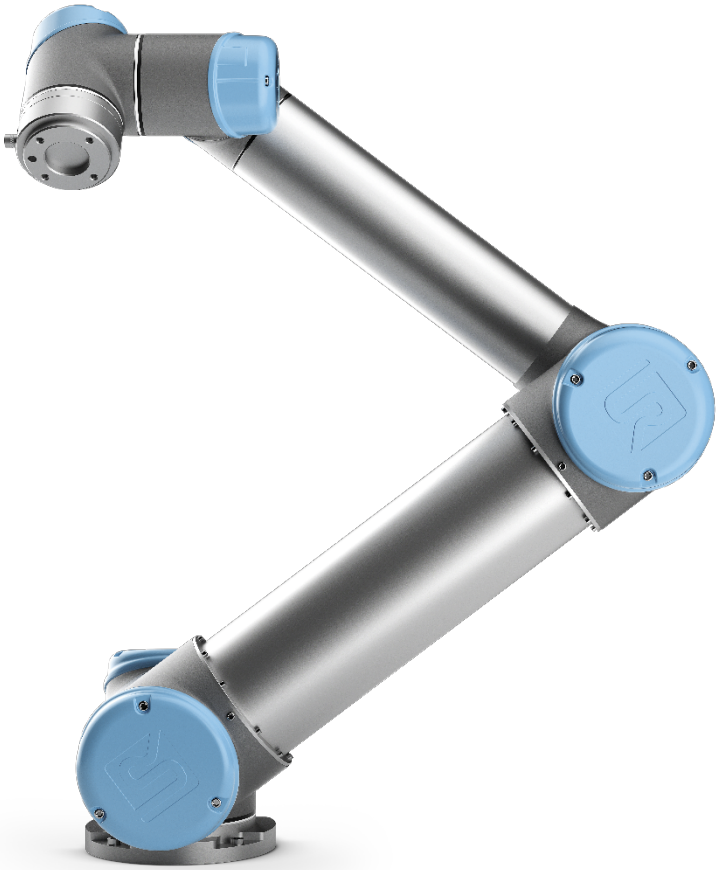
UNIVERSAL ROBOTS



Service Manual

"Original instructions"

Revision:

UR5_en_3.2.7

Robot:

UR5 with CB3.0/3.1/3.2 - controller

CB3.0 valid from robot s/n 2014350001 to 2016351863
CB3.1 valid from robot s/n 2016351864 to 2019351625
CB3.2 valid from robot s/n 2019351626

Valid from robot s/n: **2014350001**

1. Service Manual

2. Content

3. General Information

3.1. Purpose

The main purpose of this manual is to help the user safely perform service-related operations and troubleshooting.

Universal Robots industrial robots are designed using high quality components to ensure a long lifetime.

However, any improper use of robot can potentially cause failures. If for example, the robot is overloaded, run with a load not recommended by Universal Robots, dropped during relocation, damaged by collision or any other improper usage, the warranty will be void.

Universal Robots recommends that the user does not attempt repair, adjustment or other intervention in the mechanical or electrical systems of the robot without first consulting a UR certified service engineer. Any unauthorized intervention will void the warranty. Service-related operations and troubleshooting should only be performed by qualified personnel.

Before performing service-related operations, always make sure to stop the robot program and disconnect the main power to any potential dangerous tool on the robot or in the work cell.

In the event of a defect, Universal Robots recommends ordering new parts from the Universal Robot distributor where the robot was purchased from.

Alternatively, parts can be ordered from the nearest distributor, details of which can be obtained from Universal Robots official website at www.universal-robots.com

3.2. Company Details

Universal Robots A/S

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DK-5260 Odense Denmark

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3.3. Disclaimer

Universal Robots continues to improve reliability and performance of its products, and therefore reserves the right to upgrade the product without prior warning. Universal Robots takes every care that the contents of this manual are precise and correct, but takes no responsibility for any errors or missing information.

3.4. Warning Symbols in this Manual

DANGER, WARNING, CAUTION, NOTICE and SAFETY INSTRUCTION statements are used throughout this manual to emphasize important and critical information.
You MUST read these statements to help ensure safety and to prevent product damage.

The statements are defined below.

DANGER

These warnings mean a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

These warnings mean a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

These warnings mean a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

These warnings mean damage to property may occur if no precautions are taken.

CAUTION

This warning sign contain references to safety-relevant information or general safety measures.
This warning sign do not refer to individual hazards or individual precautionary measures.

4. Recommended Inspection Activities

> It is recommended to perform preventive maintenance on the control box and robot at least once per year. In case of use in dirty or dusty environments it is recommended to increase the frequency.

In case dust/dirt/oil is observed on the controller or robot arm, it can be wiped away using a cloth with cleaning agent. Cleaning agent: Water, Isopropyl alcohol, 10% Ethanol alcohol or 10% Naphtha.
In very rare cases, very small amounts of grease can seep from the joint. This does not affect the specified function or lifetime of the joint.

> **NOTICE**
>
> Never use compressed air to clean the controller or robot arm as it can damage the seals and internal components

4.1. Controller

4.1.1. Inspection Plan

Set forth below is a check list of inspections that Universal Robots recommends be performed according to the marked time interval. If upon inspection, the referenced parts are not in an acceptable state, please rectify immediately.

Use the following sections as guide: 2.1.2 Safety Functional 2.1.3 Visual Inspection 3.2 Control Box		Monthly	Bi-annually	Annually
Check Emergency stop on Teach Pendant	F	X		
Check Backdrive mode	F	X		
Check Freedrive mode	F		X	
Check safety inputs and outputs (if connected)	F	X		
Check Teach Pendant cable	V		X	
Check and clean air filters on Control Box	V	X		
Check terminals in Control Box	F		X	
Check electrical grounding 1< Ω to Control Box	F			X
Check main power to Control Box	F			X

V = Visual inspection F = Functional inspection

4.1.2. Safety Functions

The robot safety functions must be tested at least once a year to ensure correct function. The following tests must be performed.

- Backup data from the storage device - See section 4.4 Backup of data
- Test that the Emergency Stop button on the Teach Pendant functions:
  - Press the Emergency Stop button on the Teach Pendant.
  - Observe that the robot stops and turns off the power to the joints.
  - Power on robot again.
- Test Freedrive mode:
  - Unmount attachment or set TCP/Payload/CoG according to tool specifications.
  - Set the robot in Free drive mode by holding the black Freedrive button on the back of the Teach Pendant.
  - Move the robot to a position stretched out horizontally to the edge of its workspace.
  - Monitor that the robot maintains its position unsupported while the Freedrive button is still pressed.
- Test Backdrive mode:
  If the robot is close to collision, the BACKDRIVE function can be used to move the robot to a safe position before initializing.
  - Press ON to enable power, state will change to Idle.
  - Press and hold Freedrive -> status will change to BACKDRIVE.
  - Move the robot by hand as in Freedrive.

    - In BACKDRIVE mode brakes will only be released on individual joints when they are moved, and will remain released as long as the Freedrive button is pushed. Robot will be “heavy” to move around compared to Freedrive mode.
    - Be sure to test each joint individually, to ensure the brake release as expected.
- Verify safety settings:
    - Verify that the safety settings of the robot comply with the Risk Assessment of the robot installation.
- Test that additional safety inputs and outputs are still functioning:
    - Check which safety inputs and outputs are active and test that they can be triggered.

4.1.3. Visual Inspection

- Disconnect power cable from controller
- Check that the terminals on the Safety Control Board are properly inserted and do not have loose wires
- Check all connections on Motherboard and connection between Safety Control Board and Motherboard
- Check for any dirt/dust inside of controller, clean with ESD vacuum cleaner if needed

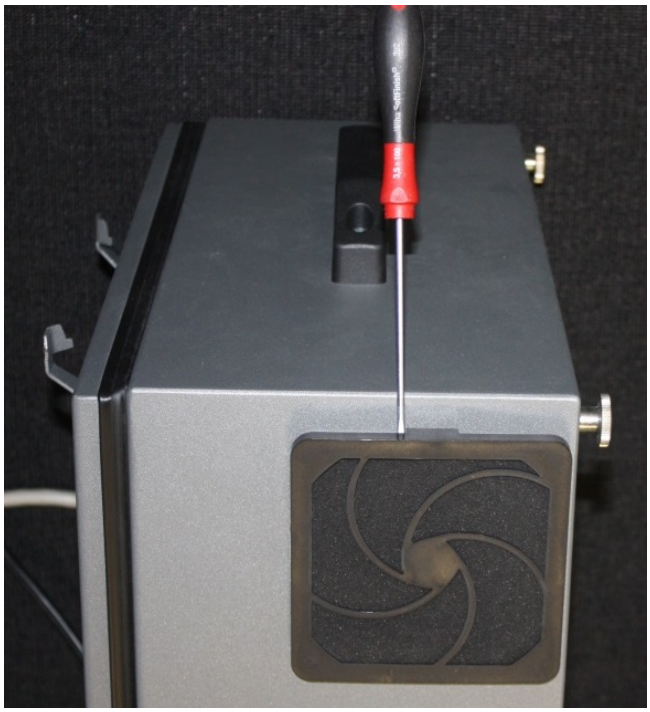
> **NOTICE**
>
> Never use compressed air to clean inside the controller as it can damage componentss

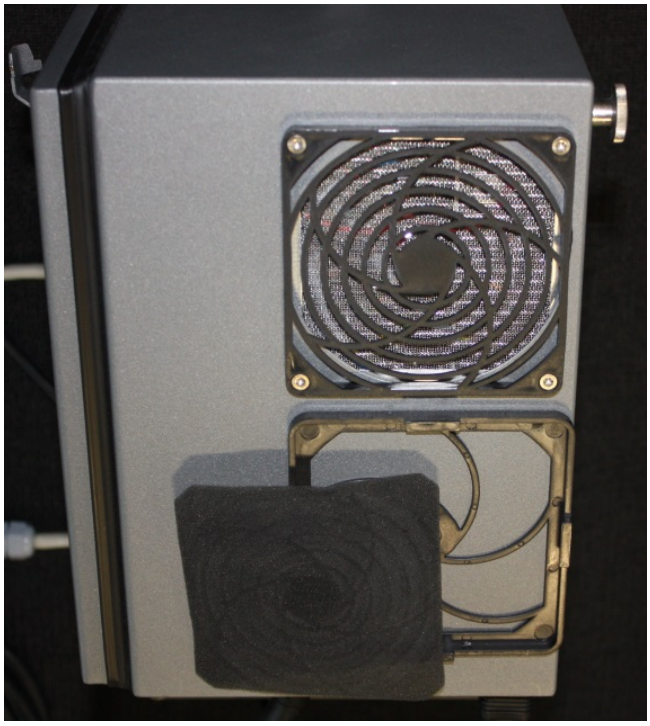
4.1.4. Cleaning and Replacement of Filters

Original control box

- Controller box has two filters, one mounted on each side of the box.

- Remove filters from controller box and clean them thoroughly using low pressure air.
  - Replace filters if necessary.
  - Gently remove the outer plastic frame and maintain the filter.

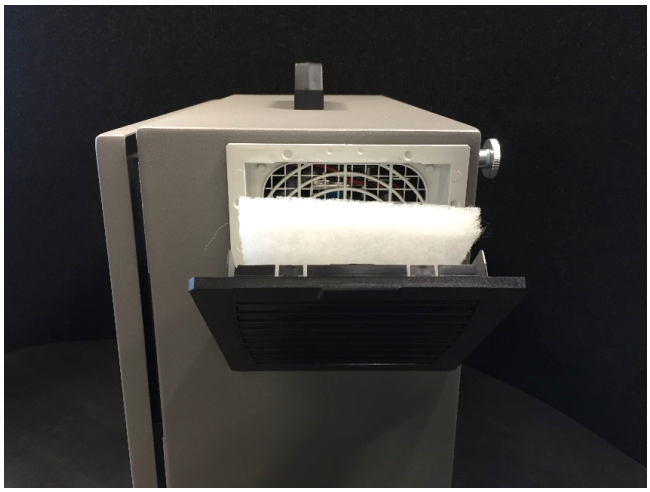




Merge Control Box

- Controller box has two filters, one mounted on each side of the box.

- Remove filters from controller box and clean them thoroughly using low pressure air.
- Replace filters if necessary.
- Gently remove the outer plastic frame and maintain the filter.



Cleaning the Robot in Relation to COVID

You can wipe away any dust/dirt/oil observed on the robot arm using a cloth and one of the following cleaning agents: Water, Isopropyl alcohol, 10% Ethanol alcohol or 10% Naphtha. In rare cases, very small amounts of grease can be visible from the joint. This does not affect the function, use, or lifetime of the joint.

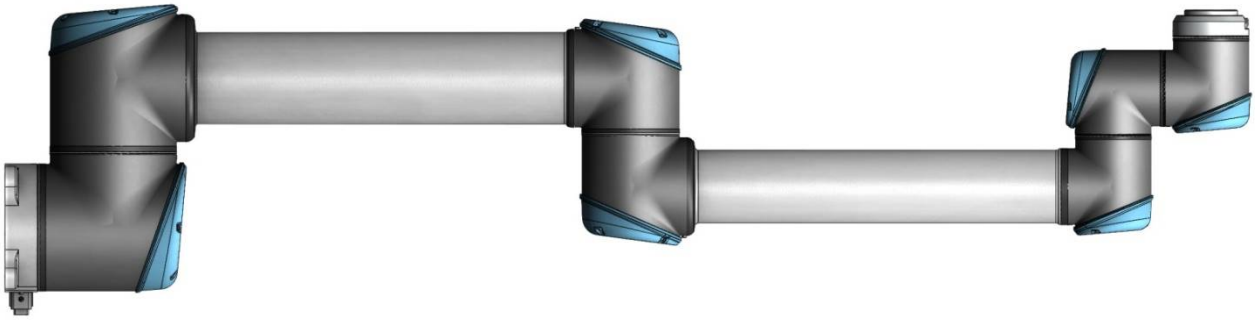
Due to the added focus on cleaning your robot, Universal Robots recommends cleaning with 70% isopropyl alcohol (rubbing alcohol).

1. Wipe the robot with a hard twisted micro fiber cloth and 70% isopropyl alcohol (rubbing alcohol).
2. Let the 70% isopropyl alcohol dwell on the robot for 5 minutes, and then clean the robot using standard cleaning procedure.

DO NOT USE BLEACH. Do not use bleach in any diluted cleaning solution.

> **NOTE**
> The above standard cleaning recommendation is still valid with the addition of the COVID-19 cleaning recommendation.

4.2. Robot Arm



4.2.1. Inspection plan

Set forth below is a check list of inspections that Universal Robots recommends be performed according to the marked time interval. If upon inspection, the referenced parts are not in an acceptable state, please rectify immediately.

Use the following sections as guide:			
2.2.2 Visual Inspection	Monthly	Semi-annually	Annually
3.1 Robot Arm			
Check blue lids*	V		X
Check blue lid screws	F		X
Check flat rings	V		X
Check robot cable	V		X
Check robot cable connection	V		X
Check Robot Arm mounting bolts*	F	X	
Check Tool mounting bolts*	F	X	
Check screws/bolts that is connecting joints*	F		X

V = Visual inspection F = Functional inspection * = Must also be checked after heavy collision

4.2.2. Inspection Plan

Set forth below is a check list of inspections that Universal Robots recommends be performed according to the marked time interval. If upon inspection, the referenced parts are not in an acceptable state, please rectify immediately.

Use the following sections as guide: 2.2.2 Visual Inspection 3.1 Robot Arm		Monthly	Bi-annually	Annually
Check blue lids*	V		X	
Check blue lid screws	F		X	
Check flat rings	V		X	
Check robot cable	V		X	
Check robot cable connection	V		X	
Check Robot Arm mounting bolts*	F	X		
Check Tool mounting bolts*	F	X		
Check screws/bolts that is connecting joints*	F		X	

V = Visual inspection F = Functional inspection * = Must also be checked after heavy collision

4.2.3. Functional Inspection

The purpose of the functional inspection is to ensure that screws, bolts, tools and robot arm are not loose. The screws/bolts mentioned in the inspection plan should be checked with a torque wrench with the correct torque, specified in 5.2.5. Torque Values on page 23

For the robot arm mounting bolts, these specifications can be found in the User Manual under the Mounting section.

4.2.4. Visual Inspection

> **NOTICE**
>
> Never use compressed air to clean the robot as it can damage the seals and internal components

- Move robot arm to HOME position (if possible).
- Turn off and disconnect power cable from controller.
- Inspect cable between controller and robot arm for any damage.
- Inspect flat rings for wear and damage.
  - Replace flat rings if worn out or damaged.
- Inspect blue lids on all joints for any cracks or damage.

    - Replace blue lids if cracked or damaged.
- Inspect that screws for blue lids are in place and properly tightened.
    - Replace screws, tighten properly if necessary.
    - Correct torque value for screws on blue lids are 0.4Nm.

If any damage is observed on a robot within the warranty period, contact the distributor from which the robot has been purchased.

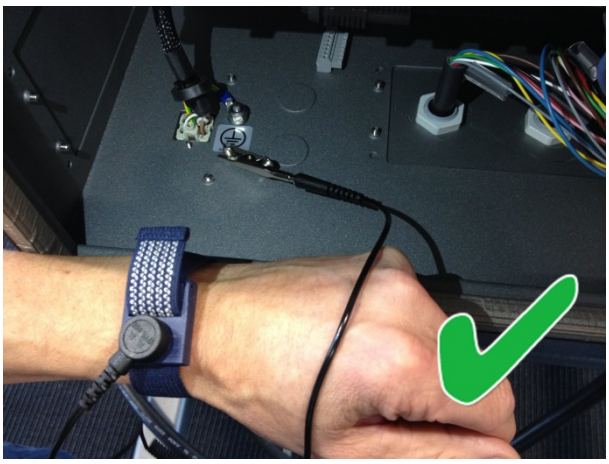
5. Service and Replacement of parts

5.1. Handling ESD Sensitive Parts

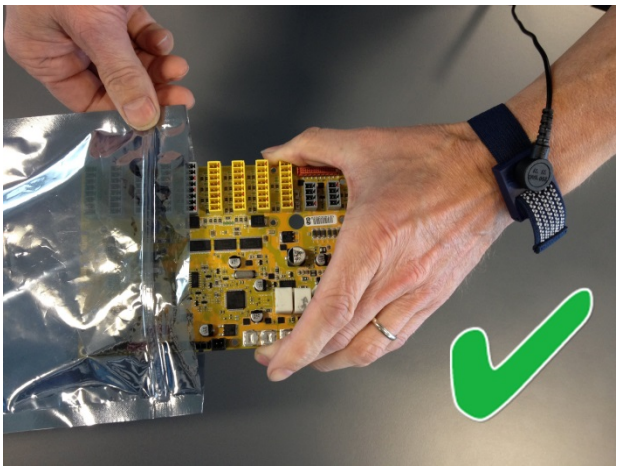
To prevent damage to ESD-sensitive parts, follow the instructions below. These are in addition to standard precautions such as turning off power before removing circuit boards.

Keep the ESD-sensitive part in its original shipping container. (a special "ESD bag") until the part is ready to be installed.

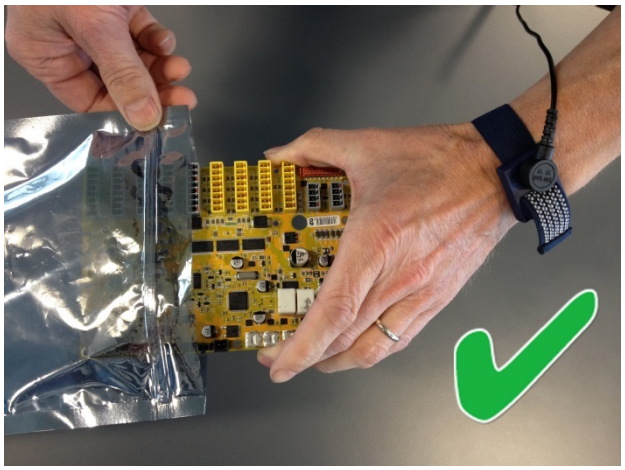
Put the ESD wrist strap on your wrist. Connect the wrist band to the system ground point. This discharges any static electricity in your body to ground.



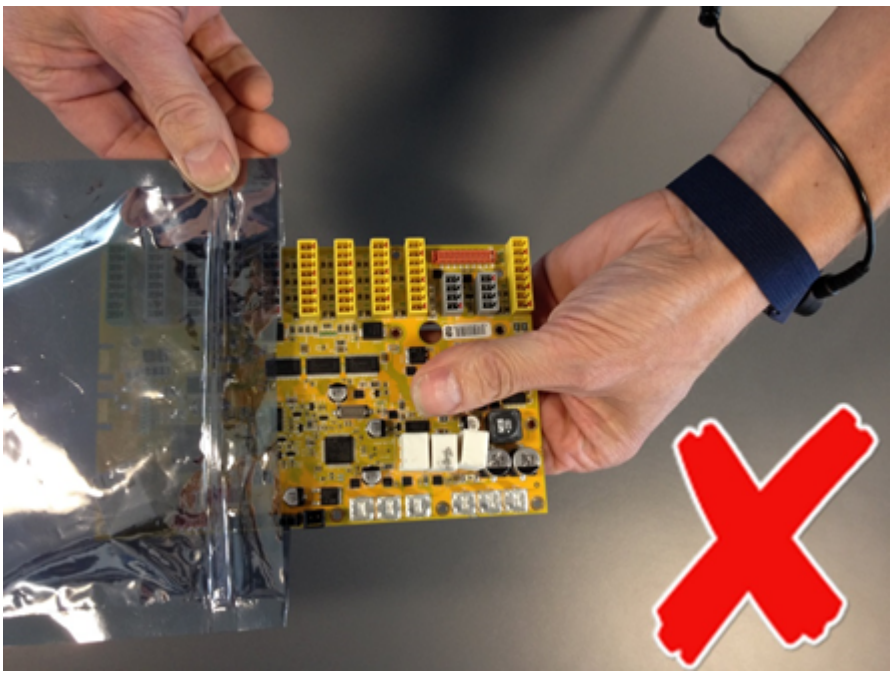
Step 1:
Put OLD board into spare ESD bag.



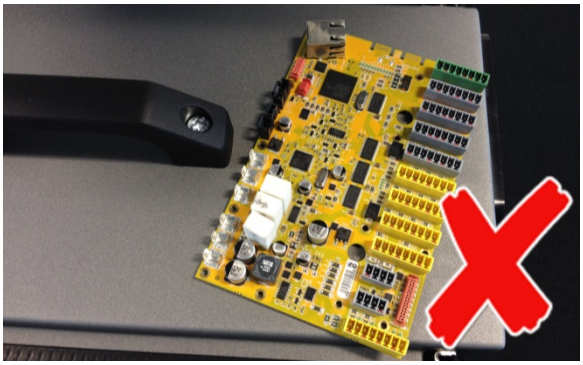
Step 2:
Take NEW board out of ESD bag.



Hold the ESD-sensitive part by its edges. **Do not touch its pins!**

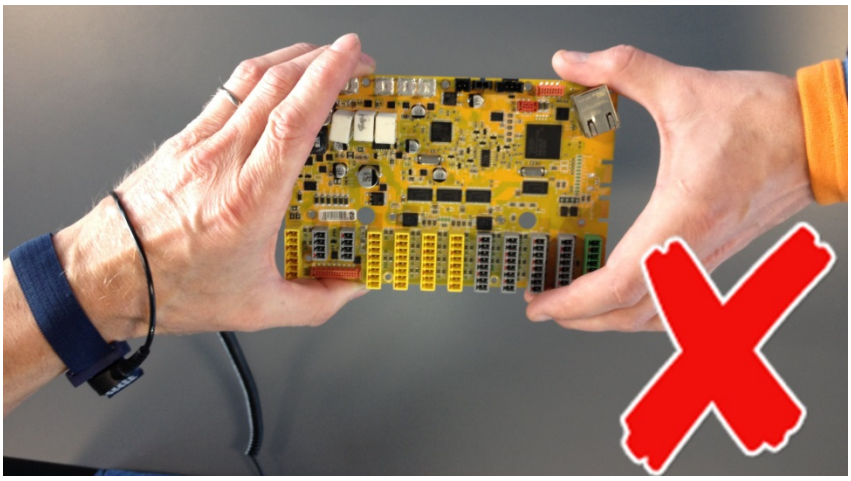


Do not place the ESD-sensitive part on nonconductive material or on a metal table. If the ESD-sensitive part needs to be put down for any reason, then first put it into its special ESD bag



Machine covers and metal tables are electrical grounds.They increase the risk of damage, because they make a discharge path from your body through the ESD-sensitive part.

(Large metal objects can be discharge paths without being grounded.)



Prevent ESD-sensitive parts from being accidentally touched by other personnel and do not put unprotected ESD-sensitive parts on a table.

Be extra careful in working with ESD-sensitive parts when cold-weather and heating is used, because low humidity increases static electricity.

5.1.1. Recommended Tools

Robot arm:

- Service kit – part no.: 109010.

Control box:

Below tool should be ESD safe tools.

Slotted screwdriver

- 0.5 (For terminals on Current Distributor)

Philips screwdriver

- PH2 (For terminals on power supplies)

Torx screwdriver

- TX10 (For external connections i.e. main power connection)
- TX20 (For shield in front of PCB's)
- TX45 (For Control box handle)

Hex screwdriver

- Size 4 (For Safety Control Board and Motherboard)

Spanner

- Size 7 (for energy eater)

Socket screwdriver

- Size 10 (For component bracket and grounding nuts)
- Bit extinction (To access nuts that are hard to reach)

Other

- Flathead Plier (for removing terminals on Safety Control Board and Current Distributor)

5.2. Robot Arm

5.2.1. Before returning any part to Universal Robots

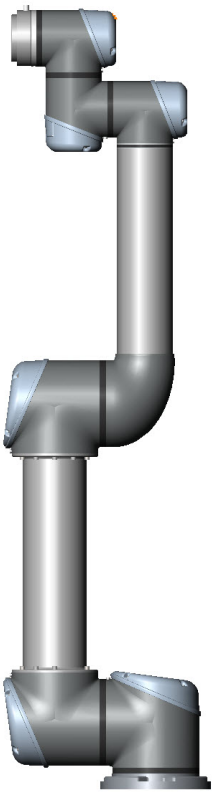
- Remove all external non-UR equipment such as grippers, hoses, cables and so on. Universal Robots cannot be held responsible for damage caused to non-UR equipment mounted on the robot.
- Backup all relevant files before sending the robot/part to UR. Universal Robots cannot be held responsible for loss of programs, data or files stored in the robot.

> **NOTICE**
>
> If the robot/part has been in contact with, or working in environments, where dangerous chemicals or materials are present, the robot must be cleaned before shipment. If this is not possible, the shipment must be accompanied by an MSDA (Material Safety Data Sheet) in English and instructions for cleaning the chemicals. The amount of labor hours needed for cleaning will be billed at the standard rate.
> If UR finds the robot/part unsafe to service, UR reserve the right to get the robot/part cleaned or decline the case and send the part back, at customers expense.

