



Collaborative Robot: 6-Axis Robots AX6 Troubleshooting User Guide

Original instructions

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1. Introduction

1.1. Conventions

The table below explains the symbols used in this document and on the product itself.

 WARNING	This symbol indicates that a danger of possible serious injury or death exists if the associated instructions are not followed.
 WARNING	This symbol indicates that a danger of possible harm to people or death caused by electric shock exists if the associated instructions are not followed properly.
 CAUTION	This symbol indicates that a danger of possible harm to people or physical damage to equipment and facilities exists if the associated instructions are not followed properly.
	This symbol indicates that safety goggles must be worn.

1.2. Safety Precautions

 WARNING  WARNING	This guide is intended to help you troubleshoot the robot system. Pay attention to the following safety instructions: • Please read the user manuals (the “Collaborative Robot: 6-Axis Robots AX6 Manual”, the “Robot Controller RC-A101 Manual” and the “AX6 / RC-A101 Safety Manual”) before following the instructions in this guide. Troubleshooting this robot system without reading and following the mentioned manuals is extremely hazardous and may result in serious bodily injury and/or severe equipment damage to the robot system. In addition to the safety instructions from the manuals mentioned above, pay attention to the following safety instructions: • Bypassing safety systems is strictly prohibited. That also applies to troubleshooting! It is extremely hazardous and can lead to very serious personal injury and/or severe equipment damage to the robot system. • An important note regarding Automatic Mode, which is mentioned several times in this manual: Automatic mode must only be used if the system is equipped with the necessary safety functions, has been tested, and its safety has been confirmed by a risk assessment. Using automatic mode in other situations is very dangerous. That also applies to troubleshooting! For further information, please refer to the “AX6 / RC-A101 Safety Manual”. • Absolutely do not attempt to repair a faulty system yourself. Under no circumstances should you open the manipulator or the controller. Any attempt to repair and/or to open the system yourself is extremely hazardous and may result in very serious injury, an electric shock and/or severe equipment damage to the robot system. If you think the robot system needs to be repaired, please contact your supplier.
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1.3. Troubleshooting Guideline

1.3.1. Diagnostic Tools

If a fault occurs, go through the points described in this section.

The robot state is visible in the “Desktop Interface” by opening the “System Monitor” window on the left. There, the current pose, axis temperature, I/O status and more can be observed.

The following information may be helpful in troubleshooting an issue:

- Robot information (model, software versions, serial numbers, ...): Accessible via the “Desktop Interface” under “Help → Robot Information”.
- Log files: They contain the system log (but no user scripts). Accessible via the “Desktop Interface” under “Help → Contact”.

If you contact your supplier for help, please provide the robot information and the log files if possible. Please also refer to the “AX Portal User’s Guide”, section “Help Menu”.

All user data, such as poses and scripts, is stored in the database, which serves as a backup. The database can be downloaded in the “Desktop Interface”, in the “Configuration” window. Back-up your data before you troubleshoot your system if possible. Please also refer to the “AX Portal User’s Guide”, section “Configuration Menu”.

1.3.2. AX Portal Error Code/Message List

The “AX Portal Error Code/Message List” contains all error messages and warnings that AX Portal can display. If you receive an error message or warning, first follow the instructions provided in those messages, and then follow the instructions in this document. Every message has a code, for example “AX_1001”. In this document, these are referred to as “error codes”.

1.3.3. Support

For getting support, please visit <https://corporate.epson/en/products/robot-systems.html>.

2. Troubleshooting

2.1. Power Supply

Problem	Possible Solution
The robot system does not boot or shuts down during operation.	Check your power connection (AC or DC) and check that you switch on the correct circuit breaker (AC for AC, DC for DC). For details about the power connection, please refer to the “Robot Controller RC-A101 Manual”, section “Electrical Installation”. For the requirements of the AC input, please refer to the “AC Input” section, for the requirements of the DC input, please refer to the “DC Input” section.

