Troubleshoot MiR200 going into Protective stop randomly

Troubleshooting guide (en)

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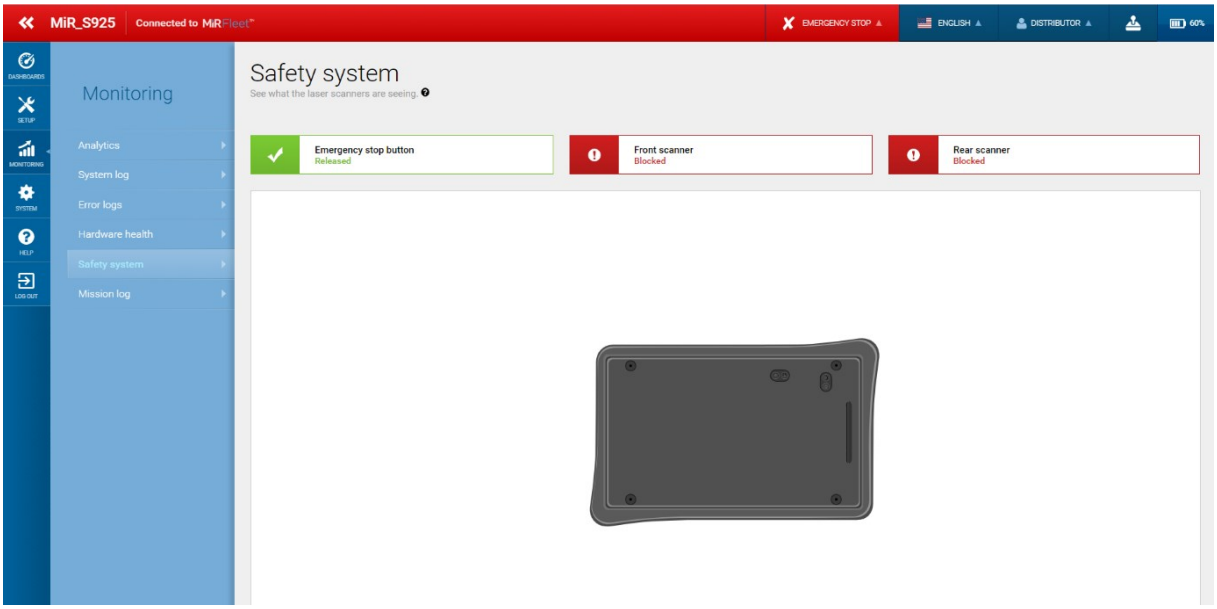
Troubleshoot MiR200 going into Protective stop randomly

This troubleshooting guide is intended to be used if MiR200 goes into Protective stop for no apparent reason. The robot reports both laser scanners as blocked, even though there are no objects located within the active protective field. This results in the robot not being able to run until the robot has been rebooted or the safety system reset.



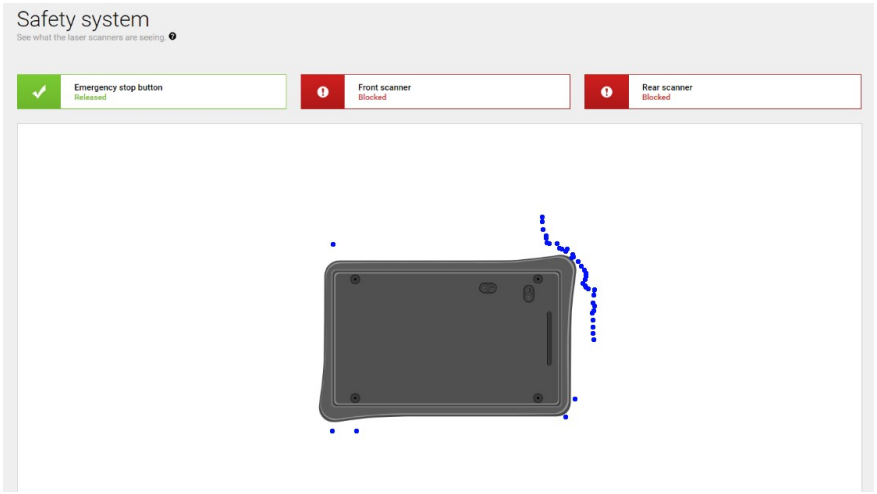
To determine whether you are experiencing the issue described in this guide, follow these steps:

1. Sign in to the robot interface, and go to **Monitoring > Safety system**.
2. Verify that the front and rear scanners display the status **Blocked**.
   - If either of the scanners have the status **Clear**, this guide will not help you remedy the issue you are experiencing. Go to **Monitoring > Hardware health**, and determine what is triggering the Protective stop by going through the statuses of the robot components. If you cannot resolve the issue, contact Technical Support as described in Contacting Technical Support on page 18.