Note: Please note that the robot will be updated to newest software/firmware when repaired. New parts will also be updated to newest version (hardware/software). Therefore, updating PolyScope may be necessary when new parts are mounted.

- You will find packing down procedure in section - Packing of robot

5.2.2. Robot Arm Configuration

Tool flange		Tool flange – Wrist 3 joint
Size 1		Wrist 3 joint – Wrist 2 joint
Size 1		Wrist 2 joint – Wrist 1 joint
Size 1		Wrist 1 joint – Lower arm
Elbow		Elbow counterpart – Elbow joint
Size 3		Elbow joint – Upper arm
Size 3		Upper arm – Shoulder joint
Size 3		Shoulder joint – Base joint
Base		Base Joint – Base Mounting Bracket

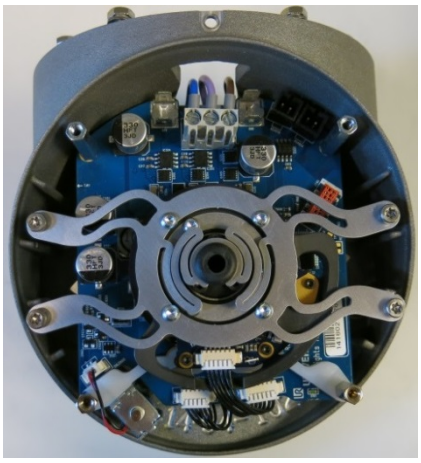
5.2.3. Brake Release

If required, the brake on a joint can be released without power connected.

> **CAUTION**
> Before releasing a brake, it is extremely important to dismount any dangerous parts to avoid any hazardous situations.
> If releasing the brake on Base joint, Shoulder joint or Elbow joint, it is important to make proper mechanical support prior to releasing the brake.
> Always make sure personnel are in no risk when releasing the brake.
> Do not move the joint more than is necessary. Not more than 160 degrees to ensure the robot can find its original physical position.

Procedure for releasing the joint

1. Shut down Controller.
2. Remove blue lid on joint.
3. Push brake pin down to release, joint can then be rotated.



Brake on Base, Shoulder and Elbow joints

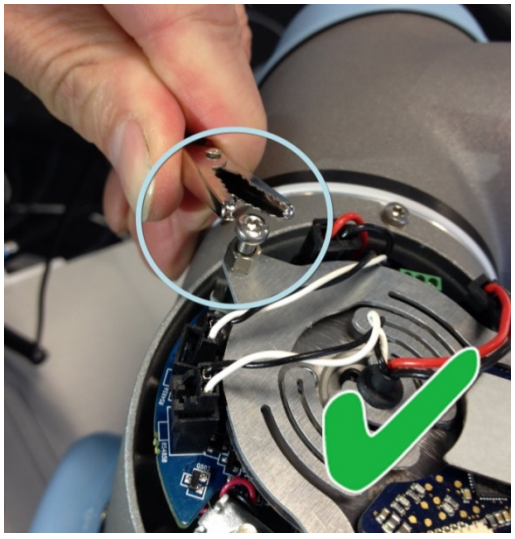
Brake on Wrist joints

4. Make sure to replace blue lid onto joint correctly and fasten screws before turning on Controller.
5. Correct torque value for screws on blue lids are 0.4Nm

5.2.4. General Guidance to Separate Joint from Counterpart

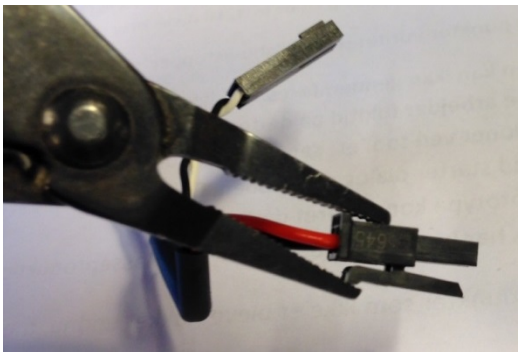
Disassemble

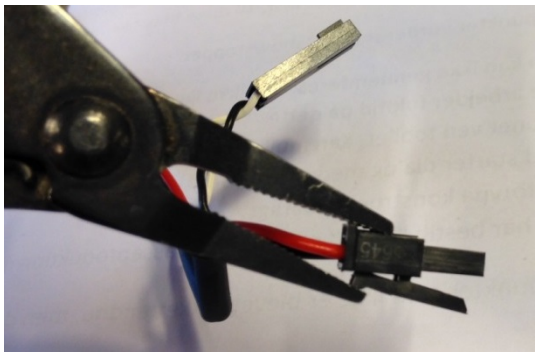
1. Ensure that the necessary tools and documentation are available before starting the repair.
    1. Service kit with torque tools, ESD Wristband, etc.
    2. Thoroughly read and understand this guide.
2. Move the robot to a comfortable position for disassembly or if necessary dismount entire robot arm from work cell and place on a solid surface.
3. Shut down the controller.
4. Remove blue lid.
5. Reattach one of the screws from the blue lids, and connect the Alligator Clip from the ESD wristband to it, as shown below.



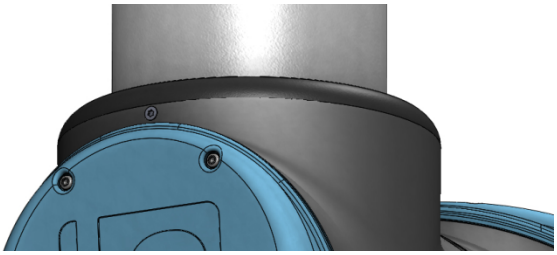
6. Gently unplug the cable connectors without bending the printed circuit board.

   Some connectors have a lock that must be engaged before it is pulled out of the printed circuit board. Example below.

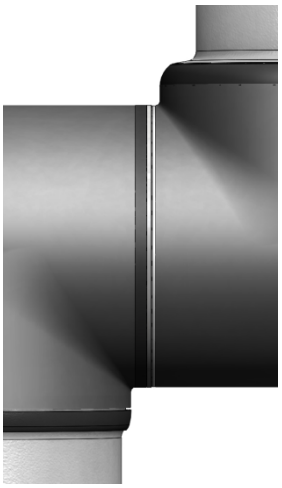




7. Disconnect wires.
8. Remove alignment screw (Not present on newer joint housings).



9. Gently remove black flexible flat ring with a small flathead screwdriver or similar tool and pull it back over joint housing away from its original position.



10. Slide the grey Teflon ring back.
    10 screws become visible, 5 on each side of joint.
    Loosen the screws with an open-ended spanner approximately two full turns each.
11. Pull the two parts apart and gently twist them counter-clockwise around 5 degrees, until a mechanical stop is met (holes are keyhole-type). They can then be completely separated.

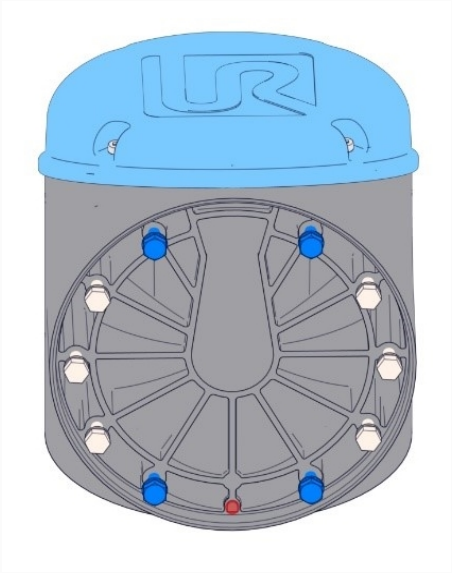
Assemble:

After replacing a joint do as follows to assemble the robot arm.

1. Gently insert a screw with washer into each of the ten threaded holes in the joint housing (the joint will most likely have these already inserted).

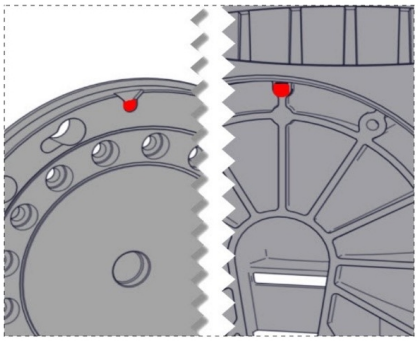
CAUTION

It's important that the correct screws are placed in the correct hole.
The blue marked screws are shorter than the rest.

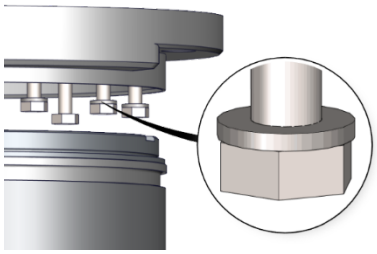


CAUTION

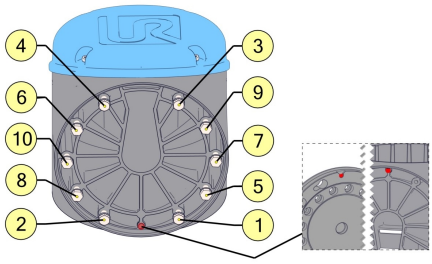
Ensure the alignment taps are aligned before assembly. If the taps are opposite each other (180 degree offset), the joints cannot be merged properly and there is a risk the joint will loosen itself over time.



2. Make sure all washers are flush against the head of the bolt (this is important) before gently twisting the parts clockwise roughly 5 degrees until a mechanical stop is met.



3. Gently tighten the screws, until they are almost in the correct position then tighten in cross order (as shown in the numbered diagram below).
   ALWAYS start with the screws at the alignment tap.
   Tighten with the correct torque, to ensure that that the two faces are parallel.
   See Torque values for more information.



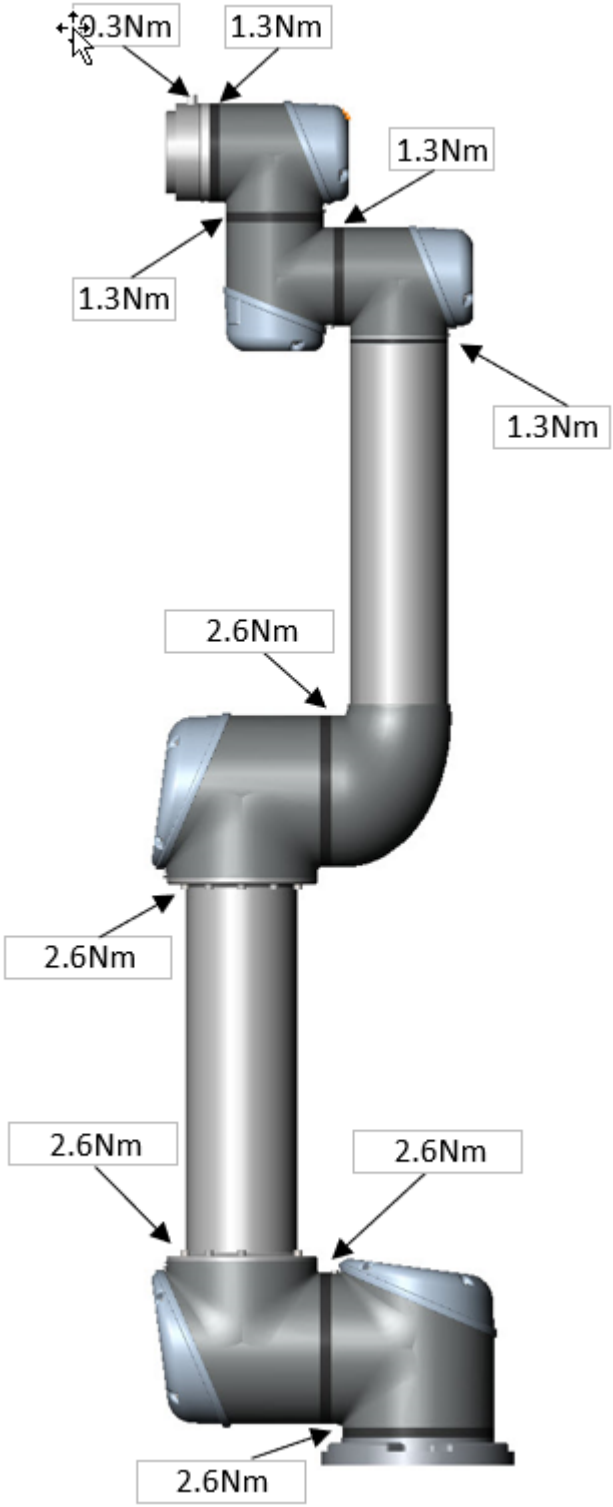
4. Slide the grey Teflon ring into place and gently put the flat ring back on top of the Teflon ring.

5. Mount the alignment screw (if present) and tighten with **0.4Nm.**
6. **Twist the communication cable** 1.5 to 2 full rounds before connecting to reduce electrical noise in the system.
7. Mount the blue lid on the joint and tighten with **0.4Nm.**
8. Proceed to chapter Dual Robot Calibration for calibrating the robot.

5.2.5. Torque Values

UR5 torque values			
CONNECTION		TORQUE	HEAD SIZE
Base mounting bracket	J0 Base	2.6Nm	7 mm.
[J0] Base	[J1] Shoulder	2.6Nm	7 mm.
[J1] Shoulder	Upper arm	2.6Nm	Hex key 3
Upper arm	[J2] Elbow	2.6Nm	Hex key 3
[J2] Elbow	Lower arm	2.6Nm	7 mm.
Lower arm	[J3] Wrist 1	1.3Nm	5.5 mm.
[J3] Wrist 1	[J4] Wrist 2	1.3Nm	5.5 mm.
[J4] Wrist 2	[J5] Wrist 3	1.3Nm	5.5 mm.
[J5] Wrist 3	Tool m. bracket	1.3Nm	5.5 mm.
Alignment screw		0.4Nm	Torx T10
Blue lid		0.4Nm	Torx T10
Tool connector		0.3Nm	Finger/hand

Attention: **Click the torque tools 3 times before using** to ensure the correct calibrated torque.



5.2.6. Base Joint – Base Mounting Bracket

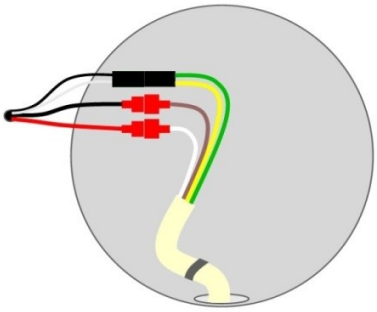
Disassemble

For details and photos please see: General Guidance to Separate Joint from Counterpart

1. Shut down the controller.
2. Remove alignment screw.
3. Gently remove black flexible flat ring with a tiny screwdriver or similar tool and twist it around the joint housing.
4. Slide the grey Teflon ring back. 10 screws become visible, 5 on each side of joint. Loosen the screws with a 7 mm. open-ended spanner about two full turns, approximately 3 mm. for each screw.
5. Pull the base plate and Base joint apart and gently twist the two parts in opposite directions around 10 mm. until a mechanical stop is met (holes are keyhole-type).

For details and photos please see: General Guidance to Separate Joint from Counterpart

1. Replace base plate and reconnect wires according to illustration:

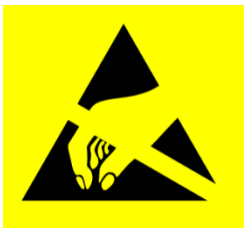


2. **Twist the communication cable** 1.5 to 2 full rounds before it is connected to reduce electrical noise in the system.
3. Gently insert base plate with screws and washers into the Base joint.
4. Make sure the washers are fully inserted and flush against the head of the bolt (this is important) before gently twisting the parts in opposite directions until a mechanical stop is met.
5. Gently tighten the 10 screws, and then tighten **in cross order with 2.6Nm**.
6. Slide the grey Teflon ring into place and gently put the flat ring back on top of the Teflon ring.
7. Mount the alignment screw and tighten with **0.4Nm.**
8. Mount blue lid on Base joint and tighten with **0.4Nm.**
9. Proceed to chapter Dual Robot Calibration for calibrating the robot.

5.2.7. Shoulder joint – Base joint

Disassemble

For details and photos please see: General Guidance to Separate Joint from Counterpart



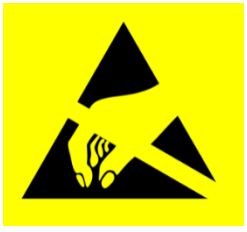
1. Shut down the controller.
2. Remove blue lid on Base joint.
3. Connect ESD wristband
4. Disconnect wires between base plate and Base joint.

1 x red wire	=	48V DC
1 x black wire	=	GND
Black connector	=	bus cable (note connector orientation)

5. Remove alignment screw
6. Gently remove black flexible flat ring between Base and Shoulder with a tiny screwdriver or similar tool and twist it around the joint housing.
7. Slide the grey Teflon ring back. 10 screws become visible, 5 on each side of joint. Loosen the screws with a 7 mm. open-ended spanner about two full turns, approximately 3 mm. for each screw.
8. Pull the Base joint and Shoulder joint apart and gently twist the two parts in opposite directions around 10 mm. until a mechanical stop is met (holes are keyhole-type).
9. Pull away the Base joint from Shoulder joint.

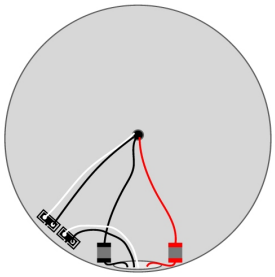
Assemble

For details and photos please see: General Guidance to Separate Joint from Counterpart



1. Gently insert Base joint with screws and washers into the Shoulder joint.
2. Make sure the washers are fully inserted and flush against the head of the bolt (this is important) before gently twisting the parts in opposite directions until a mechanical stop is met.
3. Tighten the 10 screws lightly, and then tighten **in cross order with 2.6Nm.**
4. Slide the grey Teflon ring in place and gently put back the flat ring on top of the Teflon ring.
5. Mount the alignment screw and tighten with **0.4Nm.**
6. Connect ESD wristband

7. Reconnect connectors as illustrated.
8. **Twist the communication cable** 1.5 to 2 full rounds before it is connected to reduce electrical noise in the system)



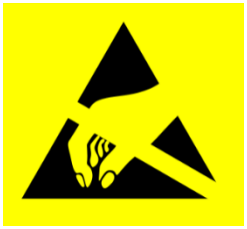
9. Mount blue lid on Base joint and tighten with **0.4Nm.**

Proceed to chapter Dual Robot Calibration for calibrating the robot.

5.2.8. Upper arm – Shoulder joint

Disassemble

For details and photos please see: General Guidance to Separate Joint from Counterpart

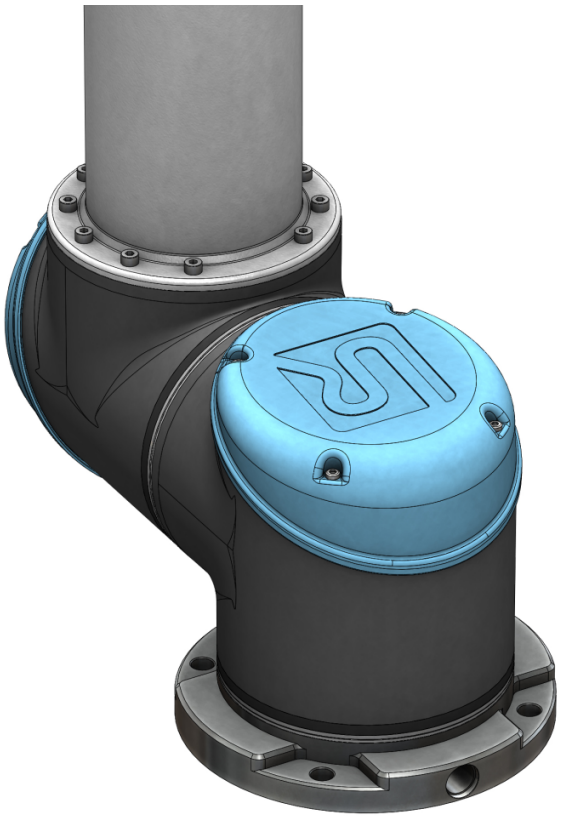


1. Shut down the controller.
2. Remove blue lid on Shoulder joint.
3. Connect ESD wristband
4. Disconnect wires between base plate and Base joint.

1 x red wire	=	48V DC
1 x black wire	=	GND
Black connector	=	bus cable (note connector orientation)

5. Remove alignment screw

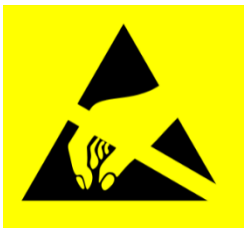
6. Unmount screws around the upper arm as indicated on the illustration:



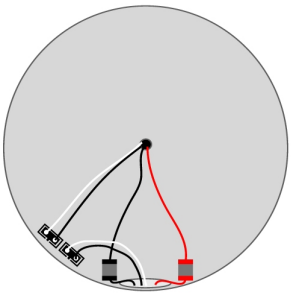
7. Pull away the Shoulder joint from upper arm.

Assemble

For details and photos please see: General Guidance to Separate Joint from Counterpart



1. Gently assembly the Shoulder joint with upper arm end mount screws into shoulder joint.
2. Tighten the 10 screws lightly, and then tighten in cross order with 2.6Nm.
3. Mount the alignment screw and tighten with 0.4Nm.
4. Connect ESD wristband
5. Reconnect wires correctly.
6. Twist the communication cable 1.5 to 2 full rounds before it is connected. (To reduce electrical noise in the system)



7. Mount blue lid on Shoulder joint and tighten with 0.4Nm.
8. Proceed to chapter Dual Robot Calibration for calibrating the robot.

5.2.9. Elbow joint – Upper arm

Disassemble and assemble

Procedure for separating Elbow joint from Upper arm is similar to separation of Upper arm and Shoulder joint, consult chapter Upper arm – Shoulder joint

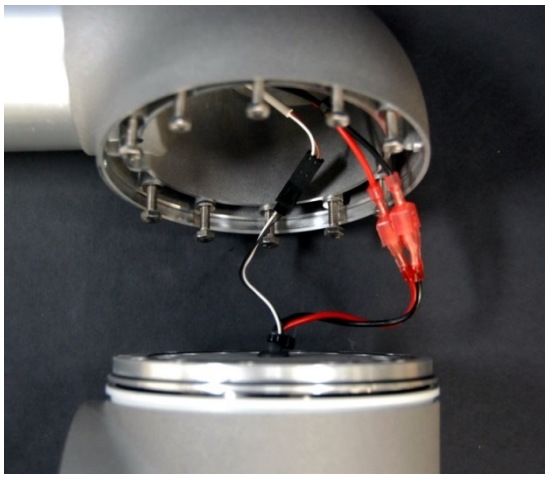
5.2.10. Elbow counterpart – Elbow joint

Disassemble

For details and photos please see: General Guidance to Separate Joint from Counterpart

1. Shut down the controller.
2. Remove alignment screw.
3. Gently remove black flexible flat ring between Elbow and Elbow counterpart with a tiny screwdriver or similar tool and twist it around the joint housing.
4. Slide the grey Teflon ring back. 10 screws become visible, 5 on each side of joint. Loosen the screws with a 7 mm. open-ended spanner about two full turns, approximately 3 mm. for each screw.
5. Pull Elbow joint and Elbow counterpart apart and gently twist the two parts in opposite directions around 10 mm. until a mechanical stop is met (holes are keyhole-type).
6. Pull away the Elbow joint from Elbow counterpart.
7. Disconnect wires between base plate and Base joint.

1 x red wire	=	48V DC
1 x black wire	=	GND
Black connector	=	bus cable (note connector orientation)



Assemble

For details and photos please see: General Guidance to Separate Joint from Counterpart

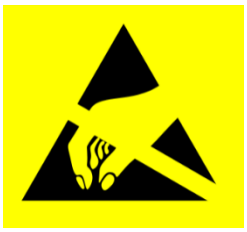
1. Reconnect connectors
2. **Twist the communication cable** 1.5 to 2 full rounds before it is connected to reduce electrical noise in the system.

3. Gently insert Elbow joint with screws and washers into the Elbow counterpart.
4. Make sure the washers are fully inserted and flush against the head of the bolt (this is important) before gently twisting the parts in opposite directions until a mechanical stop is met.
5. Tighten the 10 screws lightly, and then **tighten in cross order with 2.6Nm.**
6. Slide the grey Teflon ring in place and gently put back the flat ring on top of the Teflon ring.
7. Mount the alignment screw and tighten with **0.4Nm**.
8. Proceed to chapter Dual Robot Calibration for calibrating the robot.

5.2.11. Wrist 1 joint – Lower arm

Disassemble

For details and photos please see: General Guidance to Separate Joint from Counterpart



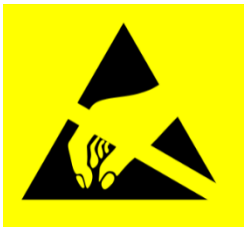
1. Shut down the controller.
2. Remove blue lid on Wrist 1 joint.
3. Connect ESD wristband
4. Disconnect wires between lower arm and Wrist 1 joint.

1 x red wire	=	48V DC
1 x black wire	=	GND
Black connector	=	bus cable (note connector orientation)

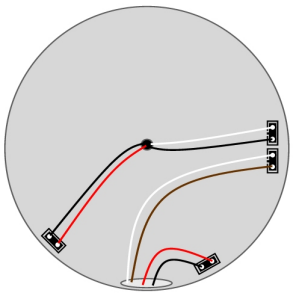
5. Remove alignment screw
6. Gently remove black flexible gasket between lower arm and Wrist 1 joint with a tiny screwdriver or similar tool and twist it around the lower arm.
7. 8 screws become visible, 4 on each side of joint. Loosen the screws with a 5.5 mm. open-ended spanner about two full turns, approximately 3 mm. for each screw.
8. Pull the lower arm and Wrist 1 joint apart and gently twist the two parts in opposite directions around 8 mm. until a mechanical stop is met (holes are keyhole-type).
9. Pull away the lower arm from Wrist 1 joint.

Assemble

For details and photos please see: General guidance to separate joint from counterpart



1. Gently insert Wrist 1 joint with screws and washers into the lower arm.
2. Make sure the washers are fully inserted and flush against the head of the bolt (this is important) before gently twisting the parts in opposite directions until a mechanical stop is met.
3. Tighten the 8 screws lightly, and then tighten **in cross order with 1.3Nm.**
4. Gently put back the gasket.
5. Mount the alignment screw and tighten with **0.4Nm**.
6. Connect ESD wristband
7. Reconnect wires between lower arm and Wrist 1 joint correctly.
8. **Twist the communication cable** 1.5 to 2 full rounds before it is connected to reduce electrical noise in the system.