2.2. Accessing AX Portal

Problem	Possible Solution
AX Portal cannot be accessed via web browser (HTML error 404).	Check if you use the correct Ethernet port, as written in the “Robot Controller RC-A101 Manual”, section “Periphery Connectors”.
	Check that your computer’s Ethernet settings are compatible with the selected connection type. Please refer also to the “Collaborative Robot: 6-Axis Robots AX6 Quick Start / Setup Manual”, section “Mounting, Connection and Start-up”.
	Check that your cabling is correct and inspect the cables for faults.
The DHCP IP address (port “Ethernet 1”) has been forgotten.	The controller can always be accessed via the port “Ethernet 2” and the IP address https://10.0.0.203 . Please also refer to the “Collaborative Robot: 6-Axis Robots AX6 Quick Start / Setup Manual”, section “Mounting, Connection and Start-up”.
The connection to the robot “appears to be slow” (displayed in AX Portal).	Reload the webpage and check if the message disappears.
	Check if your network connection is stable.
The browser shows the HTML error 502 (bad gateway).	Wait a few seconds and reload the webpage.

2.3. Power-up the Robot

Problem	Possible Solution
The robot will not power-up because the built-in IMU unit is measuring a gravity value that differs from the configuration (error code AX_3802).	Check that the gravity vector is configured correctly in the “Safety Settings” window. Please note that the gravity vector must be adjusted according to how the robot is mounted. Please refer to the “AX Portal User’s Guide”, section “Safety Power and Force Settings”. Please note that only the user role “Safety Officer” can modify the safety settings.

2.4. Safety System

Problem	Possible Solution
The “Safety Settings” can not be edited or verified.	Please note that only a user with the user level “Safety Officer” can edit or verify the safety settings. Please also refer to the “AX Portal User’s Guide”, section “Safety Settings Menu” and to the “AX6 & RC-A101 Safety Manual”, section “Role for Safety Officers”.
	Also please note that the robot must be powered down to edit the safety settings.
The robot ignores the Protective Stop.	In the safety settings, there is a setting for ignoring the Protective Stop in Manual Mode. Please also refer to the “AX Portal User’s Guide”, section “Safety I/Os and Operator Limitations”.
The operator cannot change operation mode.	The safety settings include an option to allow or restrict the “Operator” user from switching operation modes. Please also refer to the “AX Portal User’s Guide”, section “Safety I/Os and Operator Limitations”.
The safety device cannot be reset in the GUI.	The safety settings include an option to specify whether the safety device can only be reset via digital inputs. Please also refer to the “AX Portal User’s Guide”, section “Safety I/Os and Operator Limitations”.

2.5. Mechanical Issues

Problem	Possible Solution
The robot vibrates.	Vibrations can be triggered by natural frequencies. Change the speed of the robot or the problematic movement, and see if the situation improves (both increasing and decreasing may solve the problem).
	If you suspect that a gearbox has a mechanical problem, move its axis in hand-guided mode, repeat the process on a different axis, then compare their sound and motion. Note, however, that differences between the individual axes and a slightly erratic reverse torque are normal.
The robot is louder than expected.	Make sure the robot is mounted correctly.
	Avoid mounting it on objects that could act as resonating bodies.
	If you suspect that a gearbox has a mechanical problem, move its axis in hand-guided mode, repeat the process on a different axis, then compare their sound and motion. Note, however, that differences between the individual axes and a slightly erratic reverse torque are normal.
The robot surface is very hot.	It is normal for some robot links to feel quite hot to the touch when the robot is highly loaded. You can check the temperature of the axes in the “Desktop Interface” under “System Monitor > Robot State”. Please also refer to the “Collaborative Robot: 6-Axis Robots AX6 Manual”, section “Thermal Limitations”.
	Reduce the speed of your application and monitor the temperature in the “System Monitor” window.
	If it is not already enabled, it may help to enable “Temperature Speed Reduction.” Please refer to the “AX Portal User's Guide”, section “Motion Behaviors”.
The robot is not precise anymore.	If you suspect mechanical damage, please contact your supplier.
	Please also consider a user error, and refer to the section “The Robot Does not Move as Expected” .
Suspected brake failure.	Power-down the robot and move each axis to check if the brakes are locking them or if they are loose. Note: A slight amount of play in the axes is normal. In the case of a brake failure, please immediately contact your supplier and do not use the robot anymore.