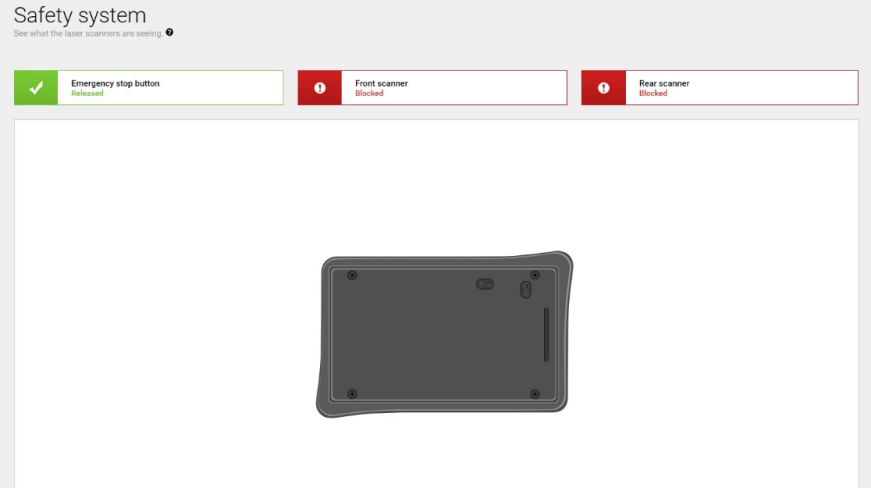
3. If both scanners are blocked, check if they are blocked because they are detecting nearby objects indicated with the blue dots. The following points describe what you should do depending on whether the laser scanners are detecting any obstacles or not, and include an image of what the Safety system page should be displaying in each case:
   - **Detected object triggering Protective stop**
     Check that there are no obstacles close to the robot that may be causing the Protective stop. If there are no obstacles, clean the scanner covers as described in your robot's user guide.

     Avoid touching the optics covers with anything other than a soft, clean, anti-static cloth.

     If the safety laser scanners still detect non-existent obstacles, inspect the optics covers for scratches or other damage. Replace the optics covers if you find anything discrepancies on the optics covers—see the guide *How to replace the safety laser scanner optics cover on MiR100/MiR200*.



- **Internal issue triggering Protective stop**
  If there are no dots or very few dots around the robot, there is an internal issue with it. There are several different identified causes that display this symptom. See *Table 1.1* for an overview of which solutions you should try to apply to your robot depending on its serial number.
  Go through each of the solutions applicable to your robot until the issue is resolved. We recommend trying the solution in the order they are listed in *Table 1.1*.



Possible solutions	Serial no. <...1129	Serial no. ...1130-...1192	Serial no. ...1193-204203005	Serial no. 204203005<
Upload a new SICK configuration file	Yes	Yes	Yes	No
Replace MOC cable	Yes	No	No	No
Adjust the encoders	Yes	Yes	No	No
Check the crimps, and push any faulty crimps back into place	Yes	Yes	Yes	Yes

Table 1.1. Overview of which solutions can be applicable for which robots with the specified serial numbers. For robots with 12-digit serial numbers, only the last four digits are written. For newer robots with 9-digit system, the full serial number is written.

The robots with the serial numbers listed below are more likely to be affected due to faulty cable connections since they use shorter cables:

190200015001110	190200015001128	190200015001206	190200015001225
190200015001111	190200015001129	190200015001207	190200015001228
190200015001112	190200015001130	190200015001208	190200015001229
190200015001113	190200015001159	190200015001209	190200015001230
190200015001114	190200015001182	190200015001210	190200015001231
190200015001115	190200015001193	190200015001211	190200015001232
190200015001116	190200015001194	190200015001212	190200015001233
190200015001117	190200015001195	190200015001213	190200015001234
190200015001118	190200015001196	190200015001214	190200015001236
190200015001119	190200015001197	190200015001215	190200015001237
190200015001120	190200015001198	190200015001216	190200015001238
190200015001121	190200015001199	190200015001217	190200015001239
190200015001122	190200015001200	190200015001218	190200015001241
190200015001123	190200015001201	190200015001219	190200015001242
190200015001124	190200015001202	190200015001221	190200015001244
190200015001125	190200015001203	190200015001222	190200015001245
190200015001126	190200015001204	190200015001223	190200015001246
190200015001127	190200015001205	190200015001224	

Safety

Before applying any of the solutions, refer to the safety chapter in your MiR product's user guide or operating guide.