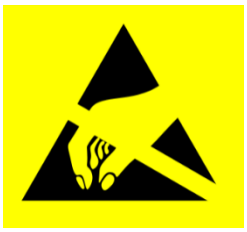


9. Mount blue lid on Wrist 1 joint and tighten with 0.4Nm.
10. Proceed to chapter Dual Robot Calibration for calibrating the robot.

5.2.12. Wrist 2 joint – Wrist 1 joint

Disassemble

For details and photos please see: General Guidance to Separate Joint from Counterpart



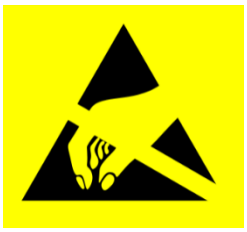
1. Shut down the controller.
2. Remove blue lid on Wrist 1 joint.
3. Connect ESD wristband
4. Disconnect wires between Wrist 1 joint and Wrist 2 joint

1 x red wire	=	48V DC
1 x black wire	=	GND
Black connector	=	bus cable (note connector orientation)

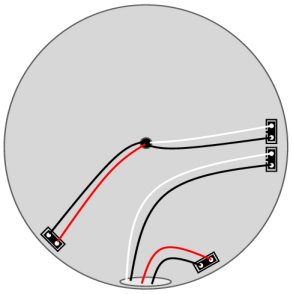
5. Remove alignment screw
6. Gently remove black flexible flat ring between Wrist 1 and Wrist 2 with a tiny screwdriver or similar tool and twist it around the joint housing.
7. Slide the grey Teflon ring back. 8 screws become visible, 4 on each side of joint. Loosen the screws with a 5.5 mm. open-ended spanner about two full turns, approximately 3 mm. for each screw.
8. Pull Wrist 1 joint and Wrist 2 joint apart and gently twist the two parts in opposite directions around 8 mm. until a mechanical stop is met (holes are keyhole-type).
9. Pull away Wrist 1 joint from Wrist 2 joint.

Assemble

For details and photos please see: General Guidance to Separate Joint from Counterpart



1. Gently insert Wrist 1 joint with screws and washers into Wrist 2 joint.
2. Make sure the washers are fully inserted and flush against the head of the bolt (this is important) before gently twisting the parts in opposite directions until a mechanical stop is met.
3. Tighten the 8 screws lightly, and then tighten in cross order with 1.3Nm.
4. Slide the grey Teflon ring in place and gently put back the flat ring on top of the Teflon ring.
5. Mount the alignment screw and tighten with 0.4Nm.
6. Connect ESD wristband
7. Replace Wrist 1 and reconnect connectors as illustrated into Wrist 2.
   Twist the communication cable 1.5 to 2 full rounds before it is connected to reduce electrical noise in the system.



8. Mount blue lid on Wrist 1 joint and tighten with 0.4Nm.
9. Proceed to chapter Dual Robot Calibration for calibrating the robot.

5.2.13. Wrist 3 joint – Wrist 2 joint

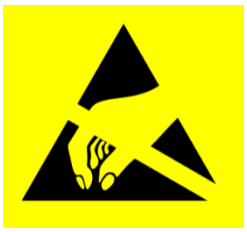
Disassemble and assemble

Procedure for separating Wrist 3 joint from Wrist 2 is similar to separation of Wrist 2 joint and Wrist 1 joint, consult chapter Wrist 2 joint – Wrist 1 joint

5.2.14. Tool flange – Wrist 3 joint

Disassemble

For details and photos please see: General guidance to separate joint from counterpart

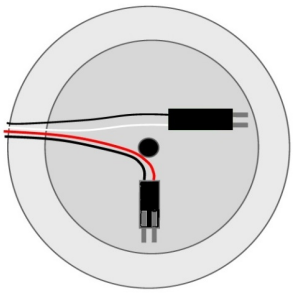


1. Shut down the controller.
2. Remove alignment screw.
3. Gently remove black flexible flat ring with a tiny screwdriver or similar tool and twist it around the joint housing.
4. Slide the grey Teflon ring back. 8 screws become visible, 4 on each side of joint. Loosen the screws with a 5.5 mm. open-ended spanner about two full turns, approximately 3 mm. for each screw.
5. Pull the tool flange and Wrist 3 joint apart and gently twist the two parts in opposite directions around 8 mm. until a mechanical stop is met (holes are keyhole-type).
6. Pull away the tool flange from Wrist 3 joint.
7. Connect ESD wristband
8. Disconnect the two connectors.

Assemble

For details and photos please see: General guidance to separate joint from counterpart

1. Connect ESD wristband
2. Replace tool flange and reconnect connectors as illustrated.
3. Twist the communication cable 1.5 to 2 full rounds before it is connected to reduce electrical noise in the system.



4. Gently insert tool flange with screws and washers into the Wrist 3 joint.
5. Make sure the washers are fully inserted and flush against the head of the bolt (this is important) before gently twisting the parts in opposite directions until a mechanical stop is met.
6. Tighten the 8 screws lightly, and then tighten in cross order with 1.3Nm.
7. Slide the grey Teflon ring in place and gently put back the flat ring on top of the Teflon ring.
8. Mount the alignment screw and tighten with 0.4Nm.
9. Proceed to chapter Dual Robot Calibration for calibrating the robot.

5.2.15. Instructions for calibrating a joint

After replacement, calibration of the new joint is required in order to find the correct zero position.

If it is possible (a dual robot calibration kit and second robot of the same model are available) and necessary (highest possible positional accuracy, and minimal deviation from positions taught prior to joint replacement are required), perform the Dual Robot Calibration Alternatively perform a simple joint calibration as shown below.

Instructions for calibrating a joint:

1. Jog robot to HOME position

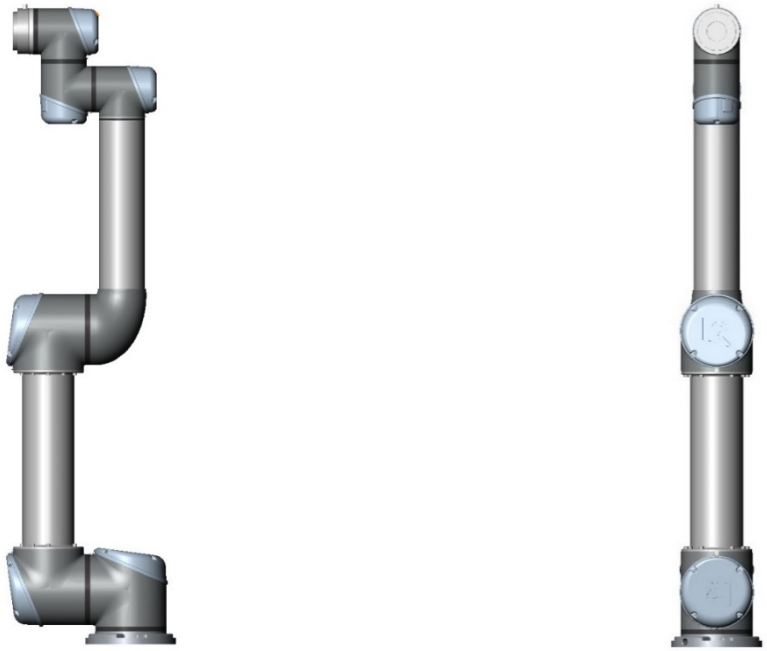
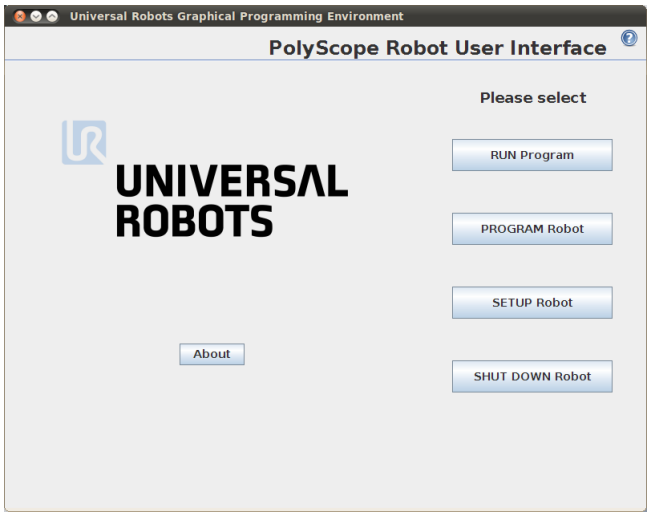
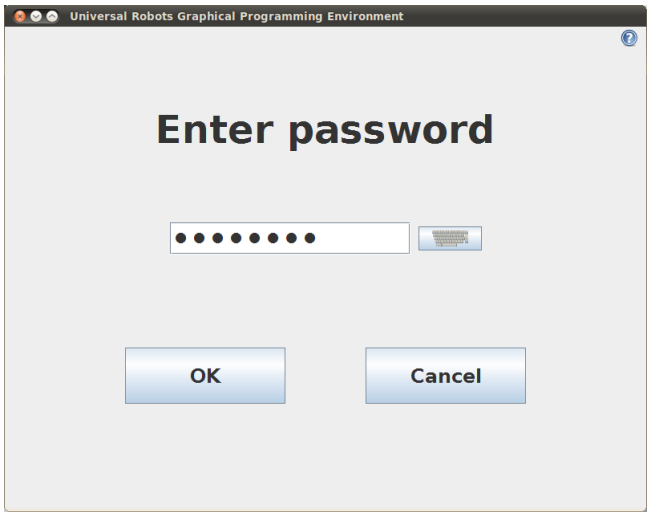


Illustration shows the HOME position, which is defined as zero position of all joints.

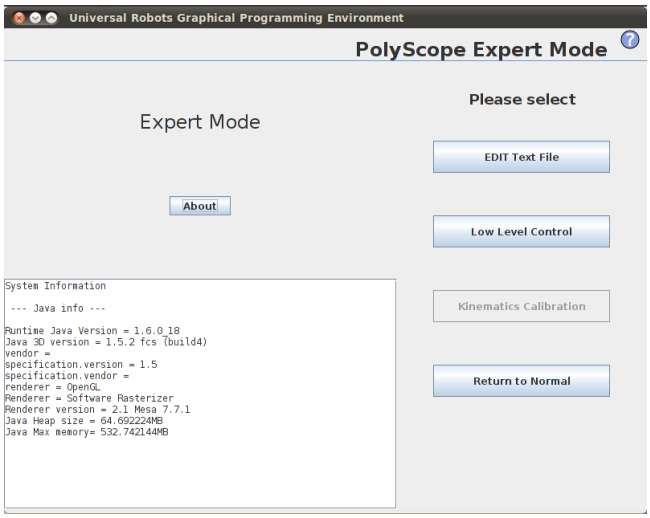
2. Swipe from left to right across the UNIVERSAL ROBOTS logo on main screen of PolyScope.



3. Enter password lightbot and press OK.



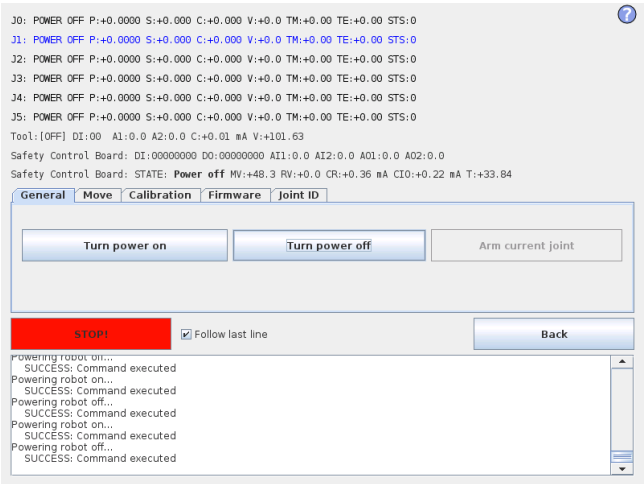
4. You are now in Expert Mode, press Low Level Control.



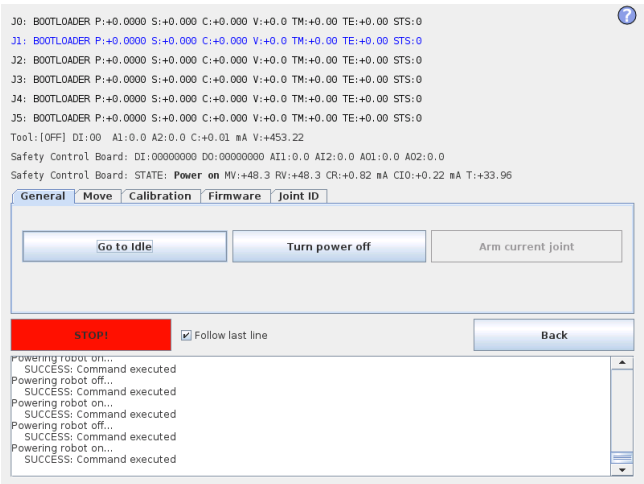
WARNING

In Low Level Control, only the safety settings in the Polyscope Installation tab are active. The protective stop is NOT active.
Set all safety settings to their lowest settings before moving the robot.

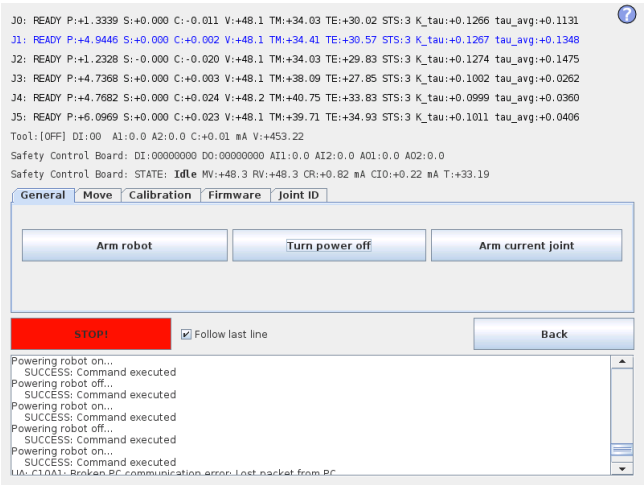
5. Press Turn power on to enable power to joints.



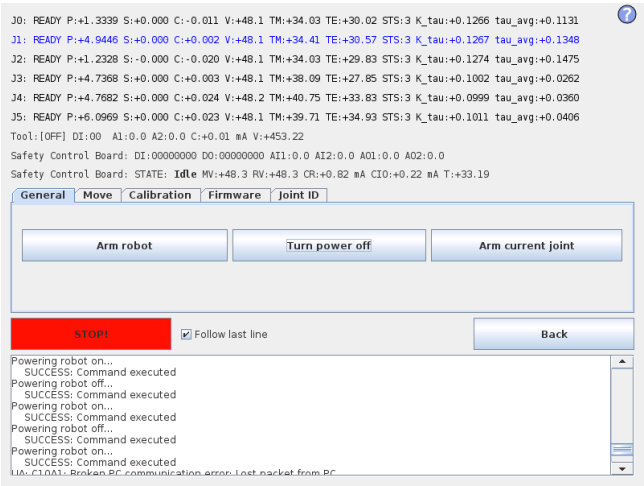
6. Press Go to Idle to put joints into ready mode.



7. Select the desired joint by directly clicking the status line for that joint. Currently selected joint is highlighted in blue.

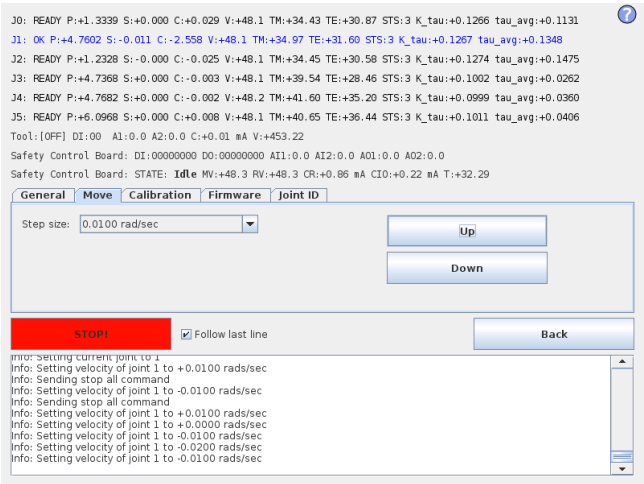


8. Press Arm current joint to release the brake on the selected joint.



Use the Up and Down buttons in the Move window to rotate the joint to the correct zero position according to the following illustrations.

Press STOP when the joint is in the correct position.



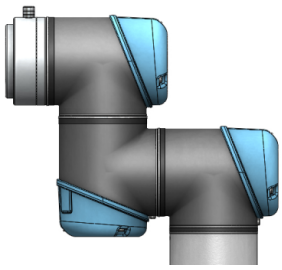
9. Zero position illustrations

Base: Shoulder, Elbow, Wrist 1:

Base zero position is aligned so that the output flange is offset 180 degrees from the cable at the back of the robot base.

Shoulder, Elbow and Wrist 1 zero output flange vertically aligned (assuming Base is horizontal). Make sure that base of robot is horizontal, use spirit level to align joints.

Wrist 2:

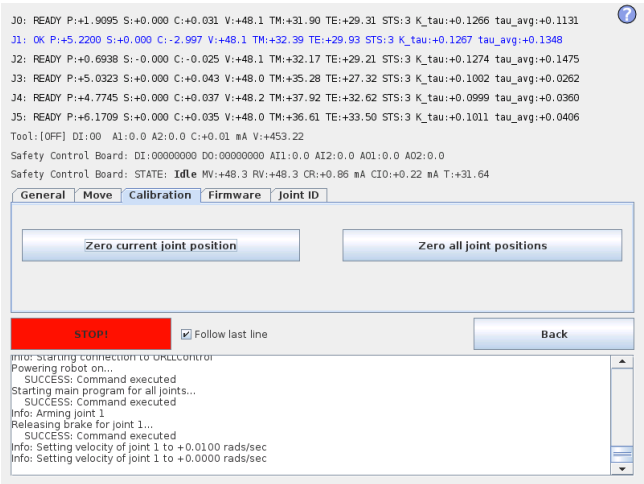


Wrist 2 zero position is aligned similar to Base joint, with tool flange parallel with wrist 1 output flange.

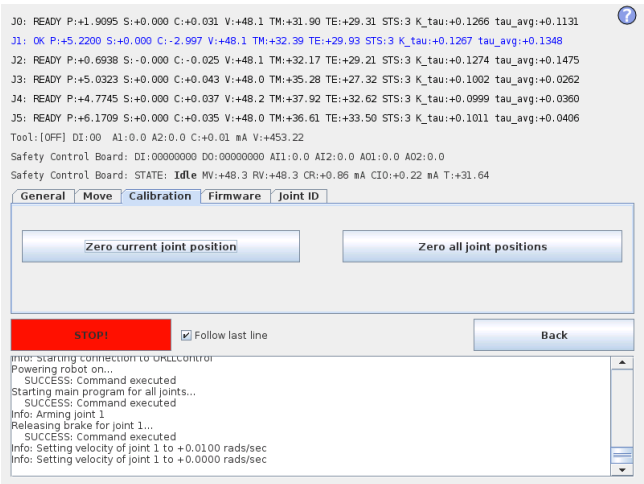
Wrist 3:

Wrist 3 zero position is aligned so tool connector is pointing upward. Mount two bolts in tool holes and use spirit level to align joint.

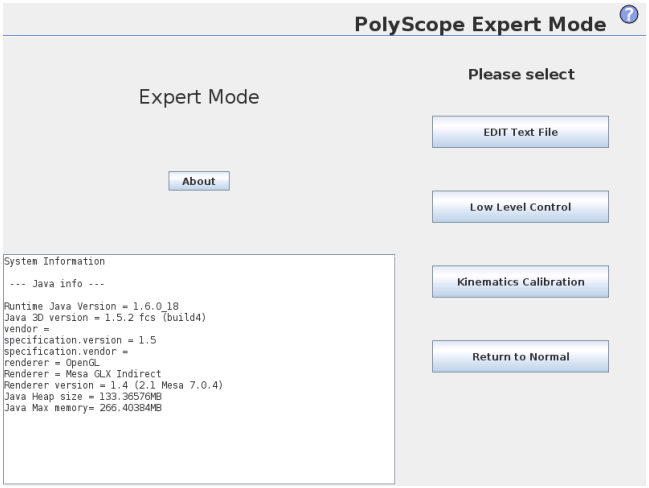
10. Select Calibration tab and press Zero current joint position to calibrate the joint.



11. Press Back to exit Low Level Control.



12. Press Return to Normal.



13. Verify zero position by moving the robot to HOME.
    If not satisfied with the zero position, perform the procedure once again.

5.2.16. Dual Robot Calibration

Dual Robot Calibration kit (Part no: 185500)

The Dual Robot Calibration process calibrates the robot across its full workspace. All robots are Dual Robot Calibrated before leaving the factory.

If a joint has been replaced, then the factory calibration is no longer valid.

There are 2 options:

- Performing a Dual Robot Calibration after replacement of a joint will allow the robot to continue in the production line without modifying waypoints in the robot program.
  To perform a Dual Robot Calibration, you need: 2 robots (same size and same generation), calibration Horse and calibration tool connector.

Go to www.universal-robots.com/support/ to download the Calibration Manual in PDF format.

- Simple Joint calibration (as described in 3.1.15 Instructions of calibrating a joint). After replacing a joint the zero position of the joint can be adjusted but the quality of calibration will not be as good as that achieved by the Dual Robot Calibration method. Adjustment of program waypoints will likely be required.

5.2.17. Change joint ID

Each joint has a unique ID no. Having two joints with the same ID on a robot will cause communication problems and the robot will not be able to operate.

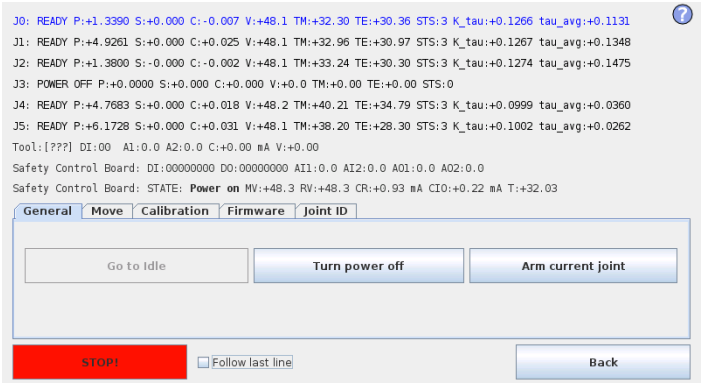
ID	Joint
J0	Base
J1	Shoulder
J2	Elbow
J3	Wrist 1
J4	Wrist 2
J5	Wrist 3

Example:

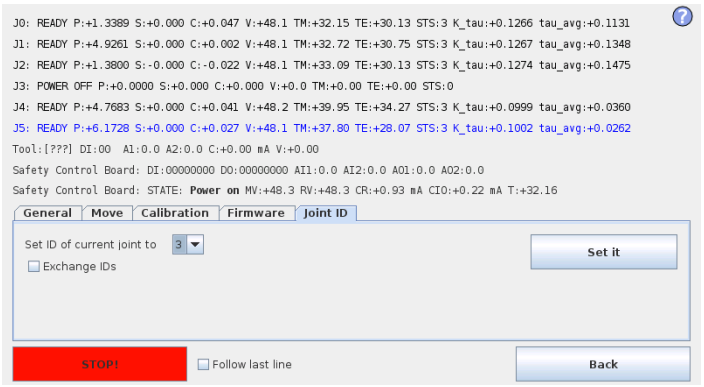
Wrist 1 (J3) needs to be replaced. Spare joint is a Wrist 3 (J5)

1. Disconnect the joint with correct ID no.
2. Enter Low Level Control
3. Press Turn power on and the connected joints enter BOOTLOADER mod

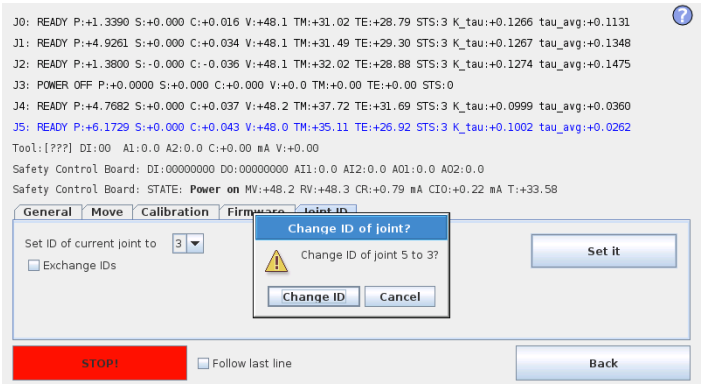
4. Press Go to Idle and the connected joints enter READY mode



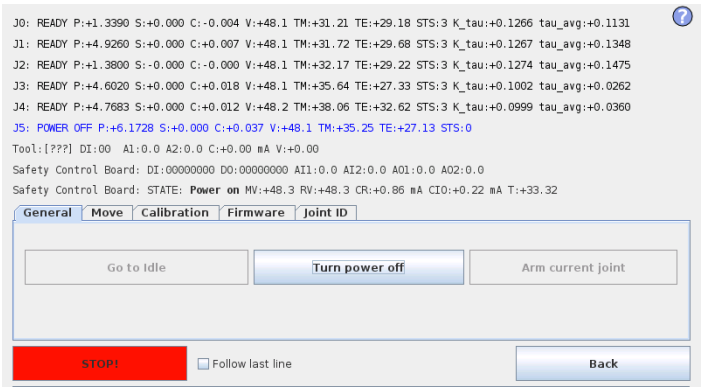
5. Select Joint ID tab
6. Select J5 (The one to be changed)
7. Uncheck “Exchange IDs” box
8. In dropdown box, select ID no. 3
9. Press Set it



10. Confirm Change ID



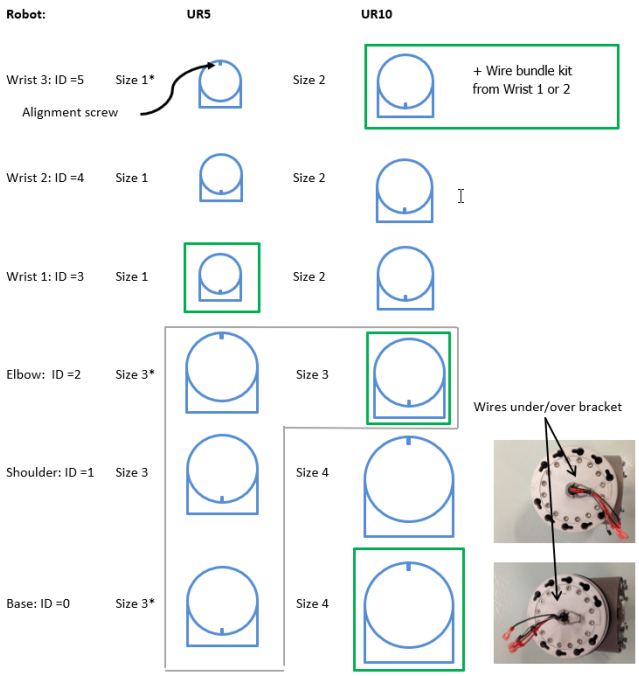
11. When the robot is powered on again, J5 will be displayed as J3.



