work Bench.
- 6** Remove the Lifting Rings and Slings before operating the AMR to complete this procedure. Save the Lifting Rings and Lifting Slings for future use. Operating the AMR with the Lifting Rings will block the field of view of the Front Safety Scanners.

4-14 AMR Lock-out Tag-out Procedure

Use the following procedure to execute Lock-out Tag-out before performing any maintenance or installation work on the AMR.

- 1** Shut down the AMR. Refer to *4-4 AMR Shut-down Procedure* on page 4-10 for more information.
- 2** Secure the Main Disconnect Switch to the locking tab with a padlock or according to your facility requirement and regulations.
- 3** Wait 60 seconds and then turn the Mode Selection Switch to OFF.
- 4** Confirm that the AMR does not power ON.
The Lock-out Tag-out procedure is complete.

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