WARNING

To troubleshoot your robot effectively, you may need to investigate the internal or external parts while the robot is turned on in some steps. You will be exposed to electrical and mechanical hazards.

- Disconnect the battery in the steps where it is not necessary for the robot to be active. It is indicated in the steps if you must disconnect the battery.
- Only qualified personnel may perform the steps in this troubleshooting guide.

Solution descriptions

1. Upload a new SICK configuration file

The SICK configuration file you are using may be outdated or corrupted. See the guide *How to apply the factory default configuration of the SICK safety system for MiR100/MiR200* on the Distributor site to upload a new SICK configuration file. Make sure to download the latest file from the how-to guide.

After you have uploaded the new SICK configuration file, turn the robot off and then on.

2. Replace MOC cable

The MOC cable is part of the W53 encoder and relay signal harness. To replace the harness, see the guide *How to replace the W53 encoder and relay signal harness on MiR100/MiR200*.

3. Adjust the encoders

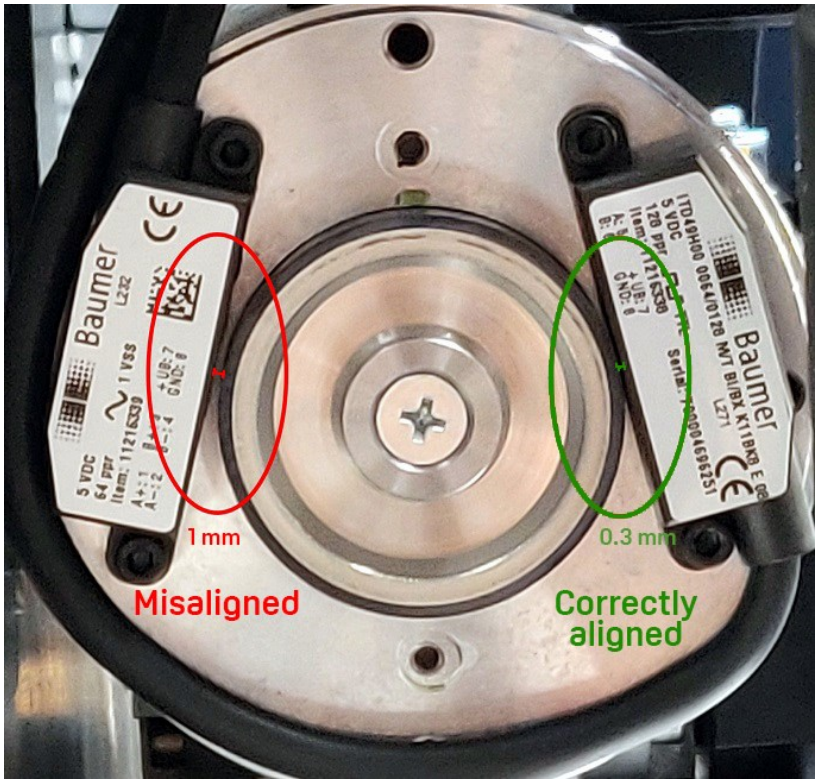
WARNING

When you are handling powered internal components, you risk electrical shock and your limbs getting caught between actuators.

- Disconnect the battery by turning the Battery disconnect switch to Off.

There are two issues with the encoders that can cause the robot to enter Protective stop:

- The distance between the encoders and the magnetic disk must be 0.3 mm ± 0.05 mm. The image below shows two encoders next to the magnetic disk, where the encoder to the right is aligned correctly with 0.3 mm distance from the disk, and the encoder to the left is misaligned with approximately 1 mm distance from the disk.



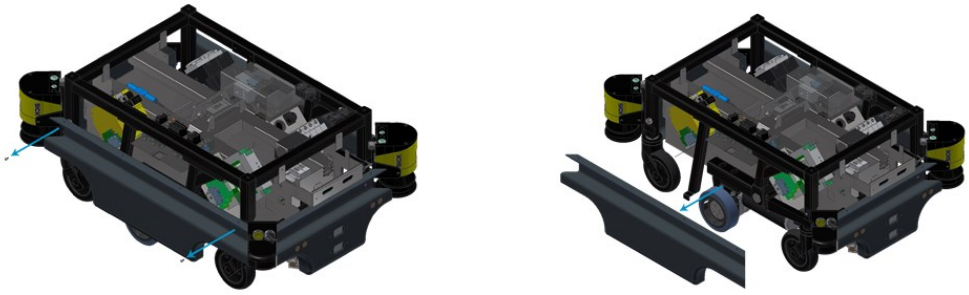
- The encoder cable can be worn down by the magnetic wheel. If the encoder cable is placed so it is pinched between the magnetic wheel and the cap of the encoder compartment, the rotating wheel can wear it down over time. The cable should be positioned along the edge of the motor as shown in the previous image.