5.2.18. Joint Spare Part Adaptation

The UR5 and UR10 consist of four different joint sizes, some of which are interchangeable between different positions/robots.

Recommended spare joints for UR5 and UR10 are marked.



* When using a joint in a different location i.e. UR5 base as UR5 Elbow, it may be necessary to change ID, connect all joints electrically, turn the joint 180 degrees in low level control by using the Move Tab Up/Down function, before mechanically assembling the robot.

The robot then needs to be zero positioned or dual robot calibrated - Instructions for calibrating a joint

5.2.19. Wire Bundle Installation Guide

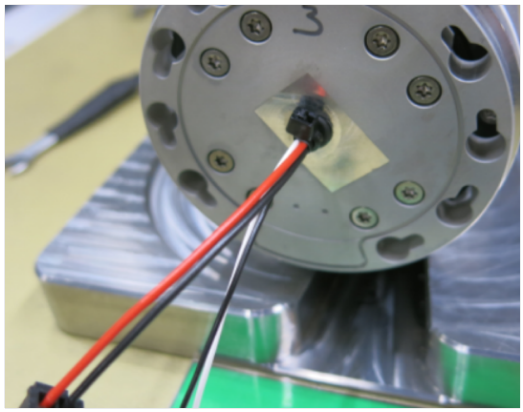
General

As well as the Wire bundle kit for the correct joint size, the Following ESD approved tools are recommended for this replacement:

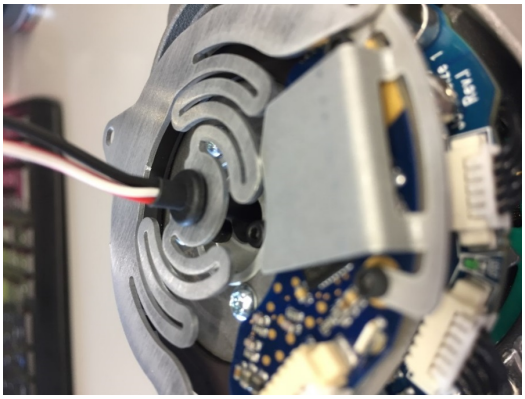
- Tool for pressing in the pins
- Small flat nose plier
- Cable tie tension and cutting tool
- Small flathead screwdriver
- Tweezers
- Crimping tool for cable shoes

Time expected: 20min (joint disassembly time not included)

Size 1 – part number: 103501

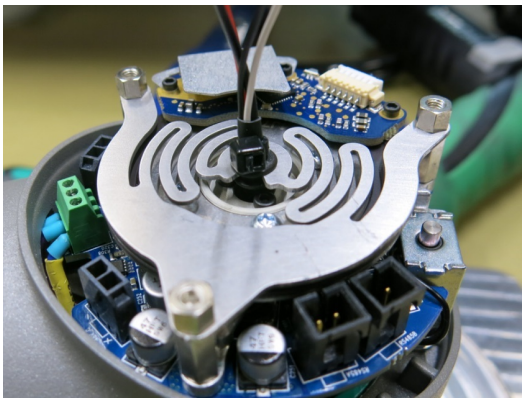


- Inset wire bundle as shown on photo, with the cable tie towards the flange.



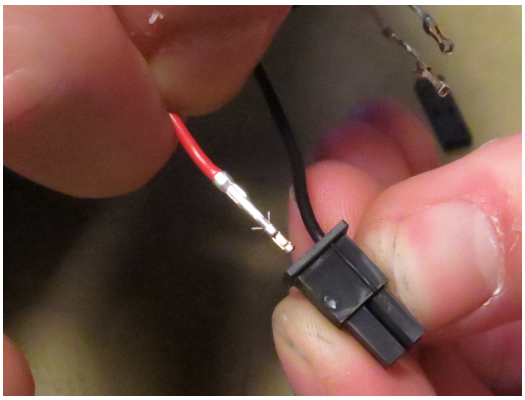
- Mount the grommet into the flex plate with the tweezers or the small flat nose screwdriver.

- Hold the heat shrink with tweezers while sliding down the grommet.

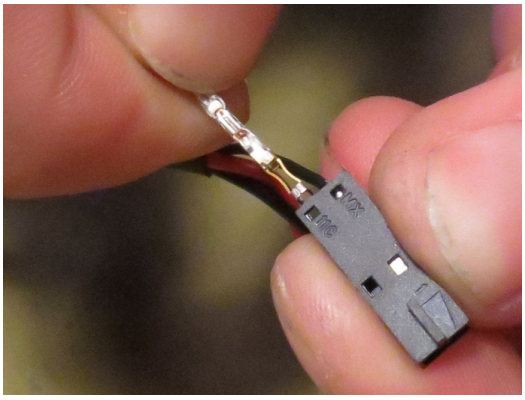


- Mount a cable tie on top of the grommet.
- Tighten and cut it off with the cable tie tool.

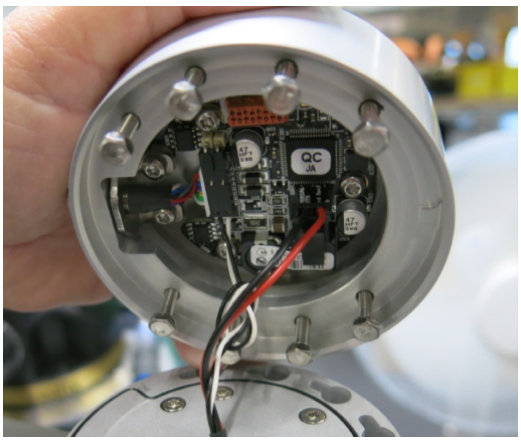
- Take the power connector:
- When inserting the connector pins, make sure the barbs, shown with green arrows, are located as shown on the photo. If not, they will not hook inside the connector and will fall out.



- Insert the black connector pin into the plug hole marked with a line – also shown with red arrow. Remember to orientate the barbs as described above.
- Insert the red into the other plug hole.
- When done, check that the connector pins are firmly hooked inside the plug by pulling gently in the wires.
- If not, check that the orientation of the barbs is correct. If they are correctly inserted, use a tool to press on the pins to ensure they are pushed all the way in.

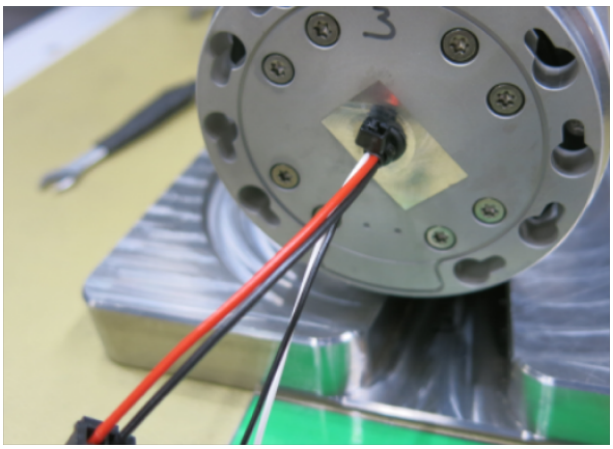


- Take the communication connector:
- When inserting the connector pins, make sure the barbs, shown with green arrows, are located as shown on the photo. If not, they will not hook inside the connector and will fall out.
- Inset the black connector pin into the plug hole marked “MX”. Remember to orientate the barbs as described above. A “click” will be heard when inserted correctly.
- Inset the white pin in the other plug hole.
- When done, check that the connector pins are firmly hooked inside the plug by pulling gently in the wires.
- If not, check that the orientation of the barbs is correct. If inserted correctly, use a tool to press on the pins to ensure they are pushed all the way in.

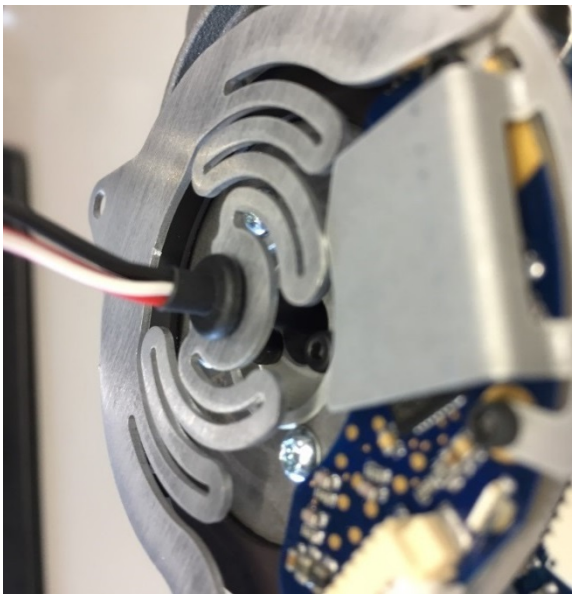


- When connecting to the tool flange, you will need to tighten a loose knot, on the communication wire, in order to shorten it. This will minimize the risk of squeezing the wire.

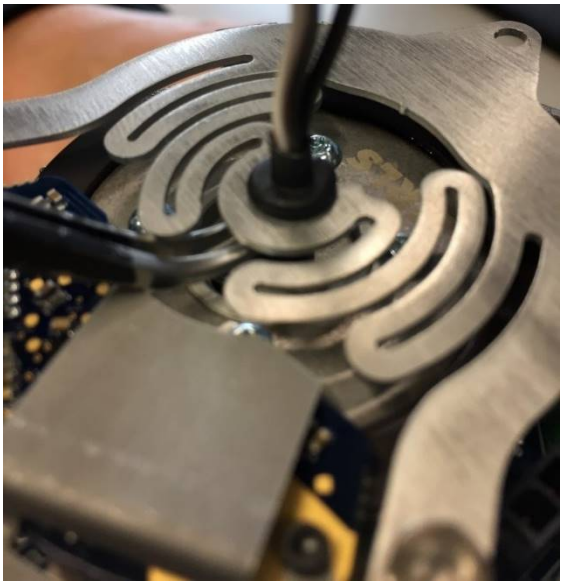
Size 3 – part number: 103503



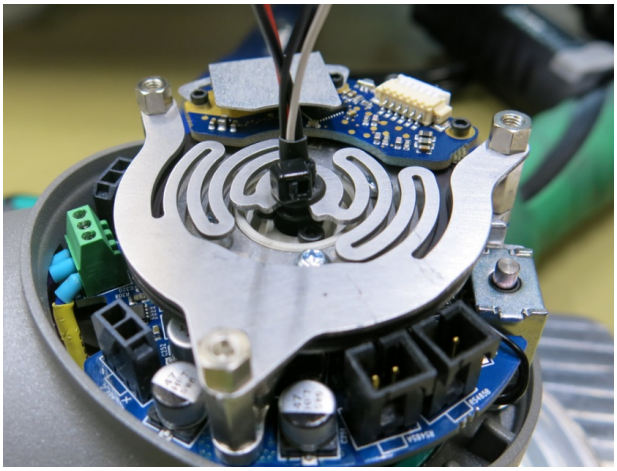
- Inset wire bundle as shown on photo example, with the cable tie towards the flange.



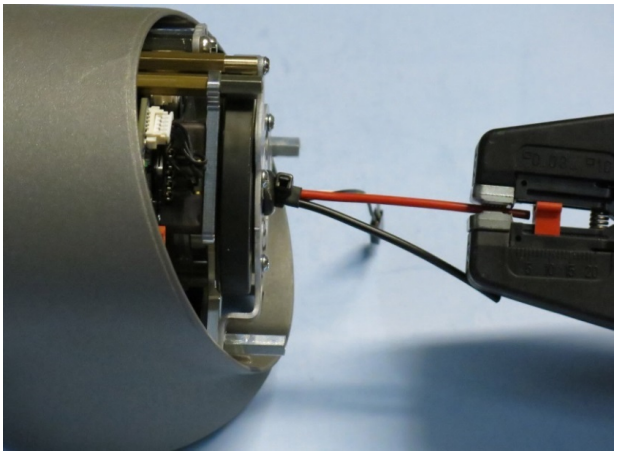
- Mount the grommet into the flex plate with the tweezers or the small flat nose screwdriver.



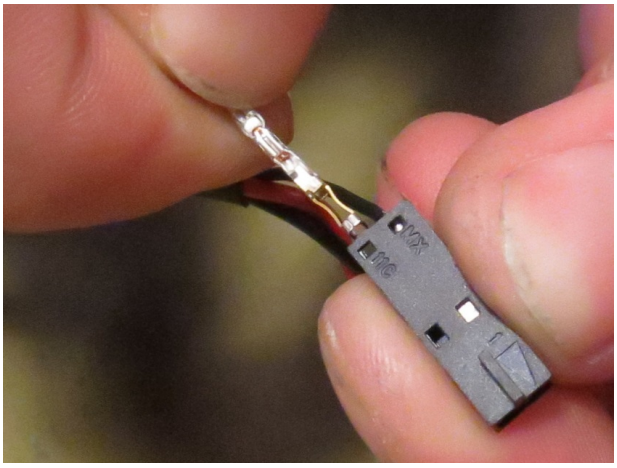
- Hold the heat shrink with tweezers while sliding down the grommet into position.



- Mount a cable tie on top of the grommet.
- Tighten and cut it off with the cable tie tool.



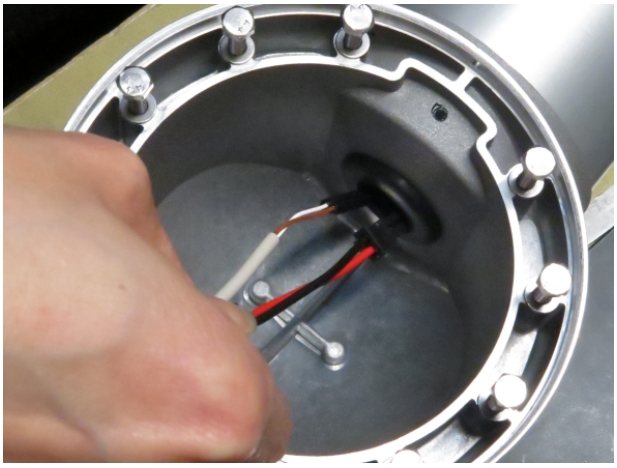
- The two power cables (two thicker, red and black wires) needs to be stripped (approx. 5mm).
- Mount the cable shoes
- Use the clamping tool as described by the manufacture.
- Check that the wire is secure in the cable shoes.



- Take the communication connector:
- When inserting the connector pins, make sure the barbs, shown with green arrows, are located as shown on the photo. If not, they will not hook inside the connector and will fall out.
- Inset the black connector pin into the plug hole marked “MX”. Remember to orientate the barbs as described above. A “click” will be heard when inserted correctly.
- Inset the white pin in the other plug hole.
- When done, check that the connector pins are firmly hooked inside the plug by pulling gently in the wires.
- If not, check that the orientation of the barbs is correct. If inserted correctly, use a tool to press on the pins to ensure they are pushed all the way in.

Lower arm – part number: 103508

> **NOTE**
>
> The lower arm wire bundle kit contains wire bundle for multiple robot types. Please be sure use the correct length.



- Slide the end with the two black connectors through the hole from the elbow end – see photo example.

- When it is pulled all the way through, it should look like the photo.

Upper arm – part number: 103509

> **NOTE**
>
> The lower arm wire bundle kit contains wire bundle for multiple robot types. Please be sure use the correct length.

- Both ends of this wire bundle are identical so inserting in either direction is acceptable.

5.3. Controller

5.3.1. Replacement of Motherboard 3.0

WARNING

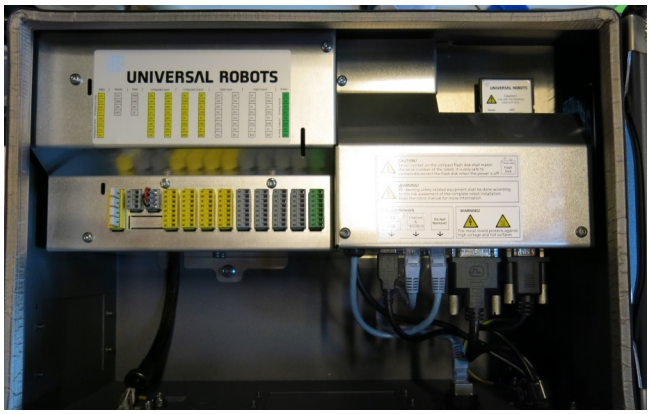
Before replacing ANY components inside the control box, it is IMPORTANT to do a complete shutdown.
Follow the first 3 steps in section Complete rebooting sequence.

When completing the following replacement, please follow the guidelines laid out in section Handling ESD-sensitive parts

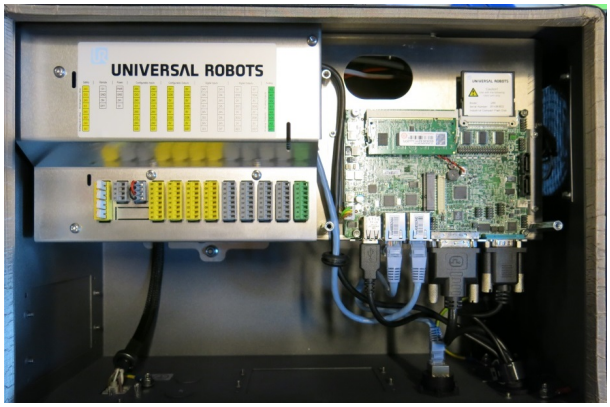
NOTICE

Motherboard 3.0 uses compact flash memory card.
Motherboard 3.1 uses USB memory stick.

1. Shut down the controller and disconnect the power cable, open the controller cabinet and remove the 3 torx screws



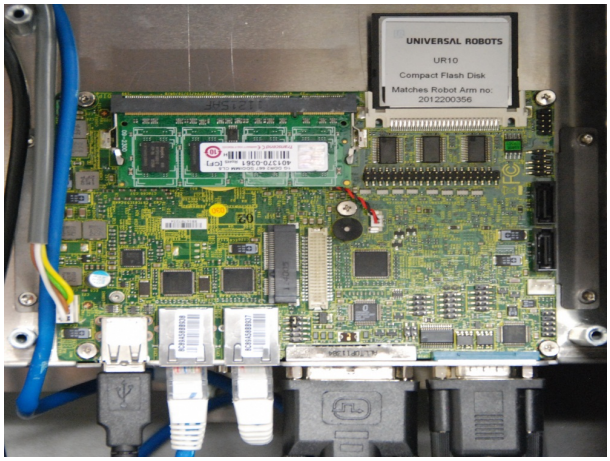
2. Remove the aluminum cover plate



3. Disconnect cable connections from motherboard:
    1. White plug with white, brown, yellow and green wires, 12 V Power
    2. Black USB cable for Teach Pendant USB connector
    3. Ethernet cable to external connector
    4. Ethernet cable to Safety Control Board SCB

5. DVI-cable for Teach Pendant screen
6. Black cable for RS232-connection for Teach Pendant touch

4. Remove the 4 screws from the 2 holding brackets.



5. If controller is equipped with long-hole brackets, make sure to replace them with circular-hole brackets
6. Replace Motherboard and tighten the 4 screws gently
7. Insert the 6 cables in correct positions. Special attention on the Ethernet cable to the Safety Control Board. It must be connected to the right connector on the mother board
8. Re-install flash card and RAM block
9. Carefully put back the aluminum cover plate, make sure to mount it correct and fix it with the 3 screws
10. Connect power and verify that teach pendant functions correctly.

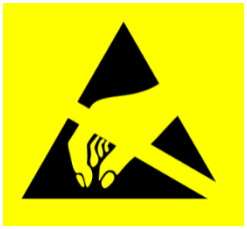
5.3.2. Replacement of Motherboard 3.1

Replace Motherboard

WARNING

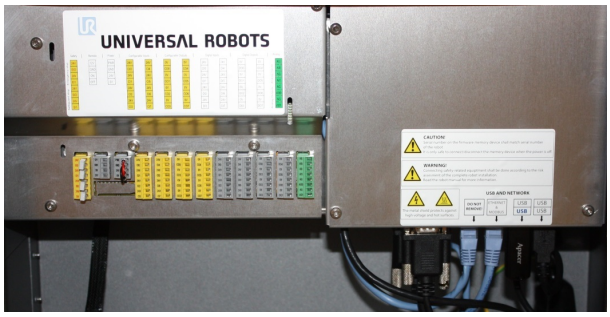
Before replacing ANY components inside the control box, it is IMPORTANT to do a complete shutdown.
Follow the first 3 steps in section Complete rebooting sequence.

When completing the following replacement, please follow the guidelines laid out in section Handling ESD-sensitive parts

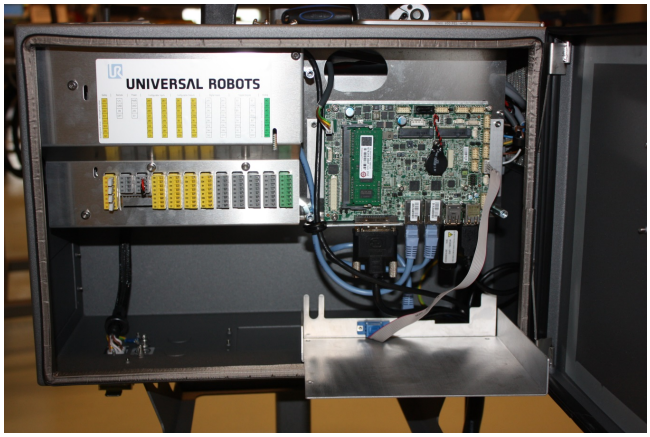


How to replace motherboard 3.1

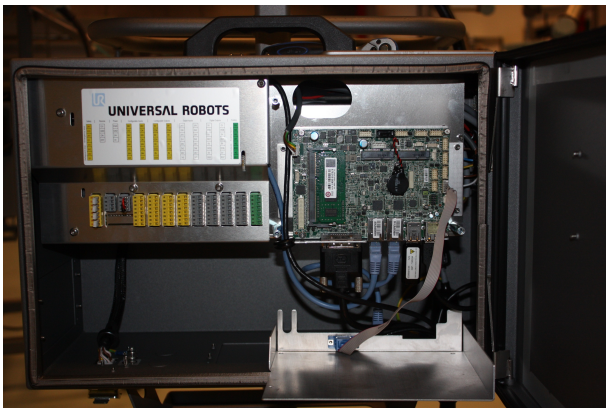
1. Shut down the controller and disconnect the power cable, open the controller cabinet, and remove the 3 torx screws (4 screws on Merge Control Box)



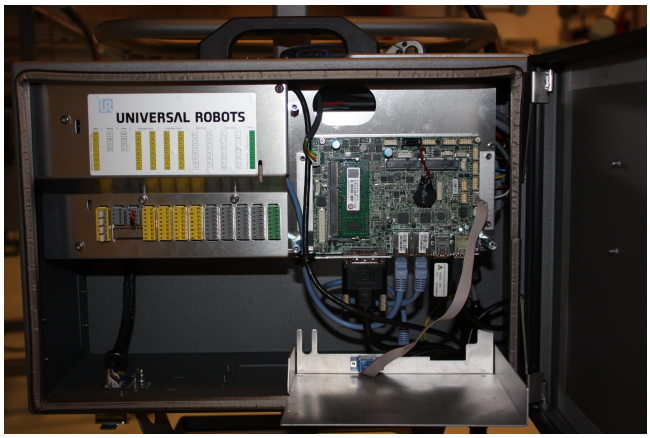
2. Remove the aluminum cover plate



3. Disconnect cable connections from motherboard
    1. White plug with white, brown, yellow and green wires, 12 V Power
    2. DVI-cable for TP screen
    3. Ethernet cable to Safety Control Board SCB
    4. Ethernet cable to external connector
    5. Black USB cable for TP USB connector
    6. Grey flat cable for RS232-connection for TP touch



4. Remove the 4 screws from the 2 holding brackets



5. Replace Motherboard.

6. Insert the 6 cables in correct connectors. Pay special attention to the Ethernet cable to the Safety Control Board. It must be connected to the right connector on the mother board
7. Re-install USB stick for UR system Software.
8. Carefully put back the aluminum cover plate, make sure to mount it correctly and fix it with the 3 screws

5.3.3. Upgrade Motherboard 3.0 To 3.1

> **WARNING**
> Before replacing ANY components inside the control box, it is IMPORTANT to do a complete shutdown.
> Follow the first 3 steps in section Complete rebooting sequence.

Introduction

- This section provides guidelines for exchanging an existing CB3 motherboard with a new CB3.1 motherboard.
- It is solely intended for advanced integrators of UR robots.

Parts and check list

122430 CB3.0 to CB3.1 Upgrade Kit	QNT
Standoff for mounting cover M4x35 – hex 7	3
Screws for cover mounting M4x8 torx T20	3
Standoff for mounting Motherboard M3x6x25mm – hex 5	4
Screws for mounting Motherboard M3x6 torx T10	4
Grommet	1
USB drive with image	1
Disposable ESD-wrist strap	1
Safety Control Board cover assembly	1
Improved motherboard power cable for CB3	1

Tools needed (not incl. in the kit):

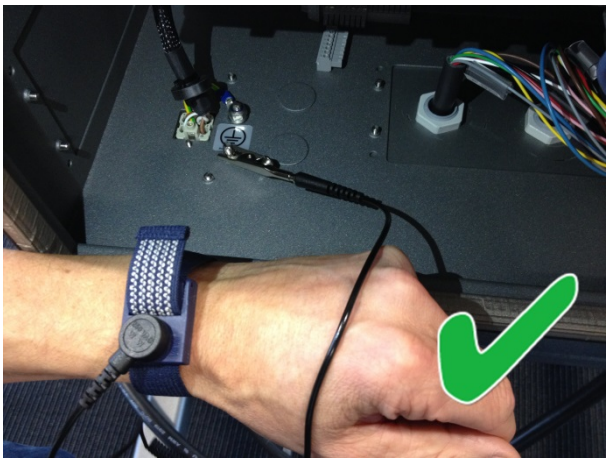
- ESD-wrist strap
- Hex 7 key
- Hex 5 key
- T20 torx
- T10 torx
- 2.5 Allen key

- Compact flash card reader
- Laptop with USB port, running Windows (7 or higher) or Linux (10 or higher) operating system

Time needed: Approx. 1 hour

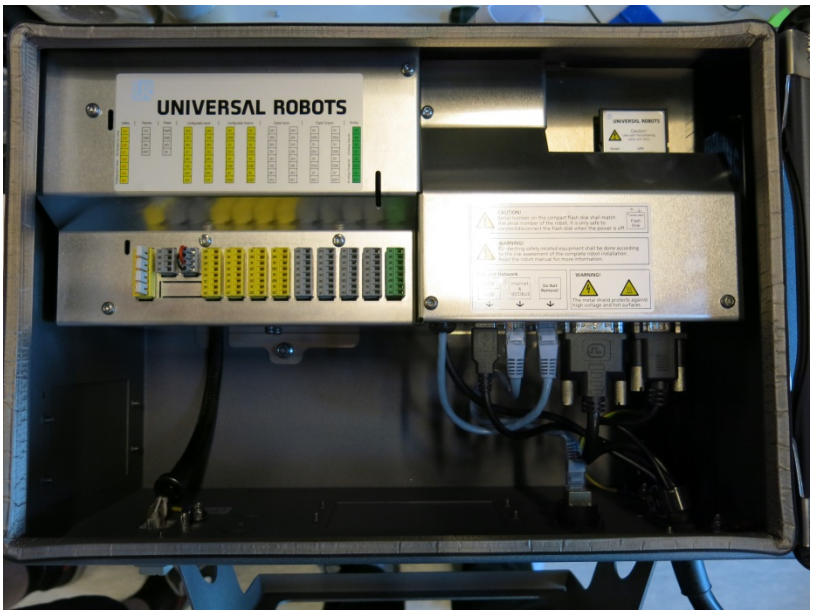
Hardware

- Always use an ESD wristband when working on the controller.