2.6. The Robot Does Not Move as Expected

Problem	Possible Solution
The robot moves slower than expected.	In the “Desktop Interface”, open the “Motion Limits” tab in the “Motion Controls” window. Ensure that neither the maximum linear nor the maximum joint velocity is limiting the motion. Additionally, check if the velocity scaling factor is set to the desired value. Please also refer to the “AX Portal User’s Guide”, section “Motion Controls”.
	Check whether any restrictive options are enabled in the “Safety Settings”. Please also refer to the “AX Portal User’s Guide”, section “Safety Settings Menu”. Please note that only the user role “Safety Officer” can modify the safety settings.
	Please note that the acceleration is limited when using heavy payloads. Please also refer to the “Collaborative Robot: 6-Axis Robots AX6 Manual”, section “Payload Limitations”.
	Please note that when the velocity or acceleration are not explicitly given in the “Core functions” (refer to “AX Portal - User’s Guide”, section “Code Documentation”), the global values are used. These values are found in the “Global Parameters” tab of the “Motion Controls” window. Please also refer to the “AX Portal User’s Guide”, section “Motion Controls”.
	Please note that the velocity of an axis is limited once it exceeds a certain temperature. The temperature of the axes can be viewed in the “System Monitor”. Please also refer to the “Collaborative Robot: 6-Axis Robots AX6 Manual”, section “Thermal Limitations”.
	Please note that the velocity of the robot is limited to 250 mm/s in manual mode. To use the automatic mode, please refer to the “AX Portal User’s Guide”, section “Operation Modes”. Certain safety precautions must be taken before using Automatic Mode: Please refer to the section “ Safety Precautions ”.
The robot does not move to the expected position.	In the “Desktop Interface”, check in the “Configuration” window if the correct tool is chosen. Furthermore, check in the “Tool Editor” if the properties of the tool are set correctly. Please also refer to the “AX Portal User’s Guide”, section “Tool Editor”. Note that the robot needs to be powered down to edit the tool.

Problem	Possible Solution
	Open the tab “Global Frames” of the “Motion Controls” windows and check both the global frames and the frame offsets. Please also refer to the “AX Portal User’s Guide”, section “Global Frames”.
	Always check that the correct configuration has been entered in the “Pose Editor” or programmed into the script.
	You should also check for purely mechanical causes, such as loose screw connections or faulty components. Please refer to the section “ Mechanical Issues ”.
Individual axes rotate very quickly without the TCP moving rapidly.	Your path is probably moving close to or directly through a singularity. Try to slightly adjust the path (x, y and z values) in order to circumvent this singularity. For better reachability you can try a different robot configuration (C1–C8). Please refer to “AX Portal - User’s Guide”, section “Configuration”.

2.7. Hand-Guided Mode

Problem	Possible Solution
Some axes cannot be moved in the Hand-Guided Mode.	Open the window for the Hand-Guided Control and check that all axes are enabled. Please also refer to the “AX Portal User’s Guide”, section “Hand-Guided Control”.
High resistance to move the axis.	Please note that the resistance is significantly higher when the robot is cold.
	Safety settings may limit the speed of the robot. Check the current settings in the “Safety Settings” window. Please note that only the user role “Safety Officer” can modify the safety settings.
	Please note that the velocity of the robot is limited to 250 mm/s in manual mode; this also applies for the hand-guided mode. For using the automatic mode, please refer to the “AX Portal User’s Guide”, section “Operation Modes”. Certain safety precautions must be taken before using Automatic Mode: Please refer to the section “ Safety Precautions ”.
The robot moves in the Hand-Guided Mode.	Check in the “Configuration” window if the correct tool is chosen. Furthermore, check in the “Tool Editor” if the properties of the tool are set correctly (especially

Problem	Possible Solution
	the mass). Please refer to the “AX Portal User’s Guide”, section “Tool Editor”.
	Check in the “Motion Controls” window if the correct payload is set. Please also refer to the “AX Portal User’s Guide”, section “Motion Controls”.
	Please note that for heavy objects (carried mass without end-effector mass), the payload must be adjusted in the script when picking or placing the object. Otherwise, the robot may move in the hand-guided mode. Caution: If the load settings are too high, the robot will move upwards!