You will need the following tools:

- Torx key T25 and T20
- Hex key 2.5 mm
- 0.3 mm distance gauge, such as a 0.05 mm accurate caliper or three pieces of standard 0.1 mm printing paper
- Loctite 2400 threadlocking adhesive or similar

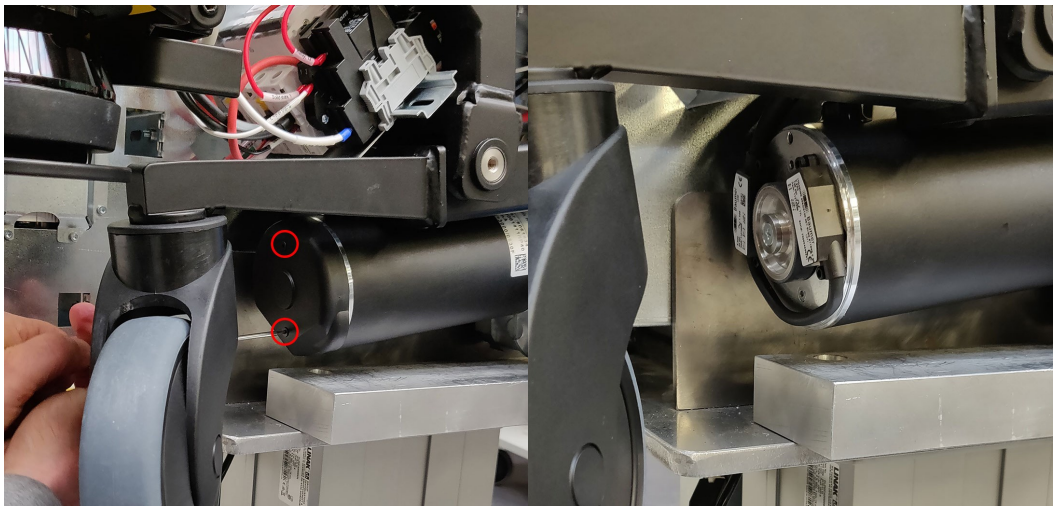
The following steps describe how to check and resolve either issue:

1. Remove both side covers by unscrewing the two screws located below the LED strips with a T25 Torx key. Disconnect the LED status light cables to completely remove the panels.



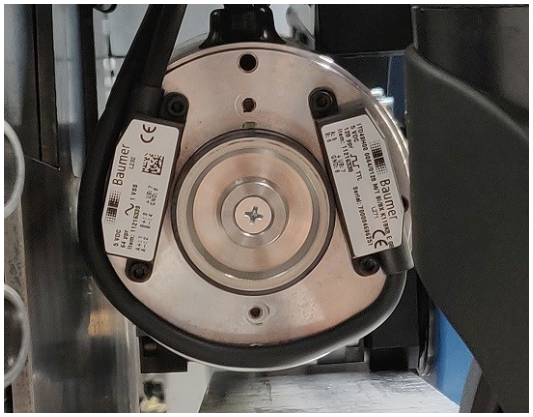
Each motor contains two encoders, so there are four encoders in total that can be faulty. The encoders are located right behind the front caster wheels on both sides of the robot.