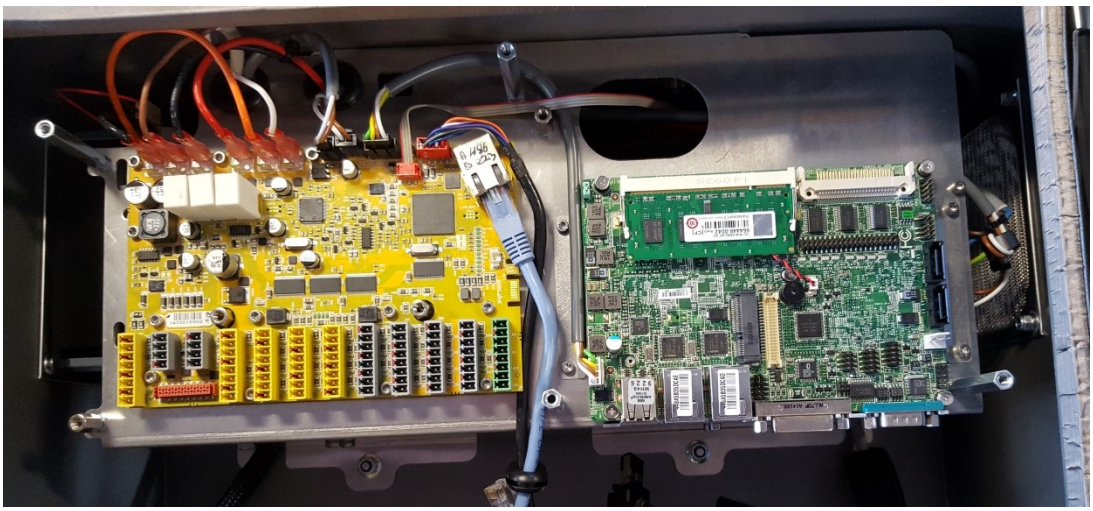


Put the ESD wrist strap on your wrist. Connect the wrist band to the system ground point. This discharges any static electricity in your body to ground

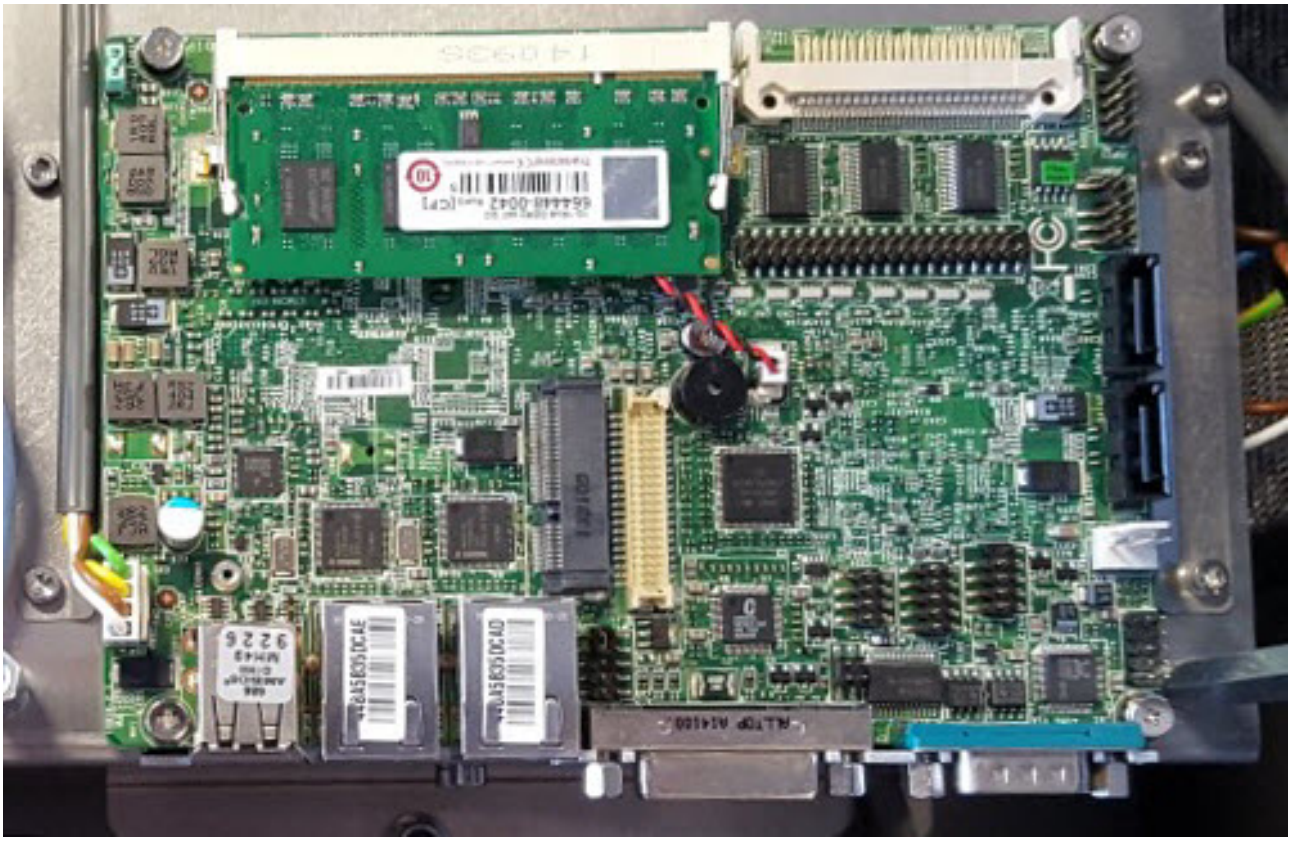
- Remove shields by removing the 7 x T20 torx screws



- Remove all cables attached to the motherboard and the compact flash card
- Remove the cable that connects the motherboard and Safety Control Board. This cable is no longer needed and should be disposed of.

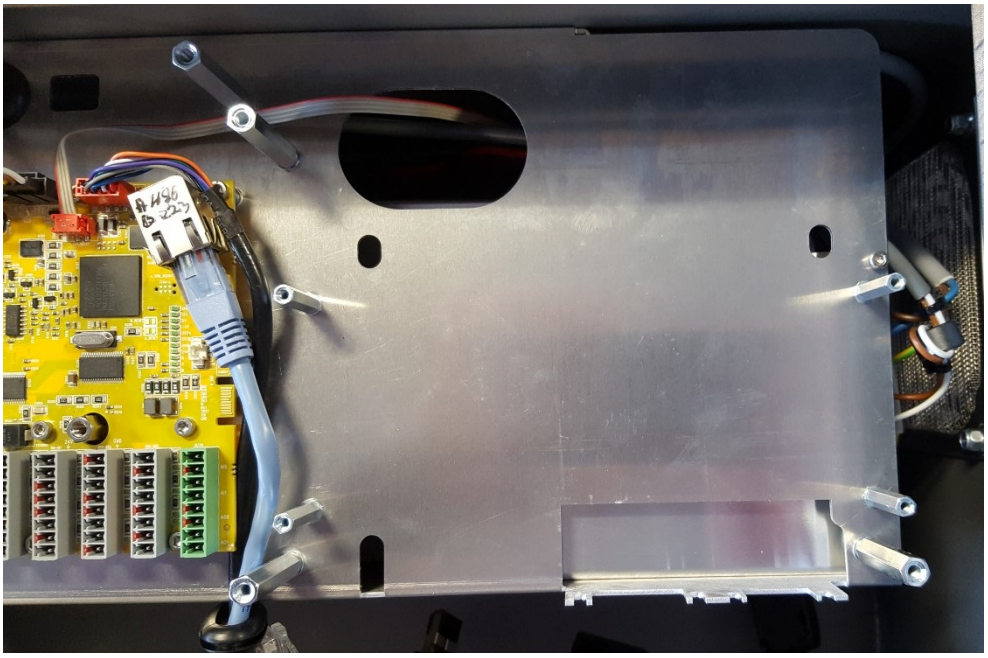


- Unscrew the motherboard by loosening the 4 x 2.5mm hex screws and the 4 x 5,5 hex standoffs that hold the RS232 and DVI connectors

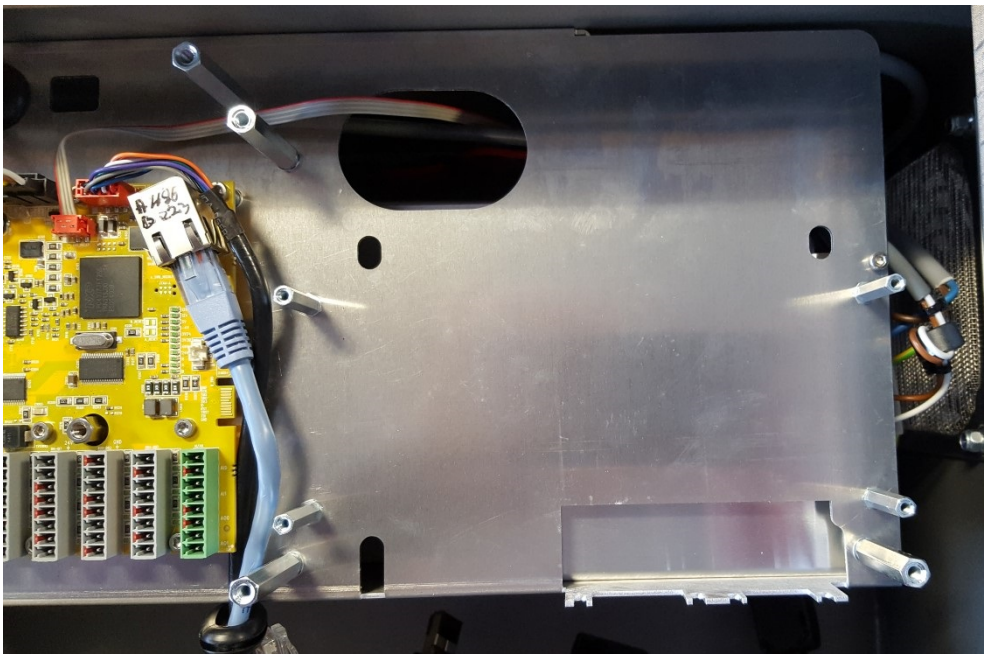


- Mount the smaller standoffs where the motherboard screws were before. Place the black cable from the Teach Pendant and the Ethernet cable on the left side of the Standoff as shown on the photo. Note: If your Ethernet cable has a black plug (Figure 1) at one end, then this end must be connected to the Safety Control Board.

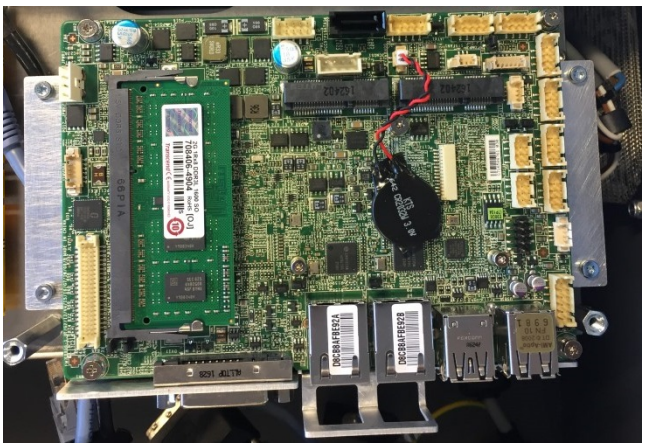
Figure 1



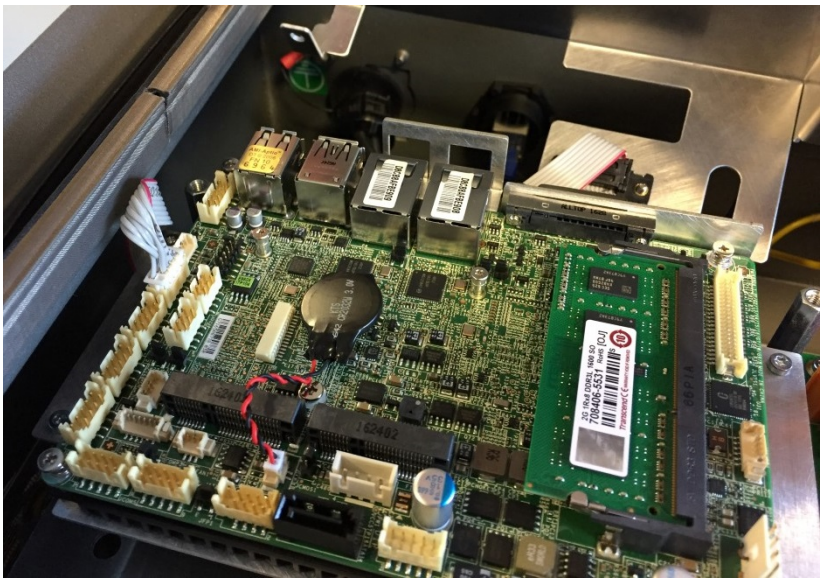
- Unscrew the 3 standoffs that hold the cover for the motherboard and mount the new larger standoffs.



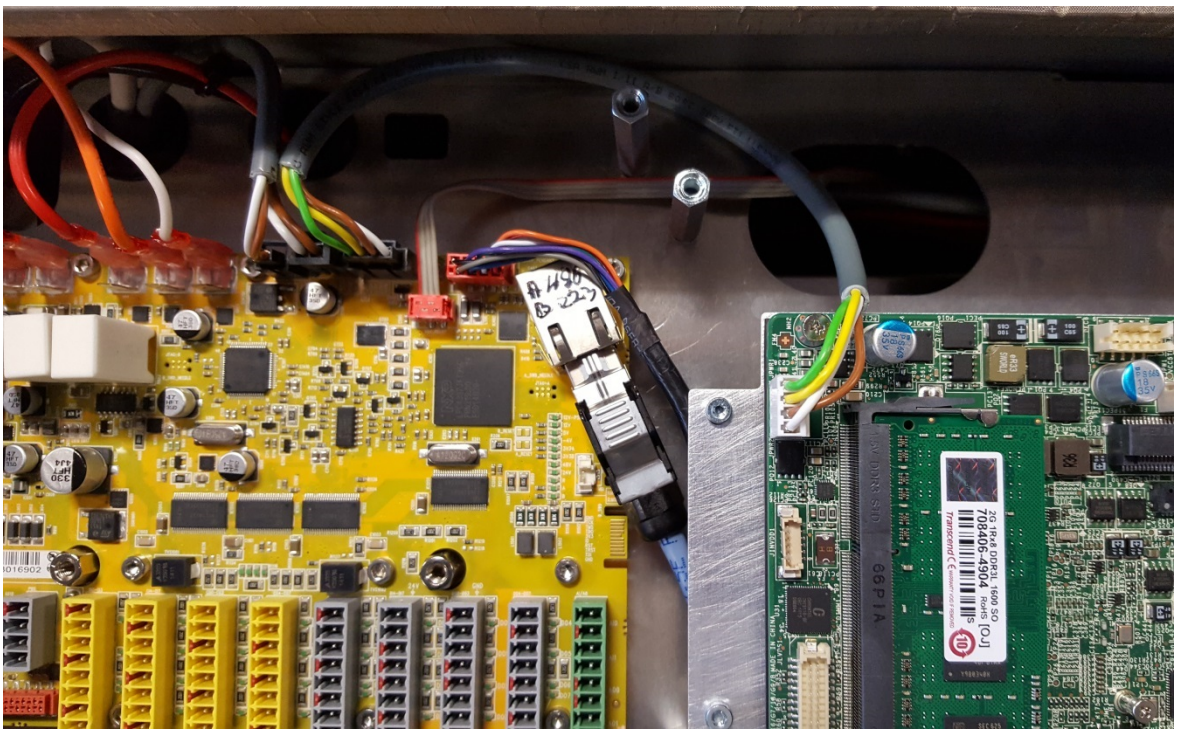
- Mount the motherboard onto the standoffs. Please note that the two screws toward the outside of the controller may be more difficult to get into position.



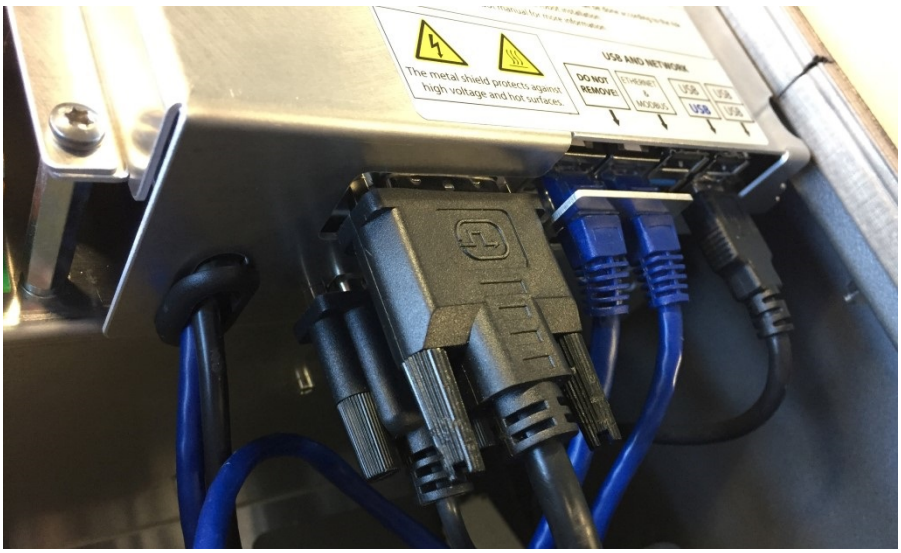
- Now take the new cover for the motherboard and navigate the flat cable under the motherboard and to the connector as shown in the photo below.



- Plug the new power cable from the SCB to the CB 3.1 motherboard as shown.



- Screw on the new cover. Please note that the screw toward the outside of the controller may be difficult to get into position.
- Mount the new cover for the Safety Control Board.
- Mount all the connectors again according to the sticker on the cover and photo below. The USB stick should be plugged into the blue USB port.



Software

NOTICE

Do not downgrade a robot with a CB3.1 motherboard, to a Software version below 3.1.1.7336. Doing so may cause unexpected behavior of the robot.
Universal Robots assumes no responsibility for the outcome of this process.
The instructions in this document shall be considered as general guidelines. It is assumed that the integrator has a high level of technical knowledge.

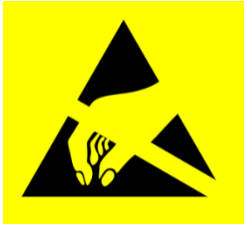
- The following files need to be copied from the existing compact flash card, onto the new USB.
  - root/ur-serial
  - root/log_history.txt
  - root/histogram.properties
  - root/.urcontrol/urcontrol.conf
  - root/.urcontrol/calibration.conf
  - root/.urcontrol/calibration.log
  - root/.urcontrol/robot_calibration_summary.txt
  - programs/ [all of the following files: .urp, .txt, .script, .installation, .variable, .old]
- Detailed description on backup of data can be found in backup of data.
- If the old CB 3.0 motherboard is defective, use a flash card reader and install a Linux partition reader for Windows to read the Linux partition on the flash card.
- Polyscope must be minimum software version 3.1.1.7336

5.3.4. Replacement of Safety Control Board

WARNING

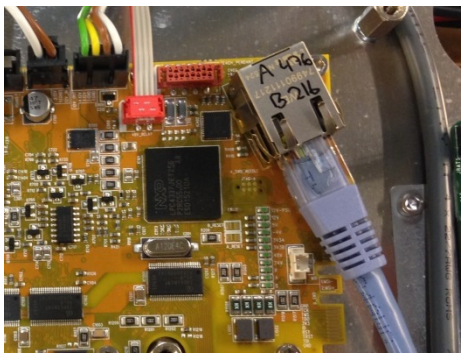
Before replacing ANY components inside the control box, it is IMPORTANT to do a complete shutdown.
Follow the first 3 steps in section Complete rebooting sequence.

When completing the following replacement, please follow the guidelines laid out in section Handling ESD-sensitive parts

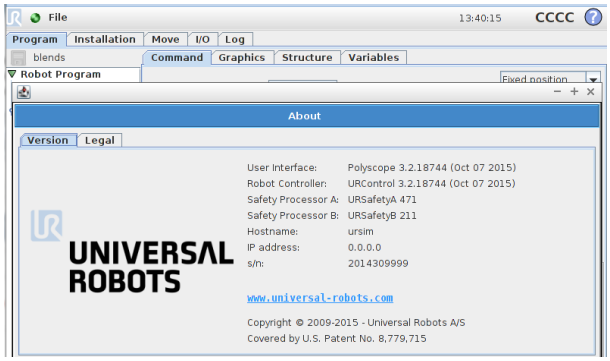


To replace Safety Control Board in Controller box:

1. Check that the software on the robot is not older than the firmware version on the SCB.
   If the software on the robot is older, error C203A0 will be displayed.
   The SCB firmware version can be found on the Ethernet connector.

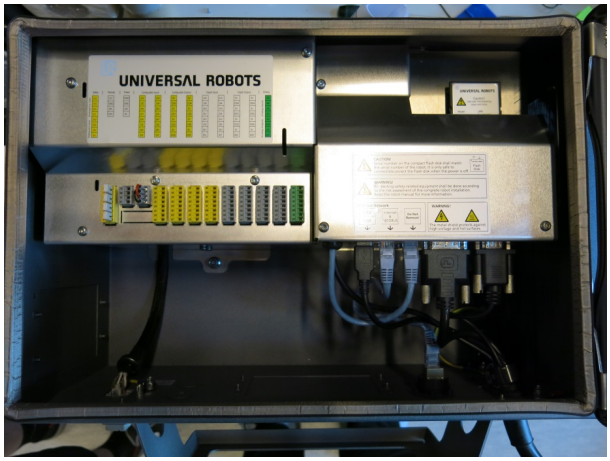


   This can also be found in the “About” menu.
   Shortcut to “About”, by clicking on the UR logo in the top right corner of the screen is available from software version 3.2.18642

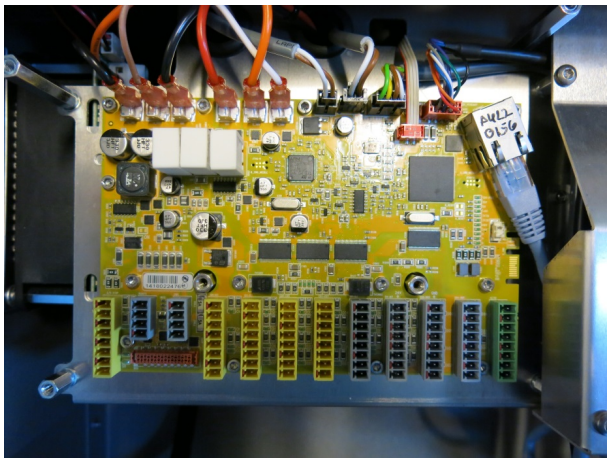


2. Shut down the controller and disconnect the power cable, open the controller cabinet then carefully remove all plugs and connectors.

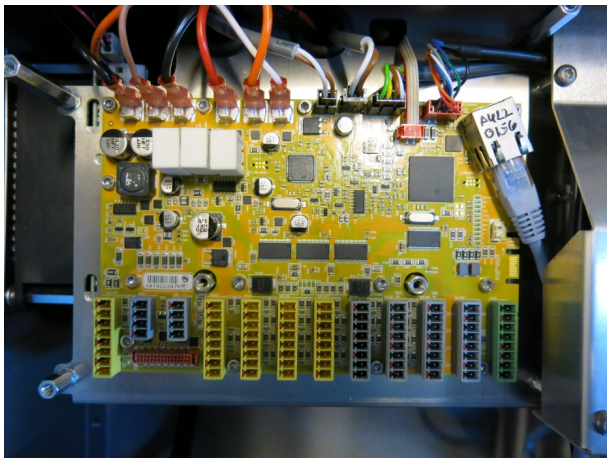
3. Remove the 5 torx screws and followed by the aluminum cover.



4. Carefully remove all plugs and connectors from the Safety Control Board.



5. Remove the 14 screws holding the board in place.



6. Replace Safety Control Board with new one and tighten the 14 screws to fasten the board in place.
7. Insert all connectors and plugs back into their correct positions.

8. Carefully attach the aluminum cover, making sure to mount it correct and fix it with the 5 screws.

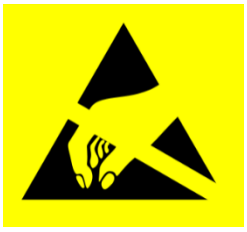
If unsure of the correct positions consult Electrical Drawing

5.3.5. Replacement of Teach Pendant

Original Control Box

> **WARNING**
>
> Before replacing ANY components inside the control box, it is IMPORTANT to do a complete shutdown.
> Follow the first 3 steps in section Complete rebooting sequence.

When completing the following replacement, please follow the guidelines laid out in section Handling ESD-sensitive parts.

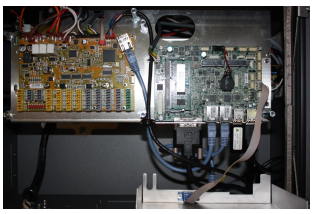


> **NOTE**
>
> Use the same procedure for power down and removing the aluminum cover plates as in chapter, Replacement of Motherboard 3.0, Replacement of Motherboard 3.1 or Replacement of Safety Control Board

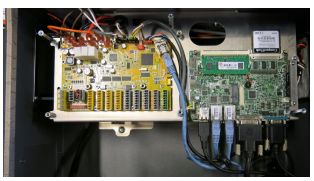
1. Disconnect 4 cables:
    1. Red plug with black cable 12 V Power
    2. Black DVI cable for the TP screen
    3. Black USB cable For the TP USB connector
    4. Black cable for RS232-connection for the TP touchscreen

See diagram: Schematic overview.