2.8. Applications

Problem	Possible Solution
The application does not start.	Please note that the enabling device needs to be triggered in manual mode. For using the automatic mode, please refer to the “AX Portal User’s Guide”, section “Operation Modes”. Certain safety precautions must be taken before using Automatic Mode: Please refer to the section “Safety Precautions”.
The application pauses or stops unexpectedly.	Please note that the robot stops once an axis exceeds a certain temperature. The temperature of the axes can be viewed in the “System Monitor”. Please also refer to the “Collaborative Robot: 6-Axis Robots AX6 Manual”, section “Thermal Limitations”.
The robot detects a collision, even though it hasn’t touched anything.	Please note that it is normal for collisions to be detected more quickly when the robot is cold. In this case, it is advisable to let the robot warm up before use.
	Check in the “Configuration” window if the correct tool is chosen. Furthermore, check in the “Tool Editor” if the properties of the tool are set correctly (especially the mass). Please refer to the “AX Portal User’s Guide”, section “Tool Editor”.
	Check in the “Motion Controls” window if the correct payload is set. Please refer to the “AX Portal User’s Guide”, section “Motion Controls”.
	Check in the “Safety Settings” that the correct average payload is set. Please also refer to the “AX Portal User’s Guide”, section “Safety Power and Force Settings”.

Problem	Possible Solution
	Please note that only the user role “Safety Officer” can modify the safety settings.
	Consider increasing the force limit at which a collision is triggered. This limit is defined in the “Safety Settings” as well as in the “Motion Controls” window. Please refer to the “AX Portal User’s Guide”, section “Safety Power and Force Settings” and “Motion Controls” respectively.
	Please note that only the user role “Safety Officer” can modify the safety settings.

2.9. Periphery and External Devices

Problem	Possible Solution
The connected sensor does not appear to be working properly.	Check whether the sensor is PNP or NPN and set the digital input accordingly. Please refer to the “Collaborative Robot: 6-Axis Robots AX6 Manual”, section “I/O Configuration”, for AX6 or to the “Robot Controller RC-A101 Manual”, section “I/O Configuration”, for RC-A101.
	If the sensor is powered by an external power source, check that the ground terminals of the control box and the power source are connected.
The connected screen does not work.	After connecting a screen on the Mini Display Port 1 or 2, a power cycle of the controller is needed. Please refer to the “Robot Controller RC-A101 Manual”, section “Mini Display Port”.

2.10. Software Interfaces

Problem	Possible Solution
The robot does not respond to commands sent via the TCP, Modbus, REST or ROS interfaces.	A good way to start troubleshooting is to open up AX Portal. All errors that are sent to the interfaces are also displayed in AX Portal. In case you missed an error, you can check the “Message History” tab of the “System Monitor” in the “Desktop Interface”.
	Make sure you are logged in. Similarly to AX Portal you must be logged in to be able to send commands to the robot. Please refer to the “AX Portal User’s Guide”, section “Authentication”.
	Make sure you have Active Control. To get active control, you need to send the active control command.

Problem	Possible Solution
	Please refer to the “AX Portal User’s Guide”, section “Active Control Station”.
The ROS Connection Module is “not imported” according to the “Robot Information” tab of the “Help” window.	Make sure that the robot is connected to your network via Ethernet before it is switched on (circuit breaker on controller).
	Make sure that the ROS Function Settings are set correctly in AX Portal. Especially for network mode “Peer to Peer”, all IP addresses need to be reachable. Please also refer to the “AX Portal User’s Guide”, section “ROS Handler Module”.