2. Use the T20 Torx key to unscrew the two screws located on the encoder cap.

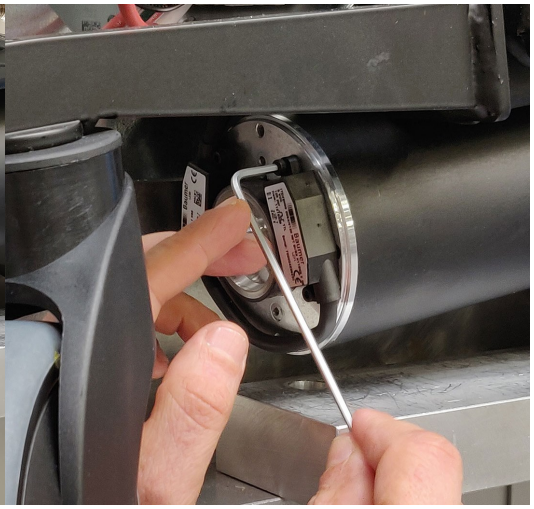


3. Verify that the encoder cables are still intact and positioned correctly so they are not in contact with the magnetic wheel. If the cable is worn down, you must replace the bogie with the faulty cables. See the guide *How to replace the bogie with motor on MiR100/MiR200*.
4. Measure the distance between the encoders and the magnetic disk in the center. Note the measurements down and take a clear photo of the placement of the encoders. Send the measurements and photo to MiR Technical Support for documentation.

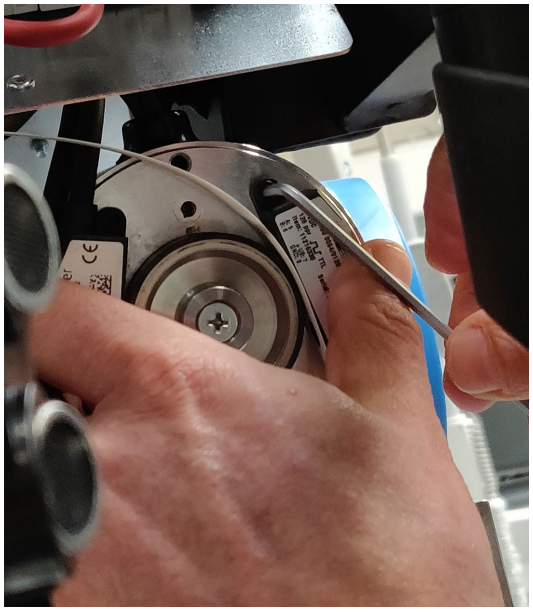
The image below is an example of a well taken photo, where it is clear that the distance between the left encoder and the disk is greater than 0.3 mm.



5. Use hex key 2.5 mm to unscrew the two bolts on one of the encoders. Once the encoder is removed, apply Loctite 2400 threadlocking adhesive or similar adhesive to the encoder mounting holes, and place the encoder back in its original position.

6. Place the 0.3 mm thickness gauge between the encoder and the magnetic disk. Push the encoder with one hand against the gauge, and screw the bolts back in to fix the encoder in place.



7. Repeat steps 5 and 6 with the second encoder, and put the cap back on. Once you have adjusted the second encoder, ensure the encoder cable is placed along the edge of the motor.

   When placing the encoder cap back on the motor, make sure no cables are pinched against the magnetic wheel

8. Apply Loctite to the two screws removed in step 2, and screw them back into the encoder cap to fix it to the motor.
9. Repeat the steps 2 to 7 with the other encoder.
10. Reassemble the robot. Fasten the two side panels back on the robot, plug in the LED cables, connect the battery, and put the top cover back on.
11. Test if the robot can operate without entering Protective stop randomly.

4. Check the crimps, and push any faulty crimps back into place

Before trying to fix any crimps, you can check the connection of each pin in the encoder connectors.

To complete this step, the battery must be connected, and the robot must be turned on.

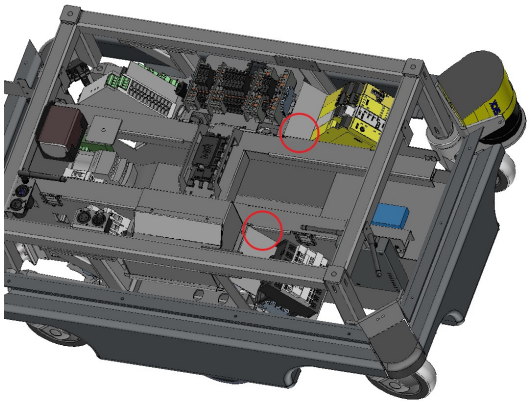
WARNING

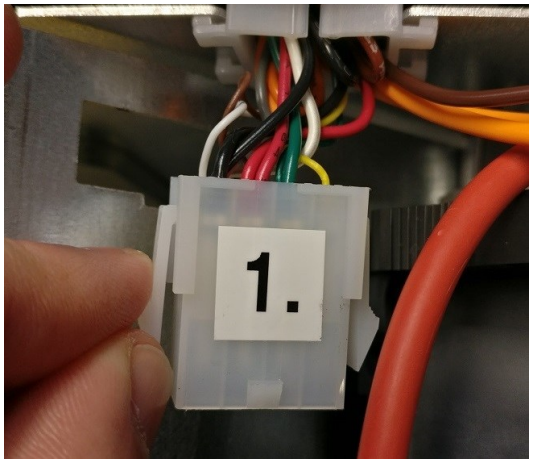
Risk of electrical shock or hands getting caught between actuators.