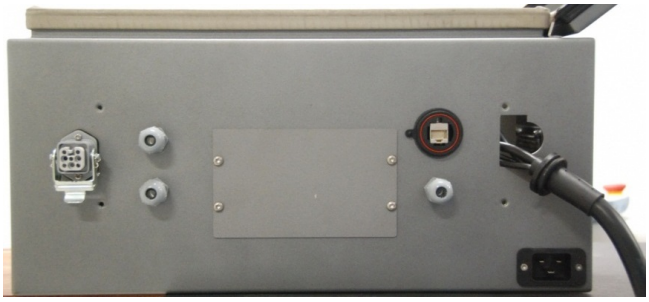
Motherboard 3.1



Motherboard 3.0



2. Remove the bracket (foot of the controller box) that holds the cable inlet and pull out the cables and plugs through this hole.



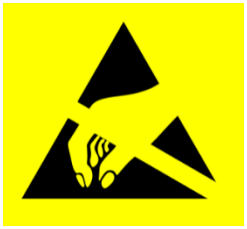
3. To install new teach pendant, thread cables through inlet, plug connectors into correct positions, then mount aluminum cover into place.
4. Connect power and verify that teach pendant functions correctly.

See diagram: Schematic overview

Merge Control Box

> **WARNING**
>
> Before replacing ANY components inside the control box, it is IMPORTANT to do a complete shutdown.
> Follow the first 3 steps in section 5.3.7 Complete rebooting sequence.

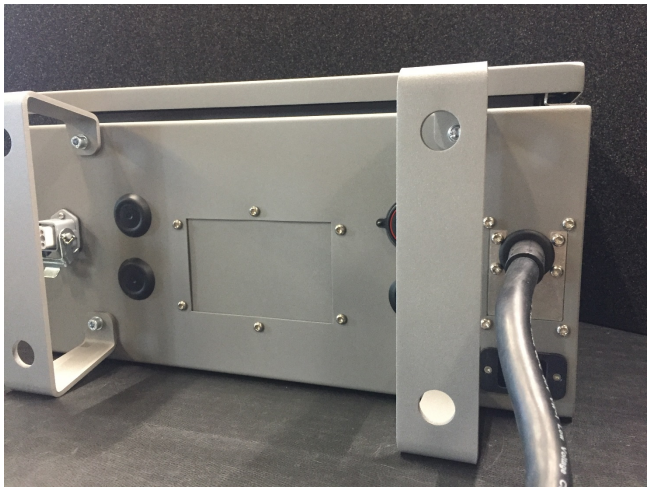
When completing the following replacement, please follow the guidelines laid out in section Handling ESD-sensitive parts



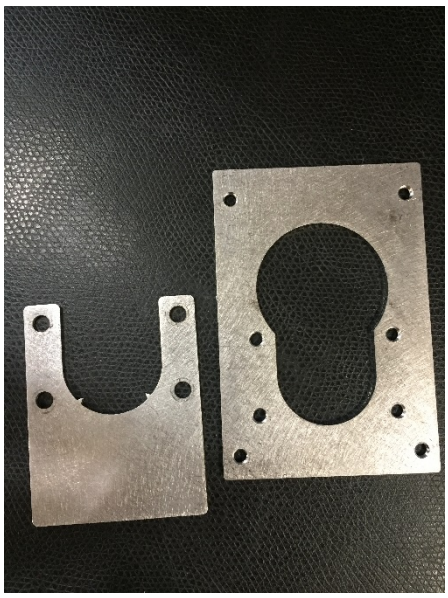
> **NOTE**
>
> Use the same procedure for power down and removing the aluminum cover plates as in chapter, Replacement of Motherboard 3.0, Replacement of Motherboard 3.1 or Replacement of Safety Control Board

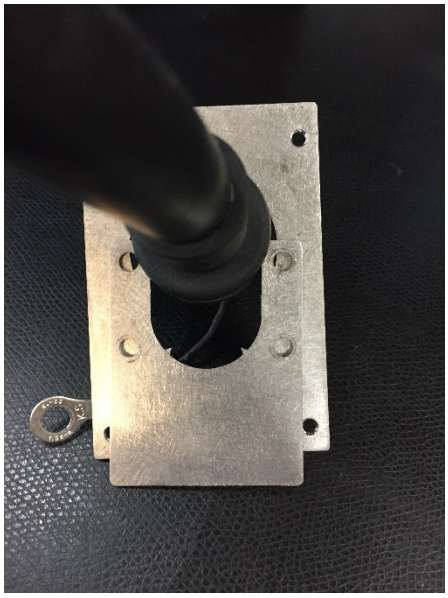
1. Disconnect 4 cables:
    1. Red plug with black cable
    2. Black DVI cable
    3. Black USB cable
    4. Black cable for RS232-connection to touchscreen

2. Remove the bracket by removing the 8 torx screws and that hold it in place.



3. Pull the two plates apart





4. To install new teach pendant, thread cables through inlet, plug connectors into correct positions, then mount aluminum cover into place.
5. Connect power and verify that teach pendant functions correctly.

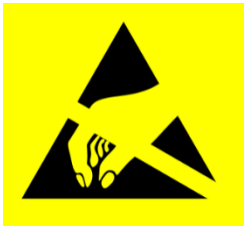
See diagram: Schematic overview.

5.3.6. Replacement of 48V power supply

Original Control Box

> **WARNING**
>
> Before replacing ANY components inside the control box, it is IMPORTANT to do a complete shutdown.
> Follow the first 3 steps in section Complete rebooting sequence.

When completing the following replacement, please follow the guidelines laid out in section Handling ESD-sensitive parts.

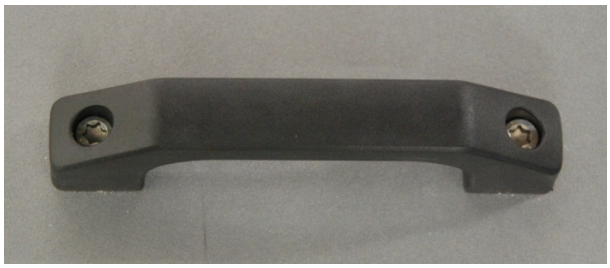


To replace 48V power supply in controller box:

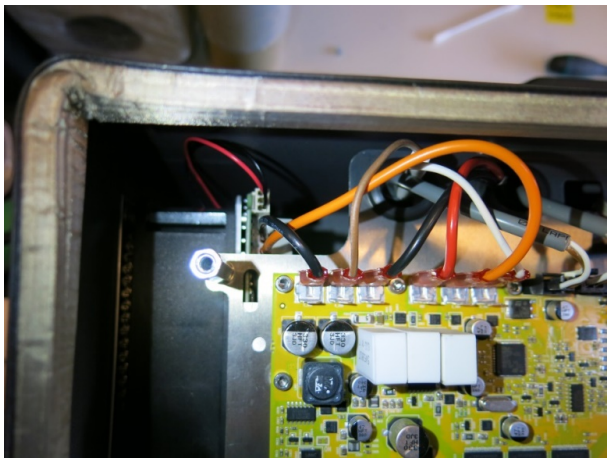
NOTE

Use the same procedure for power down and removing the aluminum cover plates as in chapter, Replacement of Motherboard 3.0, Replacement of Motherboard 3.1 or Replacement of Safety Control Board

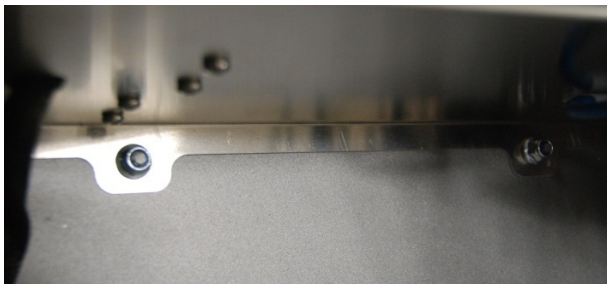
1. Remove teach pendent cable – see previous section
2. Detach the controller box handle by removing the 2 screws holding it in place.



3. Disconnect the 2 wires for the energy eater and fan.

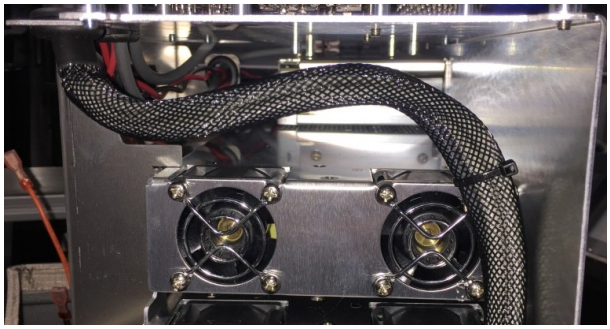


4. Remove the 2 nuts (M6) in the bottom of controller module.

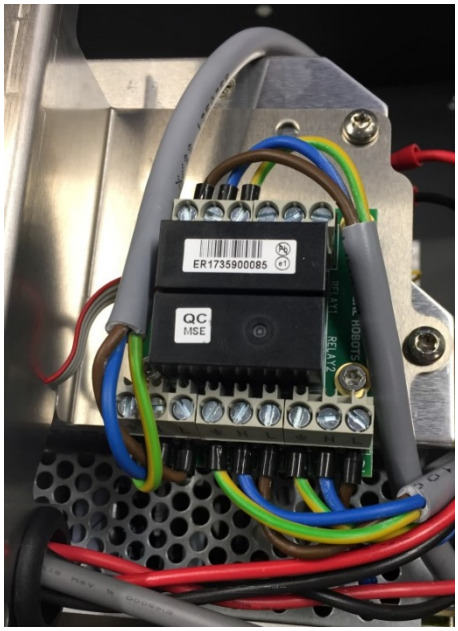


5. Gently take out the controller module from the controller box.
6. Turn the module 90° counterclockwise and place it on the controller edge.

7. Cut the cable tie that tied to the robot cable, unplug the connectors from the Safety Control Board and remove the cable.

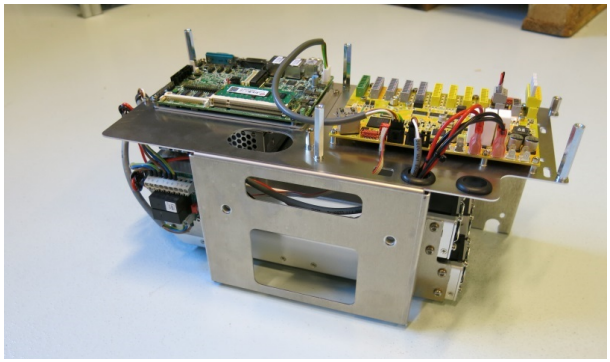


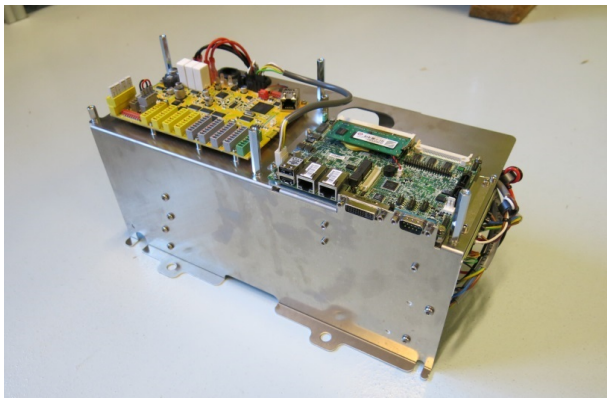
8. Turn the module 180° clockwise and place it on the controller edge.
9. Remove the power connection on the current distributor.
   The module is not loose from the controller.



10. Power supplies are located in the rack under the controller module, the two 48V power supplies are the lower ones in the rack (UR3 and UR5 has one and UR10 has two 48V power supplies).
    Before removing the 48V power supply, label the wires then disconnect them from that supply.

11. Remove the screws keeping the defective 48V power supply in place from the side of the rack.





12. Replace the defect 48V power supply with the new one.
13. Reconnect the wires for the 48V power supply.
14. Reinstall controller module in reverse order and reconnect the 2 wires for the fan and cables for the teach pendant.
15. Carefully put back the aluminum cover plate, making sure to mount it correctly and fix into place with the screws.
16. Connect power and verify that teach pendant works properly.

Merge Control Box

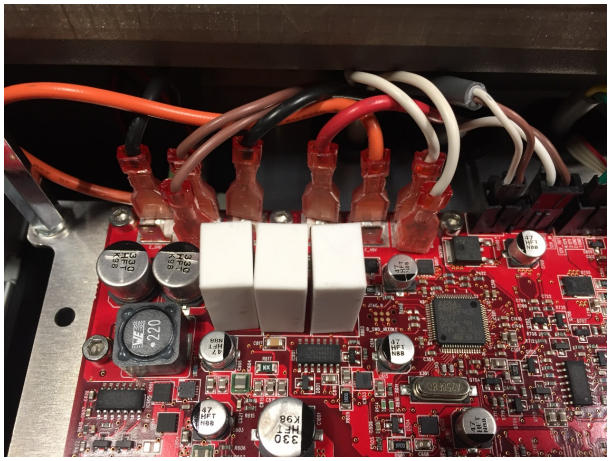
> **WARNING**
>
> Before replacing ANY components inside the control box, it is IMPORTANT to do a complete shutdown.
> Follow the first 3 steps in section Complete rebooting sequence.

When completing the following replacement, please follow the guidelines laid out in section Handling ESD-sensitive parts

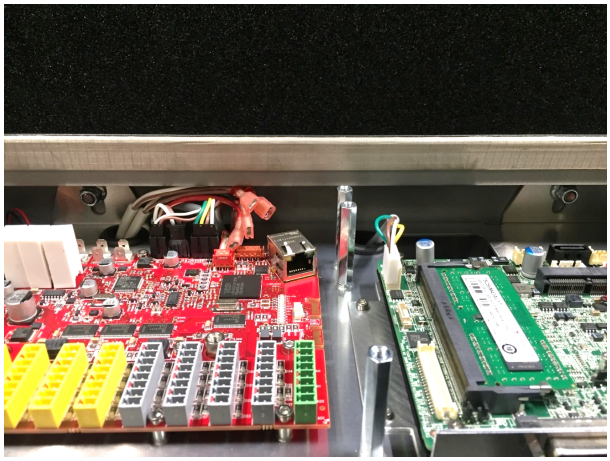
To replace 48V power supply in controller box:

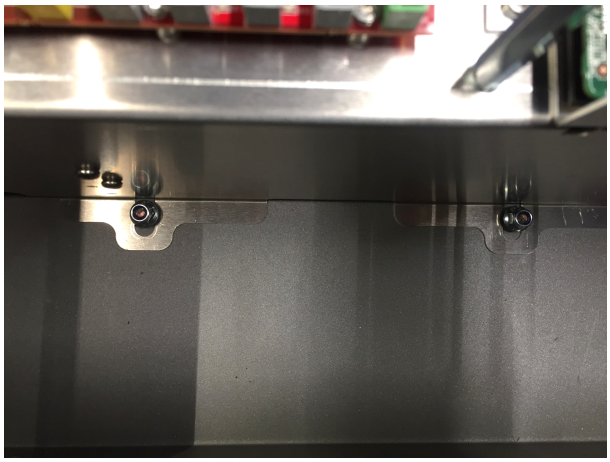
> **NOTE**
>
> Use the same procedure for power down and removing the aluminum cover plates as in chapter, Replacement of Motherboard 3.0, Replacement of Motherboard 3.1 or Replacement of Safety Control Board

1. Remove teach pendent cable – see previous section
2. Disconnect all the marked wires from the SCB.

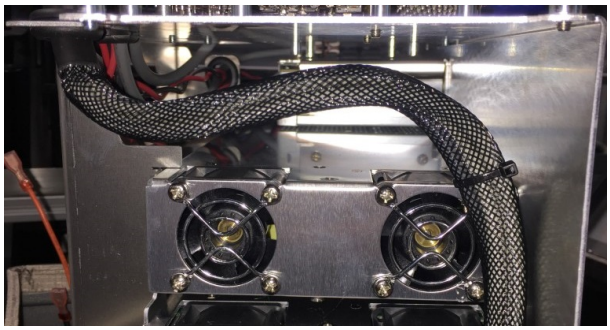


3. Remove the 4 nuts (M6) in the top and bottom of controller module.



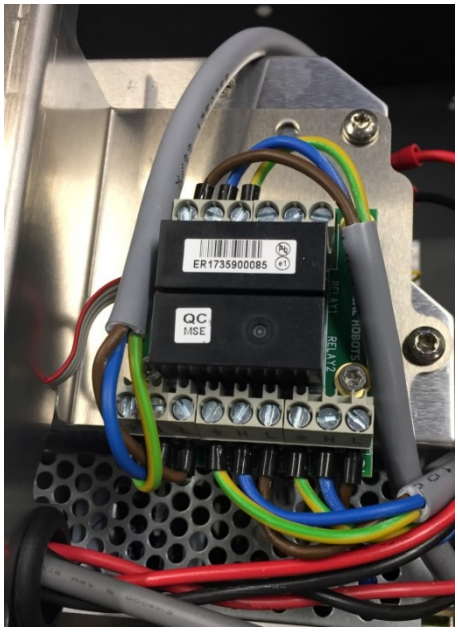


4. Gently take out the controller module from the controller box.
5. Turn the module 90° counterclockwise and place it on the controller edge.
6. Cut the cable tie that ties the robot cable, unplug the connectors from the Safety Control Board and remove the cable.

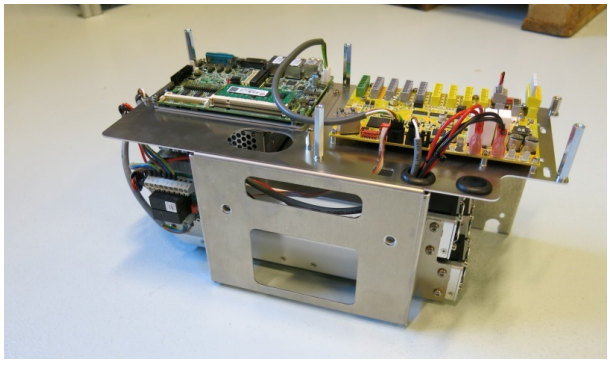


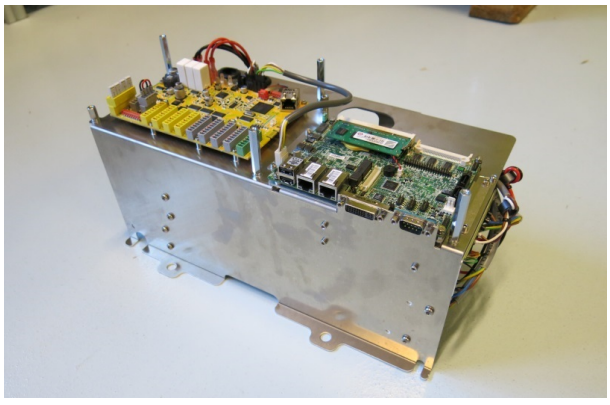
7. Turn the module 180° clockwise and place it on the controller edge.

8. Remove the power connection on the current distributor.
   The module is now loose from the controller.



9. Power supplies are located in the rack under the controller module, the two 48V power supplies are the lower ones in the rack (UR3 and UR5 has one and UR10 has two 48V power supplies).
   Before removing the 48V power supply, label the wires then disconnect them from that supply.
10. Remove the screws keeping the defective 48V power supply in place from the side of the rack.





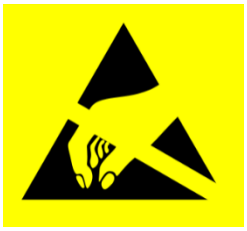
11. Replace the defect 48V power supply with the new one.

12. Reconnect the wires for the 48V power supply.
13. Reinstall controller module in reverse order attached all wire and mount the 4 bolts with 2,25 Nm.
14. Carefully put back the aluminum cover plate, making sure to mount it correctly and fix into place with the screws.
15. Connect power and verify that teach pendant works properly.

5.3.7. Replacement of 12V power supply

> **WARNING**
>
> Before replacing ANY components inside the control box, it is IMPORTANT to do a complete shutdown.
> Follow the first 3 steps in section Complete rebooting sequence.

When completing the following replacement, please follow the guidelines laid out in section Handling ESD-sensitive parts

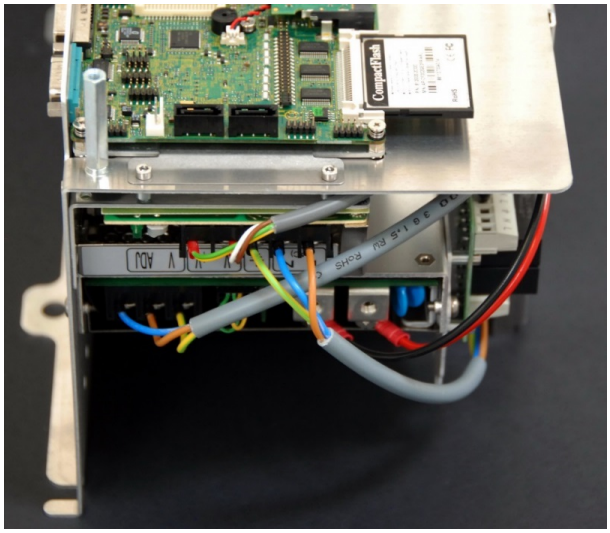


To replace 12V power supply in controller box

> **NOTE**
>
> Use the same procedure for power down and removing the aluminum cover plate and cables for teach pendant as in chapter Replacement of Teach Pendant

To replace the 12V power supply follow the same steps as for the procedure in chapter Replacement of 48V power supply

1. The 12V power supply is placed in the top of the rack. The screws holding it in the frame are at the sides.

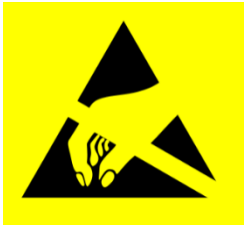


2. Replace 12V power supply with new one.
3. Reconnect the wires for the 12V power supply.
4. Re-install controller module in reverse order and connect the 2 wires for the fan and cables for the teach pendant.
5. Carefully put back the aluminum cover plate, make sure to mount it correctly and fix it in place with the 5 screws.
6. Connect power and verify that teach pendant functions correctly.

5.3.8. Replacement of Current distributor

> **WARNING**
>
> Before replacing ANY components inside the control box, it is IMPORTANT to do a complete shutdown.
> Follow the first 3 steps in section Complete rebooting sequence.

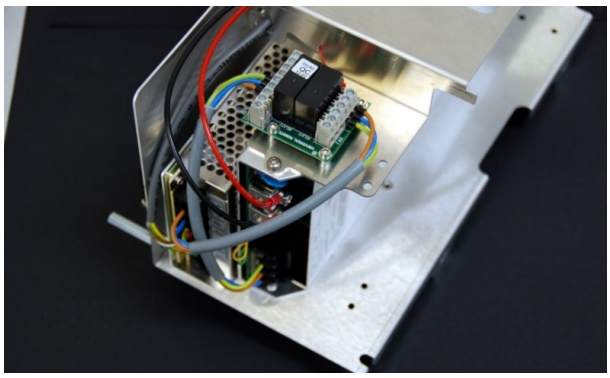
When completing the following replacement, please follow the guidelines laid out in section Handling ESD-sensitive parts



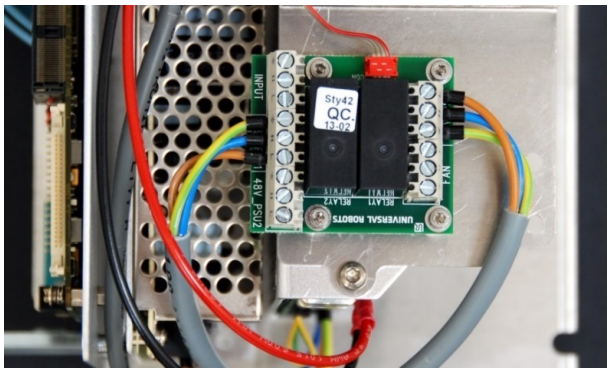
> **NOTE**
>
> To replace the current distributor, follow the same steps as for the procedure in chapter Replacement of 48V power supply

How to replace current distributor in controller box:

1. Current distributor is placed on top of the rack.



2. Before dismounting the current distributor, mark and disconnect the cables from the circuit board.



3. Replace current distributor with new one.
4. Reconnect the wires for the current distributor.
5. Re-install controller module in reverse order and connect the 2 wires for the fan and cables for the teach pendant.
6. Carefully put back the aluminum cover plate, make sure to mount it correctly and fix it in place with the 5 screws.
7. Connect power and verify that teach pendant functions correctly.

6. Software

6.1. Update software

Universal Robots software is named PolyScope.

> **NOTICE**
>
> Read the complete section prior to updating your software.
> Controller power MUST NOT be turned off during software update process.
> Universal Robots assume no responsibility for any failed update caused by improper operation.

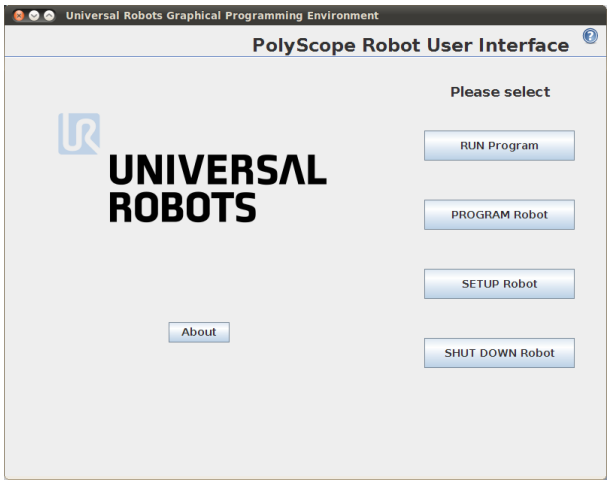
Updating the software may cause changes to some functionality. Always check with the release notes on the Universal Robots support site.www.universal-robots.com/support/

1. Do not downgrade the software to earlier version than the version the robot was produced with.
2. We advise you only to update, if you can benefit from the new features or the fixed issues.
3. We advise you to thoroughly read the release notes before performing an update, to avoid unexpected behavior, caused by changed or added functionality.
4. In case of concerns related to your actual or planned applications, please contact your supplier for advice and assistance.

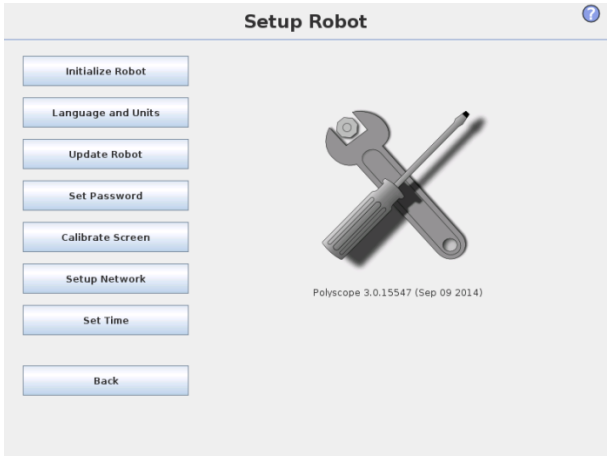
Instructions to update software:

1. Download software update. When updating, it must be done in steps i.e. from 3.3 to 3.4 to 3.5.
2. Save it in the root folder on a USB-stick.
3. Insert USB-stick into USB-connector on right-hand side of teach pendant.