- Be careful of electrical cables, and avoid inserting your hands between actuators or other moving parts of the robot while completing this step.

The following steps describe how to check the pin connections:

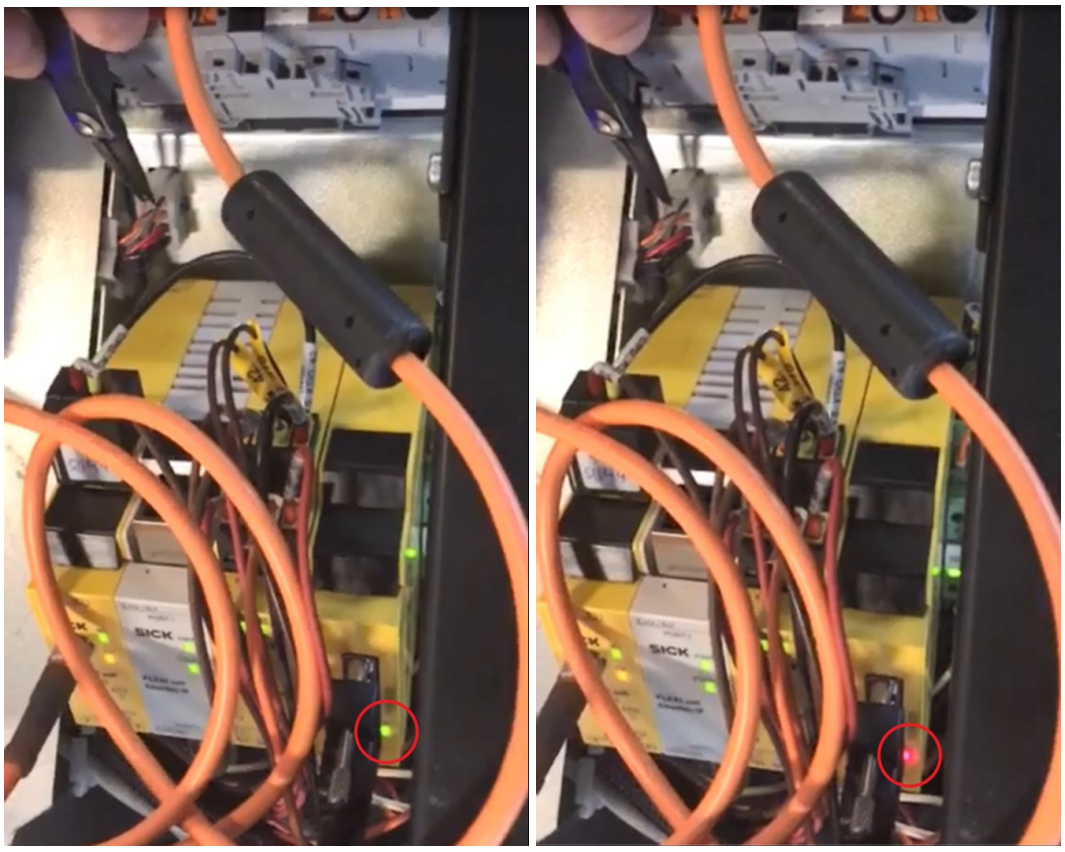
1. Locate the encoder connectors on either side of the robot. They are located at the rear end of the robot. The connectors are either fixed into a cutout in the metal sheet to the bogies or are located within the cable tray. The connectors are large and white and are labeled **1** and **2**.





2. Do not unplug the connector. The image above is intended to be used to identify the connector. If the connector has a black shrink tube, cut it away to access the pins.

3. Check the connection of each wire by gently pulling on each of the wires with a maximum force of 10 N. Avoid pulling harder than necessary, as you may damage the connection. While pulling the wire, check whether the connection is disrupted by watching the diode (circled in the following image) on the motion controller module of the safety PLC. When the diode is red, the encoder is not connected.



4. If any of the wires are not connected securely, note down which of them is faulty.

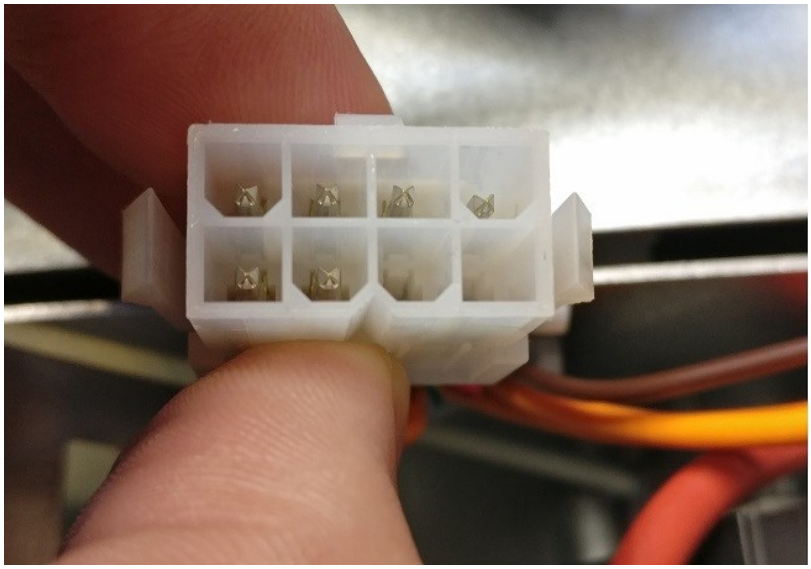
Once you have determined if there are any faulty pin connections, try to visually inspect the crimps where the connection fails and try to fix the crimps by pushing them back into place. The following steps describe how to do so:

WARNING

When you are handling powered internal components, you risk electrical shock and your limbs getting caught between actuators.

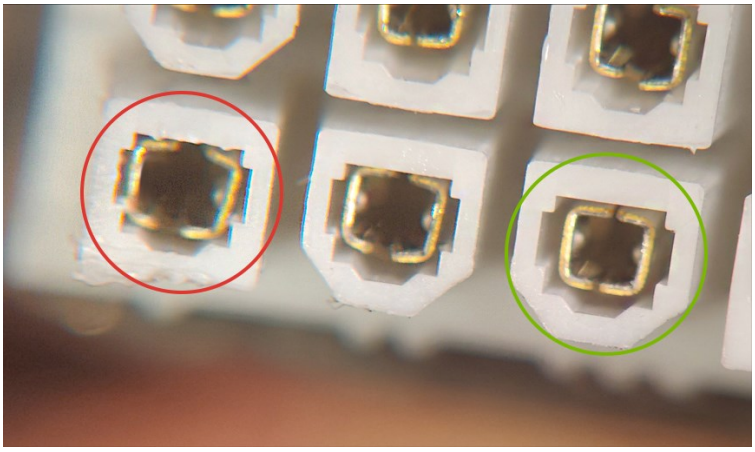
- Disconnect the battery by turning the Battery disconnect switch to Off.

1. Disconnect the encoder connectors gently. Make sure you pull them apart as straight as possible to avoid bending the crimps in the connectors.
2. Inspect the crimps inside the connector of the cable connected to the robot. Check if any of the crimps are loose, bent, or have fallen out of place. For example, in the image below, the crimp to the far right is not aligned with the other crimps.

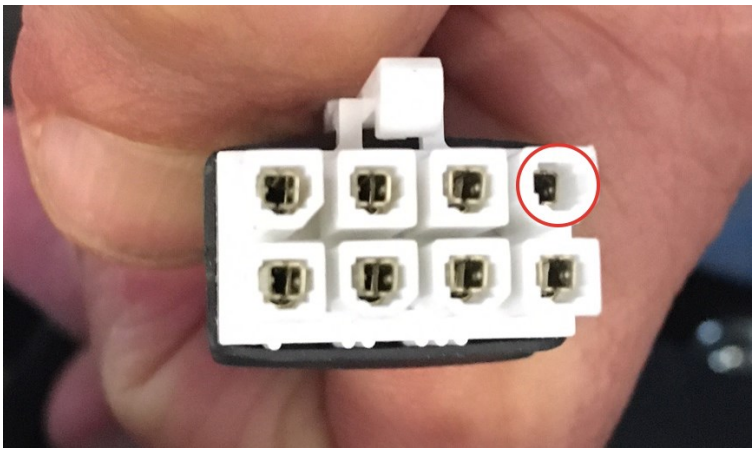


3. Use a small thin tool, such as a screw driver, to try to push the crimp back into place. The crimp should click into place when positioned correctly.