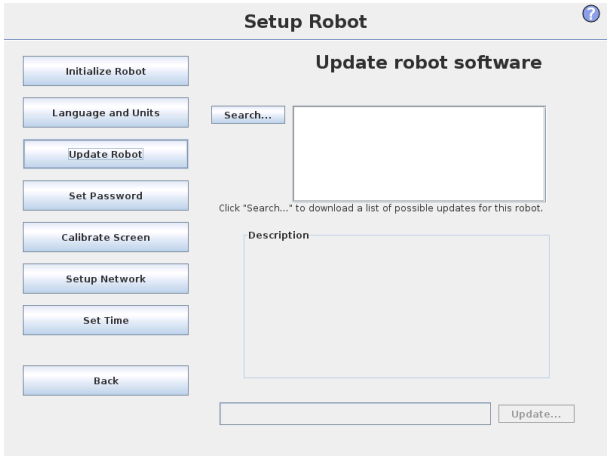
4. Go to main screen of PolyScope.



5. Press *SETUP Robot*.
6. In left side menu, select *Update Robot*.



7. Press button *Search* to search for software update files on USB-stick.



8. Select the desired software update and press *UPDATE*.

9. Press YES to update the software.
10. Wait for update too complete, after successful update controller will automatically reboot.
11. Remove USB-stick and initialize the robot.

6.2. Update joint firmware

> **NOTICE**
>
> Read the complete section prior to updating your firmware.
> Controller power MUST NOT be turned off during firmware update process.
> Universal Robots assume no responsibility for any failed update caused by improper operation.

Software version 3.1.16828 and newer:

When the software is updated on a robot the firmware is **automatically** updated.

After replacement of a joint on a robot the firmware is **automatically** updated.

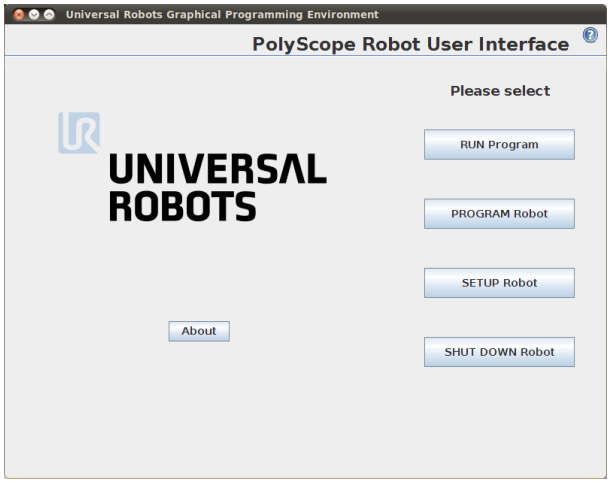
Software version before 3.1.16828:

Instructions for updating firmware:

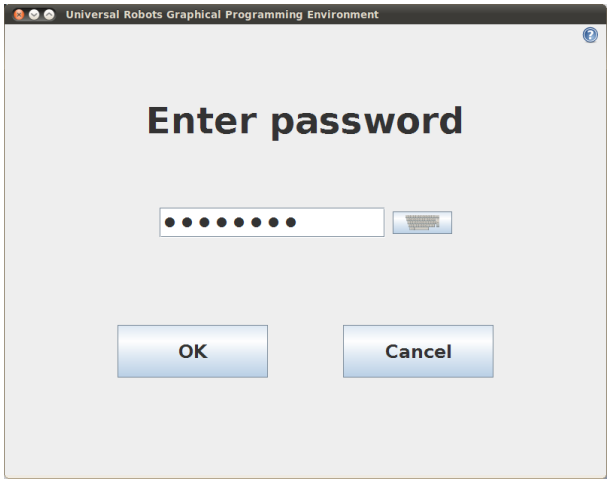
Prior to updating firmware, robot software must be updated.

Please refer to chapter Update software. When updating robot software, the firmware will automatically be copied to a folder on the controller.

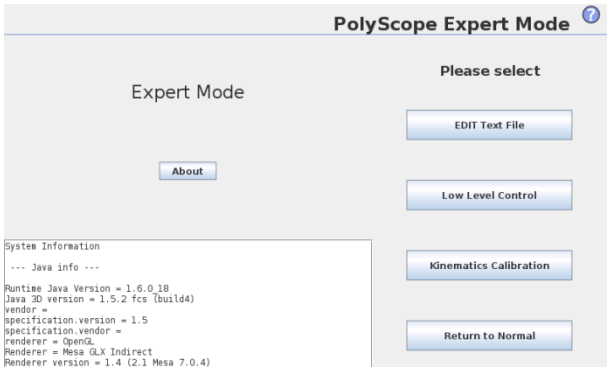
1. Swipe from left to right across the UNIVERSAL ROBOTS logo on main screen of PolyScope.



2. Enter password *lightbot* and press OK.

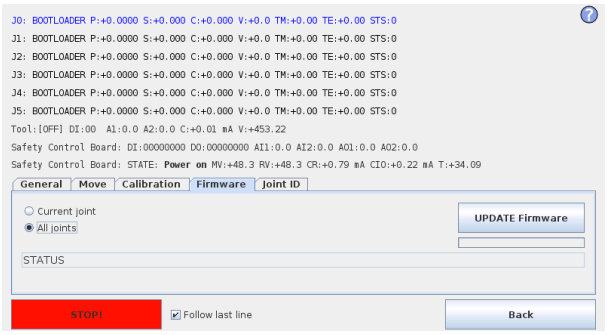


3. You are now in Expert Mode, press Low Level Control.

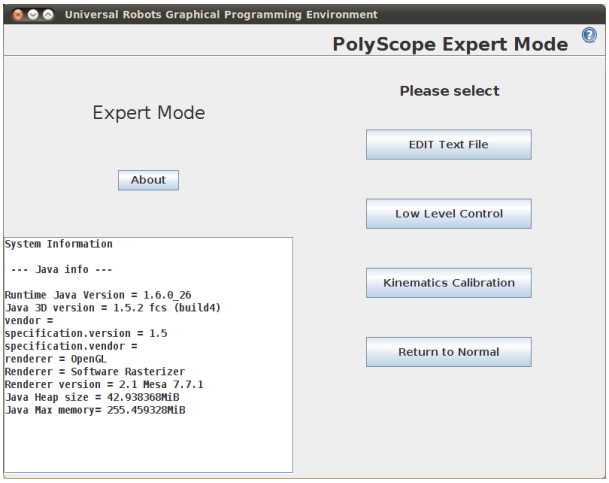


4. Press Turn power on to go into BOOTLOADER

5. Select the Firmware tab, mark All joints and press UPDATE Firmware.



6. Firmware update is being processed, await message that robot firmware updated successfully.
   Controller MUST NOT be powered off during this update.
7. After successful update, press Back.
8. Back in Expert Mode, press Return to Normal.



9. Firmware has now been updated

6.3. Using Magic files

For easy backup, Universal Robots provides Magic files to automatically copy data from controller to USB-stick.

These files are available	Function
URmagic log file	Copies the entire log history file to USB-stick
URmagic backup programs	Copies all programs and installation files to USB-stick
URmagic configuration files	Copies all configuration files to USB-stick
URmagic upload programs	Copies all programs and installation files from USB-stick
URmagic screenshot	Generates a screenshot of GUI when USB-stick is inserted

Go to www.universal-robots.com/support/ to download Magic files.

Instruction for using Magic files.

1. Download Magic file.
2. Save it in the root folder on a USB-stick.
   If more than one Magic file is on USB-stick, they will be run in sequence; the warnings will then appear for each file. Do not remove the USB-stick until after the last file has been run. Multiple folders will be created and named with serial number plus a sequential no, e.g. 201430xxxx_0, 201430xxxx_1etc.
3. Insert USB-stick into USB-connector on right-hand side of teach pendant.
4. After a few seconds a red **! USB !** -sign will appear on the screen, this is a warning not to remove the USB-stick, while the file will do its magic.
5. Await a green **<- USB** -sign appears on the screen, if there is more than one Magic file on the USB-stick then go to step 4.
6. After the last Magic file is completed the USB-stick can be safely removed.
7. Remove USB-stick and the process is complete.

The Magic file creates a folder on USB-stick named with the serial number of the robot.

6.4. Backup of data

> **NOTICE**
> When copying/moving files and folders, incorrect action might corrupt the file system.

This section explains the process of moving required files when upgrading from motherboard with compact flashcard to motherboard with USB.

6.4.1. Hardware Requirements

Compact Flash Card from the old motherboard

A standard flash card reader that can read the CF-card (not included in motherboard upgrade kit).

The USB stick from the motherboard upgrade kit

Part no. 122430 (CB3.0 to CB3.1 upgrade kit)

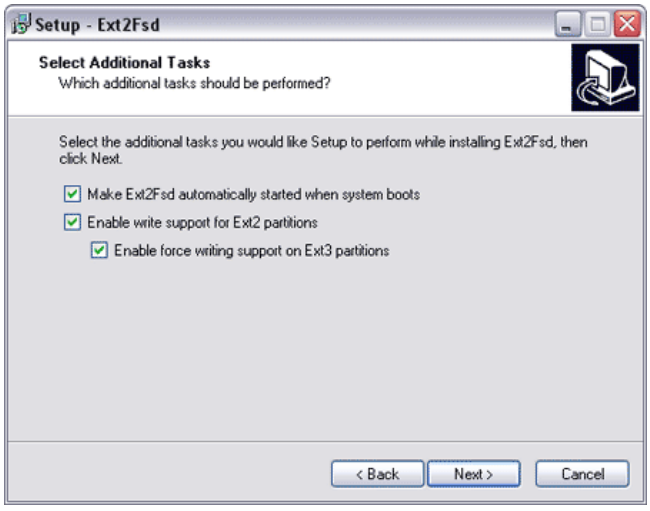
6.4.2. Software Requirements

A Linux software file system driver is required; Universal robots recommend the free Linux-partition driver Ext2Fsd but other windows Linux reader can be used as well (these are however not tested by Universal Robots).

6.4.3. How to Access Linux Partition from Windows

Download and install Ext2Fsd.

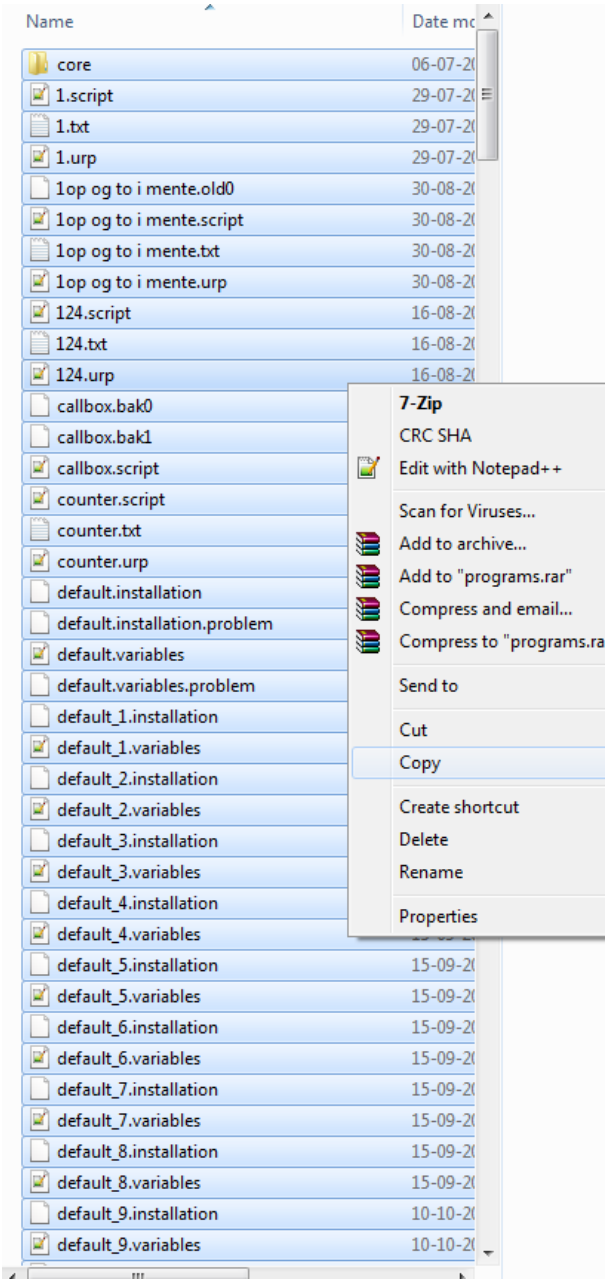
Ensure to enable Read and Write Support for Ext2 and Ext3.



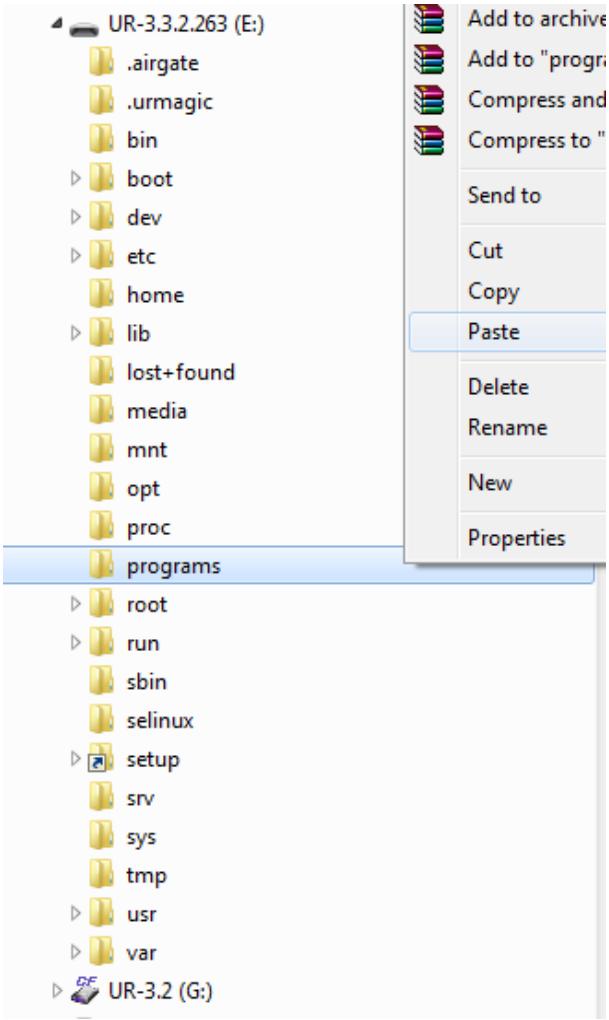
Reboot the computer to allow the changes to take effect.

6.4.4. Copy the data from CF-card to UR-USB

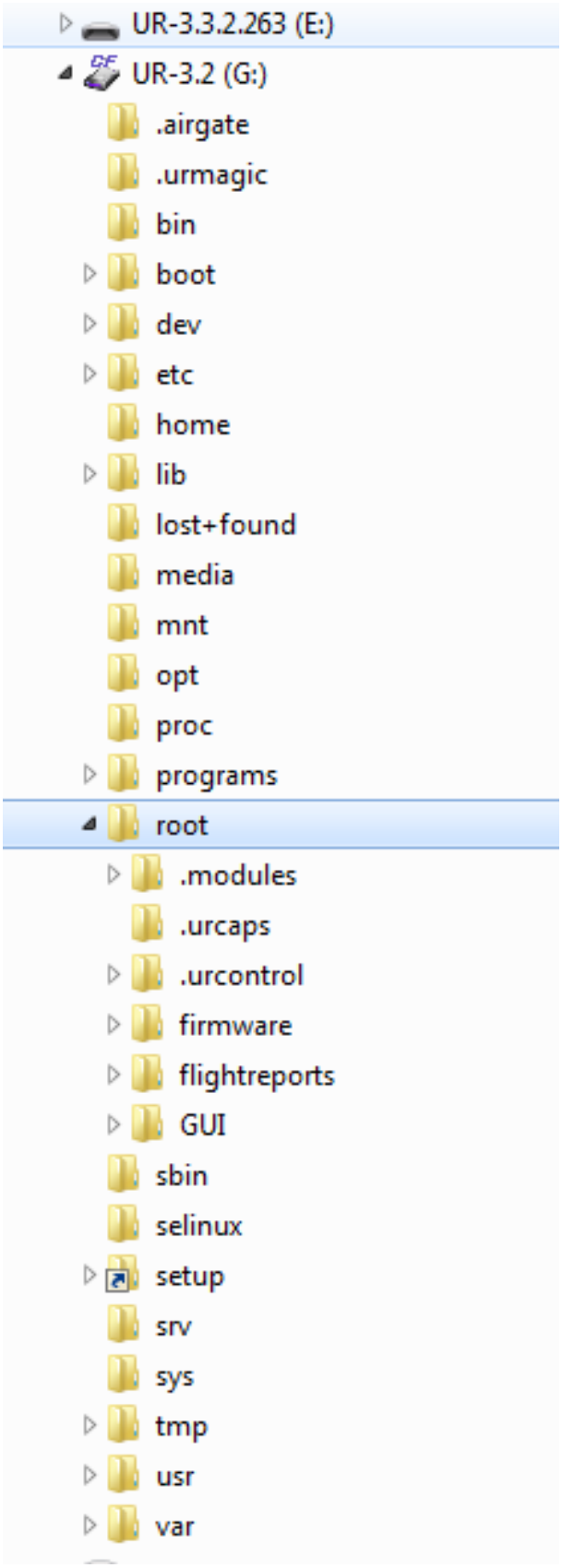
1. Take CF-card from control box and insert the CF-card in card reader and the UR-USB in one of the computers USB ports.
2. CB3:
   Open windows explorer navigate to the CF-card open the folder “programs”, select all the files in the folder, right click and select Copy.



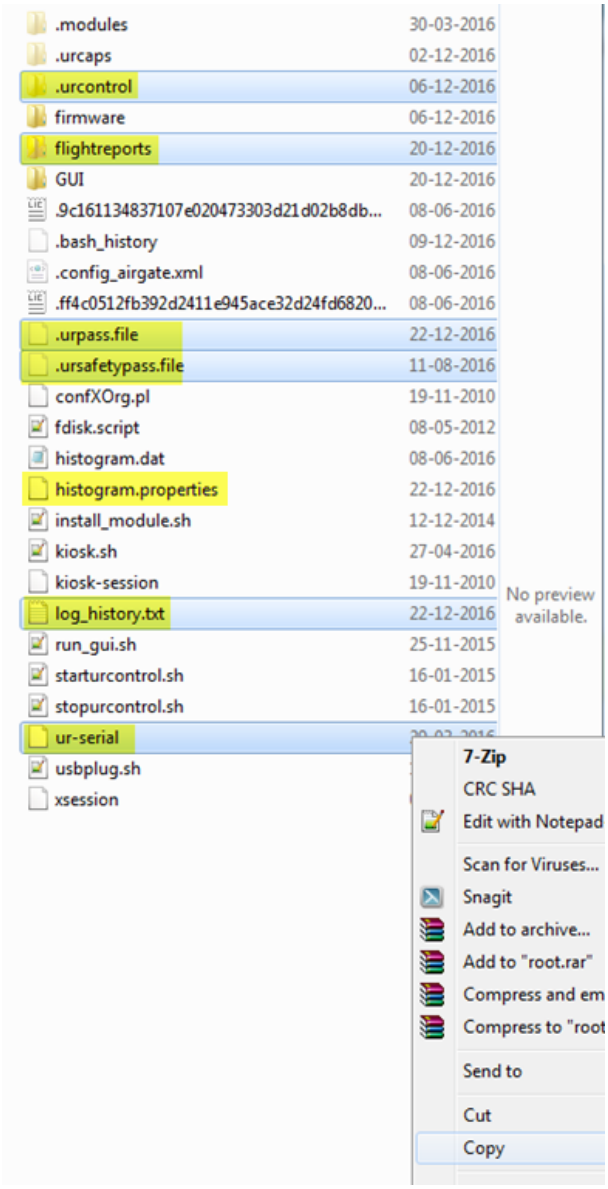
3. Navigate to the UR-USB right-click on the folder “programs” and select Paste.



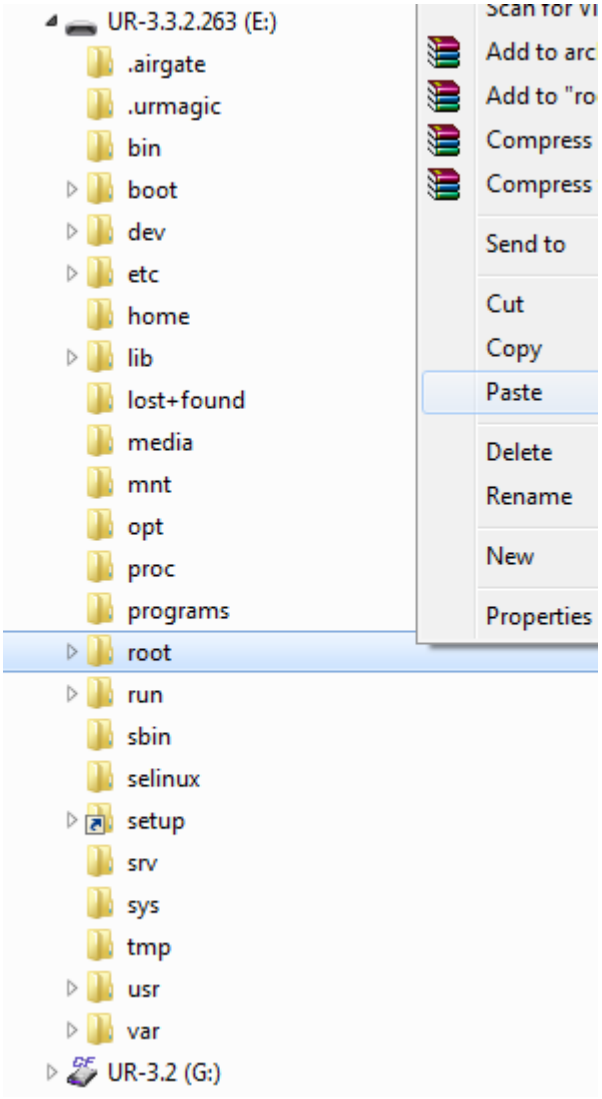
4. Navigate to the root folder on the CF-Card



5. In the root folder view select the folders and files highlighted in yellow, then right-click and select Copy.
   If the .urpass.file or .ursafetypass.file is not visible on the CF-card, then the files don't need to be saved

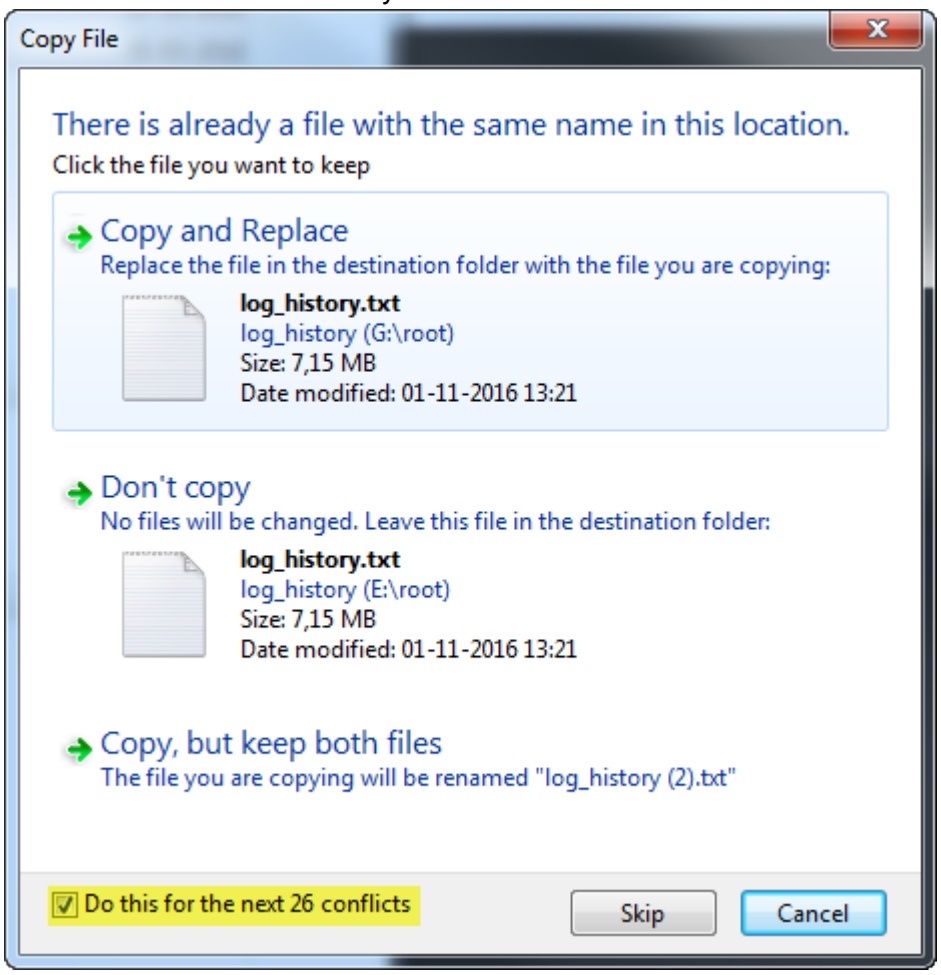


6. Navigate to the UR-USB right-click on the folder root and select paste.



7. A prompt will popup when the files are being copied, in the prompt choose Copy and replace.

8. Check the checkbox marked yellow.



9. All required files are copied. UR-USB can now be inserted in new motherboard and booted

7. Troubleshooting

In the error codes, different words have been used for the same thing:

- On the Safety Control Board: Processor A = A uP = SafetySys1
- On the Safety Control Board: Processor B = B uP = SafetySys2

Abbreviations in the troubleshooting chapter

PSU = Power Supply

PC = Controller

Open log files with Support Log Reader(SLR).