4. Inspect the other connector that is part of the cable connected directly to the motor encoder. There are two main things to look for:
    a. Check if some of the crimps have a larger gap like the crimp circled with red below. If there are any large gaps, try to push the crimps back together again. The crimp circled with green is a well functioning crimp.



    b. Check if some of the crimps have been pushed out of place like the crimp circled in red below. Try to push any misplaced crimps back into place.

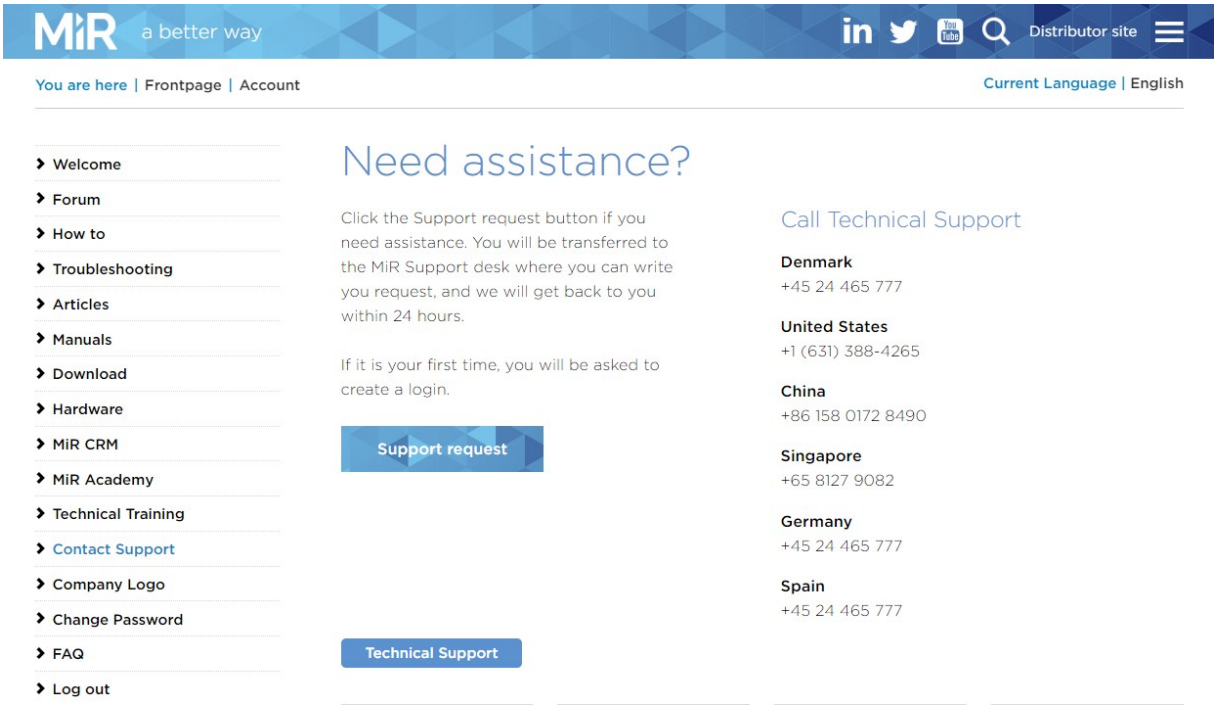


5. After checking all crimps and fixing any faulty ones, reconnect the encoder connectors gently.
6. Reassemble the robot, reconnect the battery, and turn on the robot.
7. Test if the robot can operate without entering Protective stop randomly.

Contacting Technical Support

If you are asked to contact Technical Support in a step or solution in this guide, or if the solution you reach at the end of the guide does not remedy the issue, you can create a support request through the Distributor site under **Contact Support**.

Before creating a support request, it is highly recommended to update to the latest recommended software, as this may resolve the issue. It will also enable your robot to generate a more detailed error log, providing Technical Support with more information to troubleshoot the issue correctly.



In your support request, describe the problem you are experiencing and your observations for each step in the guide you have completed. To document this, download the troubleshooting documentation sheet with the same title as this guide from the Distributor site.

To ensure that Technical Support can diagnose and solve the issue correctly, attach an error log retrieved from the robot. It is important that the error log is generated as described in the guide *How to generate an error log* found on the Distributor site. To assist Technical Support further, include any reported error codes, images, or videos of the issue.

Document history

Version	Date	Description
1.0-1.3	2020-06-16	Undocumented changes.
1.4	2020-06-25	Added that HW versions 3.0 and 5.0 are affected my the issue.
1.5	2020-07-20	Change in structure and added new solutions.