Go to www.universal-robots.com/support/ to download Support Log Reader

7.1. Error code

- On the Safety Control Board: Processor A = A uP = SafetySys1
- On the Safety Control Board: Processor B = B uP = SafetySys2
- PSU = Power Supply
- PC = Controller
- LVD = Low Voltage Detected

Error code	Description	Explanation	Suggestion
C0A	No error	Communication established	Log entry only, no issue
C1A1	Buffer of stored warnings overflowed		
C1A2	Outbuffer to RS485 overflowed (problem with Controller message)		
C2A	Inbuffer overflow		
C3A	Processor overloaded		Review program or remove some external controls and communications

C4A1	Lost communication with Controller	Communication is being interfered	a) Check Ethernet cable between Control Board and Motherboard, check that a script or UR+ software is not overloading the communication between the Control Board and Motherboard. b) Check cable between controller and robot b) Do a Complete rebooting sequence. c) Update the software
C4A2	Lost communication with Safety Control Board A uP		a) Check TCP/IP connection between Motherboard and Control Board. b) Do a Complete rebooting sequence. c) Replace Safety Control Board
C4A3	Communication with Safety Control Board B uP lost		Same as C4A2
C4A4	Communication with primary Teach Pendant uP lost		a) Check RS485-12V connection between Motherboard and Teach Pendant. b) Do a Complete rebooting sequence. c) Replace Teach Pendant
C4A5	Communication with secondary Teach Pendant uP lost		Same as C4A4
C4A6	Communication with primary EUROMAP67 uP lost		a) Check Euromap67 connection between Motherboard and Teach Pendant. b) Do a Complete rebooting sequence. c) Replace Teach Pendant
C4A7	Communication with secondary EUROMAP67 uP lost		Same as C4A6

C4A8	Primary EUROMAP67 uP present, but euromap67 is disabled	Incorrect safety configuration	a) Update the miscellaneous settings in the Safety Configuration. b) Do a Complete rebooting sequence
C4A9	Secondary EUROMAP67 uP present, but euromap67 is disabled	Incorrect safety configuration	Same as C4A8
C4A10	Primary Teach Pendant present, but Teach Pendant safety is disabled	Incorrect safety configuration	Same as C4A8
C4A11	Secondary Teach Pendant uP present, Teach Pendant safety is disabled	Incorrect safety configuration	Same as C4A8
C4A12	Communication with joint 0 lost	More than 1 package lost	a) Verify that the communication cables are connected properly. b) Do a Complete rebooting sequence
C4A13	Communication with joint 1 lost	More than 1 package lost	Same as C4A12
C4A14	Communication with joint 2 lost	More than 1 package lost	Same as C4A12
C4A15	Communication with joint 3 lost	More than 1 package lost	Same as C4A12
C4A16	Communication with joint 4 lost	More than 1 package lost	Same as C4A12
C4A17	Communication with joint 5 lost	More than 1 package lost	Same as C4A12
C4A18	Communication with tool lost	More than 1 package lost	Same as C4A12
C4A65	Lost package from Primary Teach Pendant	1 package lost	Same as C4A12
C4A66	Lost package from Secondary Teach Pendant	1 package lost	Same as C4A12

C4A67	Lost package from Primary Euromap67	1 package lost	Same as C4A12
C4A68	Lost package from Secondary Euromap67	1 package lost	Same as C4A12
C4A69	Lost package from Secondary Masterboard	1 package lost	Same as C4A12
C4A70	Lost package from joint 0	Serial communication problem with one or more joints	Same as C4A12
C4A71	Lost package from joint 1	Serial communication problem with one or more joints	Same as C4A12
C4A72	Lost package from joint 2	Serial communication problem with one or more joints	Same as C4A12
C4A73	Lost package from joint 3	Serial communication problem with one or more joints	Same as C4A12
C4A74	Lost package from joint 4	Serial communication problem with one or more joints	Same as C4A12
C4A75	Lost package from joint 5	Serial communication problem with one or more joints	Same as C4A12
C4A76	Lost package from tool	Serial communication problem with one or more joints	Same as C4A12
C4A77	Lost package from uPA to joints	1 package lost	Same as C4A12
C4A78	Lost package from uPA to teach pendant	1 package lost	Same as C4A12
C4A79	Lost package from uPA to uPB	1 package lost	Same as C4A12
C4A80	Lost package from uPB	1 package lost	Same as C4A12
C4A81	Packet counter disagreement in packet from Primary Screen	Safety processor 1 in Teach Pendant has a packet disagreement	Same as C4A12

C4A82	Packet counter disagreement in packet from Secondary Screen	Safety processor 2 in Teach Pendant has a packet disagreement	Same as C4A12
C4A83	Packet counter disagreement in packet from Primary Euromap67	More than 1 package lost	Same as C4A12
C4A84	Packet counter disagreement in packet from Secondary Euromap67	More than 1 package lost	Same as C4A12
C4A85	Packet counter disagreement in packet from Safety Control Board B	More than 1 package lost	Same as C4A12
C4A86	Packet counter disagreement in packet from joint 0	More than 1 package lost	Same as C4A12
C4A87	Packet counter disagreement in packet from joint 1	More than 1 package lost	Same as C4A12
C4A88	Packet counter disagreement in packet from joint 2	More than 1 package lost	Same as C4A12
C4A89	Packet counter disagreement in packet from joint 3	More than 1 package lost	Same as C4A12
C4A90	Packet counter disagreement in packet from joint 4	More than 1 package lost	Same as C4A12
C4A91	Packet counter disagreement in packet from joint 5	More than 1 package lost	Same as C4A12
C4A92	Packet counter disagreement in packet from tool	More than 1 package lost	Same as C4A12
C4A93	Packet counter disagreement in packet from processor A to joints	More than 1 package lost	Same as C4A12

C4A94	Packet counter disagreement in packet from processor A to B	More than 1 package lost	Same as C4A12
C4A95	Packet counter disagreement in packet from processor A to Teach Pendant and EUROMAP	More than 1 package lost	Same as C4A12
C4A100	Communication lost due to Packet counter disagreements	More than 1 package lost	Same as C4A12
C5A	Heavy processor load warning	Too much instructions being sent at the same time	Review communication frequency between robot and external equipment
C10A	Controller communication issue		
C10A1	Lost packet from Controller		
C10A101	Controller packet received too early		
C10A102	Packet counter does not match		
C10A103	Controller is sending packets too often		
C11A	Bad CRC	Serial communication problem with joint	Check black 2-wire connectors and wires in joints
C12A	Unknown message error		
C14A1	Debug message		
C14A2	Debug message		
C14A3	Debug message		
C17A	Communication error between Safety Control Board and Motherboard		a) Check Ethernet connection between circuit boards b) Do a Complete rebooting sequence c) Update the software

C25A	Motor Encoder index missing	Joint's encoder system mechanical problem	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace joint c) Contact your local UR provider
C26A	Motor Encoder index drift detected	Joint's encoder system mechanical problem	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace joint c) Contact your local UR provider
C27A	Calibration data is invalid or does not exist.	Calibration needed	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace joint
C29A	Online Calibration data checksum failed		a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace joint
C30A	Master received data from too many joints		
C31A	Caught wrong message (not from master)	Serial communication problem with joint	Check black 2-wire connectors and wires on joints
C32A	Flash write verify failed		
C33A	Calibration flash checksum failed		
C34A	Program flash checksum failed		Update Firmware
C34A0	Program flash checksum failed during bootloading		Update Firmware
C34A1	Program flash checksum failed at runtime		Update Firmware
C35A	Joint ID is undefined		

C36A	Illegal bootloader command		
C37A	Inbuffer parse error	Serial communication problem with joint	Check black 2-wire connectors and wires on joints
C38A	Online RAM test failed		Check the log file for what item is reporting this error. Replace the reported item
C38A1	Data-bus test failed		
C38A2	Address-bus stuck-high test failed		
C38A3	Address-bus stuck-low test failed		
C38A4	Address-bus shorted test failed		
C38A5	Memory-cell test failed		
C39A	Logic and Temporal Monitoring Fault		
C39A1	Max current deviation failure		a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace joint
C39A2	Max joint-encoder speed exceeded		Same as C39A1
C39A3	Max motor-encoder speed exceeded		Same as C39A1
C39A4	Illegal state change in joint detected		Same as C39A1
C39A5	A timing issue occurred during startup.	Too fast state change in joint detected	Same as C39A1
C39A6	5V regulator voltage too low		Same as C39A1
C39A7	5V regulator voltage too high		Same as C39A1
C39A100	Watchpoint fault: ADC task timeout		Same as C39A1

C39A101	Watchpoint fault: Motor-Control task timeout		Same as C39A1
C39A102	Watchpoint fault: Motor-encoder task timeout		Same as C39A1
C39A103	Watchpoint fault: Joint-encoder task timeout		Same as C39A1
C39A104	Watchpoint fault: Communication task timeout		Same as C39A1
C39A105	Watchpoint fault: RAM-test task timeout		Same as C39A1
C39A106	Watchpoint fault: CalVal-test task timeout		Same as C39A1
C39A107	Watchpoint fault: ROM-test task timeout		Same as C39A1
C40A	AD-Converter hit high limit joint	EMC issue external or electronics internal	Check grounding and shielding for EMC problems
C41A	RC Oscillator Trim register hit high limit		
C42A	RC Oscillator Trim register hit low limit		
C43A	Change in invariant memory detected		
C43A1	Current sensor gain		
C44A	CRC check failure on primary bus	Serial communication problem with joint or secondary bus node	a) Check black 2-wire connectors and wires in joints. b) Do a Complete rebooting sequence. c) If this happens more than two times in a row, contact your local service provider for assistance.
C44A0	Base		
C44A1	Shoulder		

C44A2	Elbow		
C44A3	Wrist 1		
C44A4	Wrist 2		
C44A5	Wrist 3		
C44A6	Tool		
C44A80	CRC Check failure on primary bus.	Interference on the communication field bus.	
C45A	AD-Converter error		
C46A	Loose gearbox or bad encoder mounting	Mechanical problem in gear related to encoder mounting	a) Do a Complete rebooting sequence b) If this happens more than two times in a row, replace joint
C47A	AD-Converter hit low limit	EMC issue external or electronics internal	Check grounding and shielding for EMC problems
C49A	RS485 receive warning		
C49A200	Secondary RS485 bus is down	Bus for: Teach Pendant, Processor A and Processor B on Control Board	Check TCP/IP-12V cable to Teach Pendant
C50A	Robot powerup issue	Electrical error control box	Remove all external connections to I/O-interface of Safety Control Board. Check for short circuit
C50A1	Voltage detected at 24V rail before startup		
C50A2	Voltage present at unpowered robot		
C50A5	Powersupply voltage too low		Check 48 V cable between power supply and Control Board
C50A6	Powersupply voltage too high		
C50A11	Voltage not detected at 24V rail after startup		
C50A15	Warning, waiting for SafetySYS2		

C50A16	The Teach Pendant does not respond	Loose wire or incorrect safety configuration	a) Check the Teach Pendant cable and connections. b) Check the settings in the miscellaneous tab in the Safety menu
C50A17	The Euromap67 interface does not respond	Loose wire or incorrect safety configuration	a) Check the Euromap67 cable and connections. b) Check the settings in the miscellaneous tab in the Safety menu
C50A18	Warning, waiting for SafetySYS1	SafetySYS1 = Processor A on Safety Control Board	
C50A19	Warning, Waiting for a valid "euromap67 activated" status bit from secondary Safety Control Board		
C50A20	5V, 3V3 or ADC error (5V too high)		
C50A21	5V, 3V3 or ADC error (5V too low)		
C50A22	Robot current sensor reading too high		
C50A23	Robot current sensor reading too low		
C50A24	48V not present (Check internal connection)		
C50A25	Robot voltage present at 48V PSU powereup		
C50A26	Voltage present on unpowered 48V power supply		
C50A27	12V, 3V3 or ADC error (12V too high)		
C50A28	12V, 3V3 or ADC error (12V too low)		
C50A29	Analog I/O error (-12V too high)		
C50A30	Analog I/O error (-12V too low)		

C50A31	The other safetySYS do not initialize		
C50A40	Wrong voltage from PSU1		
C50A41	Wrong voltage from PSU2		
C50A42	Voltage will not disappear from PSU		
C50A43	Warning, waiting for CB2 type answer from primary processor		
C50A50	Processor A 3.3V supply voltage out of bounds		
C50A51	Robot voltage below threshold		
C50A52	Robot voltage above threshold		
C50A53	58V generator deviation error		
C50A54	5V regulator too low		
C50A55	5V regulator too high		
C50A56	-4V generator too low		
C50A57	-4V generator too high		
C50A80	Last CPU reset caused by Low-Power-Reset		
C50A81	Last CPU reset caused by Window-Watchdog-Reset		
C50A82	Last CPU reset caused by Independent-Watchdog-Reset		
C50A83	Last CPU reset caused by Software-Reset	The Control Board was reset on explicit request.	

C50A84	Last CPU reset caused by External-Pin-Reset		
C50A85	Last CPU reset caused by Brown-Out-Reset		
C50A99	Wrong software on PCB		
C50A100	Cable not connected		Check cable and connections between robot and control box
C50A101	Short circuit in robot detected or wrong robot connected to control box		Check robot type. Look for short circuit in cable and in robot arm
C50A102	Voltage rising too slowly		
C50A103	Voltage failed to reach acceptable level		
C50A104	The IMMI module does not respond		
C51A	CRC check failure on secondary bus		
C51A0	Processor B		
C51A1	Primary screen processor	CRC check failure on safety processor 1 in Teach Pendant	
C51A2	Secondary screen processor	CRC check failure on safety processor 2 in Teach Pendant	
C51A3	Primary E67		
C51A4	Secondary E67		
C53A	IO overcurrent detected	Control Board error	Remove all external connections to I/O-interface of Safety Control Board. Check for short circuit
C53A1	IO Overcurrent detected. Max is 800mA		

C53A2	IO Overcurrent detected. Max is 600mA		
C55A	Safety system error	Safety system malfunction	a) Check Motherboard, Control Board, Screenboard, Current distributor (Euromap, if installed). b) Check safety devices and cables/connections to these devices. c) Do a Complete rebooting sequence
C55A23	Safety relay error (minus connection)	Current distributor error	a) Check cable from Control Board to Current distributor or 48V Power supply and Current distributor for issues b) Do a Complete rebooting sequence
C55A24	Safety relay error (plus connection)	Current distributor error	a) Check cable from Control Board to Current distributor or 48V Power supply and Current distributor for issues b) Do a Complete rebooting sequence
C55A33	Safety relay error (a relay is stuck)	Current distributor error	a) Check cable from Control Board to Current distributor or 48V Power supply and Current distributor for issues b) Do a Complete rebooting sequence
C55A34	Safety relay error (relays are not on)	Current distributor error	a) Check cable from Control Board to Current distributor or 48V Power supply and Current distributor for issues b) Do a Complete rebooting sequence
C55A50	Voltage present at unpowered robot	Safety Control Bord hardware fault	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Control Board

C55A51	Voltage will not disappear from robot	Safety Control Bord hardware fault	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Control Board
C55A52	5V, 3V3 or ADC error (5V too low)	Safety Control Bord hardware fault	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Control Board
C55A53	5V, 3V3 or ADC error (5V too high)	Safety Control Bord hardware fault	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Control Board
C55A90	Bootloader error, robot voltage too low or current too high		
C55A91	Bootloader error, robot voltage too high		
C55A100	Safety violation		
C55A101	Safety Channel Error In Safety Control Board		
C55A102	Safety Channel Error In Screen		
C55A103	Safety Channel Error In Euromap67 Interface		
C55A109	Received fault message from Controller		
C55A110	Safety State is changing too often		
C55A111	On/Off State is changing too often		
C55A112	Robot current sensors readings differ		

C55A120	Robot current is too high while emergency stopped		
C55A121	Robot current is too high while safeguard stopped		
C56A	Overvoltage shutdown	Voltage exceeded 55V	a) Check Energy Eaters cable and connections. b) Check Energy. c) Replace Energy Eater
C57A	Brake release failure		a) Check Brake, solenoid. b) Check TCP configuration, payload and mounting settings
C57A1	Joint did not move or motor encoder is not functioning		
C57A2	Large movement detected during brake release		
C57A3	Robot was not able to brake release, see log for details		
C58A	Motor encoder not calibrated		
C59A	Overcurrent shutdown	Overcurrent in joint. Argument = Current in Amps	a) Check for short circuit. b) Do a Complete rebooting sequence. c) If this happens more than two times in a row, replace joint
C60A	Energy surplus shutdown	The power supply is sending energy to the energy eater	a) Ensure power grid is not delivering more than 48V b) Measure robot energy input c) Contact your local Universal Robots service provider for assistance.
C61A	Idle power consumption to high	The system is drawing more power than expected while idle	a) Check Energy Eaters cables and connections b) Check Energy Eater c) Replace Energy Eater

C62A	Thermal issue		a) Check nothing is hindering free movement of the joints. b) Check TCP configuration, payload and mounting settings
C62A1	Joint temperature: High (80 C)		
C62A3	Warning: Static load too high		
C62A11	Joint temperature: Shut down (85 C)		
C62A13	Shutdown: Static load too high		
C63A	Motor test failed	Joint motor has a failure in a step	
C64A	Interface connection error		
C65A	PSU voltage to high	The power supply output voltage is above 48.7V	a) Ensure supply is not delivering more than 48V b) Contact support
C68A	SPI error	Joint: Absolut encoder on joint communication error	a) Check for short circuit. b) Do a Complete rebooting sequence. c) If this happens more than several times in a row, replace joint
C70A	Close to gearbox shear limit	Acceleration / deceleration to high. Mechanical problem in gear related to encoder mounting	a) Reduce acceleration in user program. b) Do a Complete rebooting sequence. c) If this happens more than several times in a row, replace joint
C71A	Startup check error		Check for the phases of motor in the joint. Update firmware
C71A0	Hardware is size0, wrong firmware at the joint		Update firmware
C71A1	Hardware is size1, wrong firmware at the joint		Update firmware

C71A2	Hardware is size2, wrong firmware at the joint		Update firmware
C71A3	Hardware is size3, wrong firmware at the joint		Update firmware
C71A4	Hardware is size4, wrong firmware at the joint		Update firmware
C71A5	Invalid hardware revision		
C71A6	ADC calibration failed		
C71A7	Unknown error result	The motor wires are damaged, bad connection in screw terminals or defect PCB	a) Check joint for damaged or loose connections. b) Replace the joint
C71A8	Motor short circuit to ground or H-bridge problems	The motor wires are damaged, bad connection in screw terminals or defect PCB	a) Check joint for damaged or loose connections. b) Replace the joint
C71A9	Motor indication signal does not work	The motor wires are damaged, bad connection in screw terminals or defect PCB	a) Check joint for damaged or loose connections. b) Replace the joint
C71A10	Phase 1 is unconnected or not working	The motor wires are damaged, bad connection in screw terminals or defect PCB	a) Check joint for damaged or loose connections. b) Replace the joint
C71A11	Phase 2 is unconnected or not working	The motor wires are damaged, bad connection in screw terminals or defect PCB	a) Check joint for damaged or loose connections. b) Replace the joint
C71A12	Phase 3 or multiple phases is unconnected or not working	The wire is (1) damaged or (2) has been disconnected from the PCB (not likely) or (3) defect PCB	a) Check joint for damaged or loose connections. b) Replace the joint
C71A50	Current sensor test failed	Sensor reported wrong current when probed	a) Check joint for damaged or loose connections. b) Replace the joint

C71A51	Current sensor test failed	Sensor reported wrong current when probed	a) Check joint for damaged or loose connections. b) Replace the joint
C71A52	Current sensor test failed	Sensors reported different currents when probed	a) Check joint for damaged or loose connections. b) Replace the joint
C71A101	Wrong firmware on RLS encoder		
C72A	Power Supply Unit failure		
C72A1	0 PSUs are active	Power Supply was not able to deliver 48V	Check power connection between power supply and Control Board
C72A2	1 PSU active, but we expect 2 (UR10)	Power Supply was not able to deliver 48V or UR10 flash card in UR5 robot	Check power connection between power supply and Control Board and check that the flash card and robot match
C72A3	2 PSUs active, but we expect 1 (UR5)	UR5 flash card in UR10 robot	Check that the flash card and robot match
C74A	Joint encoder warning	Magnetic encoder error (absolute encoder). Argument = sum of C74 errors	
C74A1	Invalid decode: Readhead misalignment, ring damaged or external magnetic field present.		Check grounding and shielding for EMC problems
C74A2	Speed reading is not valid		
C74A4	System error=malfunction or inconsistent calibration detected		
C74A8	Supply voltage is out of range		
C74A16	Temperature is out of range		

C74A32	Signal lost =Misaligned readhead or damaged ring		
C74A64	Signal low =Too far from magnetic ring		
C74A128	Signal saturation =Too close to magnetic ring		
C75A	Joint encoder error	Magnetic encoder error (absolute encoder). Argument = sum of C75 errors	Check encoder connections
C75A1	Invalid decode: Readhead misalignment, ring damaged or external magnetic field present.		a) Do a Complete rebooting sequence. b) Check grounding and shielding for EMC problems. c) If this happens more than two times in a row, replace joint
C75A2	Speed reading is not valid		a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace joint
C75A4	System error=malfunction or inconsistent calibration detected		a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace joint
C75A8	Supply voltage is out of range		
C75A16	Temperature is out of range		
C75A32	Signal lost =Misaligned readhead or damaged ring		a) Do a Complete rebooting sequence. b) Check grounding and shielding for EMC problems. c) If this happens more than two times in a row, replace joint

C75A64	Signal low =Too far from magnetic ring		a) Do a Complete rebooting sequence. b) Check grounding and shielding for EMC problems. c) If this happens more than two times in a row, replace joint
C75A128	Signal saturation =Too close to magnetic ring		a) Do a Complete rebooting sequence. b) Check grounding and shielding for EMC problems. c) If this happens more than two times in a row, replace joint
C75A200	Position from joint encoder does not change while motor is running		
C76A	Joint encoder communication CRC issue	Error between sensor and joint circuit	Check connections or very heavy electrical noise
C77A	Sudden position change detected on the joint-encoder	The position reading from the encoder was different than expected.	
C78A	Large sudden position change detected on the joint-encoder	The position reading from the encoder was severely different than expected, the latest measurement was discarded. The argument relates to the size of the position change.	
C85A200	Position from motor encoder does not change while motor is running		
C85A	Motor encoder error		
C100A	Robot changed mode	Status warning, general mode change	Check preceding errors in log history
C101A	Real Robot Connected		
C102A	Real Robot not connected – Simulating Robot		

C103A	Communication issue		
C103A1	Connection to Safety Control Board lost	PC did not receive 3 packets in a row	a) Check that the Ethernet cable between Motherboard and Control Board is connected. b) Do a Complete rebooting sequence
C103A2	Package lost from Safety Control Board		
C103A3	Ethernet connection initialization with Safety Control Board failed		
C104A	Error=Empty command sent to robot		
C111A	Something is pulling the robot		Check TCP configuration, payload and mounting settings
C115A	Unknown robot type	The robot type specified in the configuration is unknown	
C116A	Realtime part warning	Possible CPU-overload due to structure of user program	Restructure user program
C117A	Restart SCB failed	The Control Board couldn't be rebooted from the controller.	Do a Complete rebooting sequence
C150A	Protective Stop: Position close to joint limits		
C151A	Protective Stop: Tool orientation close to limits		
C152A	Protective Stop: Position close to safety plane limits		
C153A	Protective Stop: Position deviates from path		

C153A0	(base). Check payload, center of gravity and acceleration settings. Log screen may contain additional information.		Check payload, center of gravity and acceleration settings.
C153A1	(shoulder). Check payload, center of gravity and acceleration settings. Log screen may contain additional information.		Check payload, center of gravity and acceleration settings.
C153A2	(elbow). Check payload, center of gravity and acceleration settings. Log screen may contain additional information.		Check payload, center of gravity and acceleration settings.
C153A3	(wrist 1). Check payload, center of gravity and acceleration settings. Log screen may contain additional information.		Check payload, center of gravity and acceleration settings.
C153A4	(wrist 2). Check payload, center of gravity and acceleration settings. Log screen may contain additional information.		Check payload, center of gravity and acceleration settings.

C153A5	(wrist 3). Check payload, center of gravity and acceleration settings. Log screen may contain additional information.		Check payload, center of gravity and acceleration settings.
C154A	Protective Stop: Position in singularity	Robot cannot move linear near a singularity	Use MoveJ or change the motion
C155A	Protective Stop: Robot cannot maintain its position, check if payload is correct		
C156A	Protective Stop: Wrong payload or mounting detected, or something is pushing the robot when entering Freedrive mode	The robot may move unexpected due to wrong settings	Verify that the TCP configuration and mounting in the used installation is correct
C157A	Protective Stop: Collision detected by joint		
C157A0	(base). Check payload, center of gravity and acceleration settings. Log screen may contain additional information.		Make sure no objects are in the path of the robot and resume the program.
C157A1	(shoulder). Check payload, center of gravity and acceleration settings. Log screen may contain additional information.		Make sure no objects are in the path of the robot and resume the program.

C157A2	(elbow). Check payload, center of gravity and acceleration settings. Log screen may contain additional information.		Make sure no objects are in the path of the robot and resume the program.
C157A3	(wrist 1). Check payload, center of gravity and acceleration settings. Log screen may contain additional information.		Make sure no objects are in the path of the robot and resume the program.
C157A4	(wrist 2). Check payload, center of gravity and acceleration settings. Log screen may contain additional information.		Make sure no objects are in the path of the robot and resume the program.
C157A5	(wrist 3). Check payload, center of gravity and acceleration settings. Log screen may contain additional information.		Make sure no objects are in the path of the robot and resume the program.
C158A	Protective Stop: Collision detected by joint		
C158A0	(base). The user specified payload is 0kg, please make sure this is correct.	Specifying an incorrect payload mass and/or center of gravity may cause poor robot performance and/or protective stops.	Make sure the specified payload mass and center of gravity are correctly specified.

C158A1	(shoulder). The user specified payload is 0kg, please make sure this is correct.	Specifying an incorrect payload mass and/or center of gravity may cause poor robot performance and/or protective stops.	Make sure the specified payload mass and center of gravity are correctly specified.
C158A2	(elbow). The user specified payload is 0kg, please make sure this is correct.	Specifying an incorrect payload mass and/or center of gravity may cause poor robot performance and/or protective stops.	Make sure the specified payload mass and center of gravity are correctly specified.
C158A3	(wrist 1). The user specified payload is 0kg, please make sure this is correct.	Specifying an incorrect payload mass and/or center of gravity may cause poor robot performance and/or protective stops.	Make sure the specified payload mass and center of gravity are correctly specified.
C158A4	(wrist 2). The user specified payload is 0kg, please make sure this is correct.	Specifying an incorrect payload mass and/or center of gravity may cause poor robot performance and/or protective stops.	Make sure the specified payload mass and center of gravity are correctly specified.
C158A5	(wrist 3). The user specified payload is 0kg, please make sure this is correct.	Specifying an incorrect payload mass and/or center of gravity may cause poor robot performance and/or protective stops.	Make sure the specified payload mass and center of gravity are correctly specified.
C159A	Protective Stop: Position deviates from path		
C159A0	(base). The user specified payload is 0kg, please make sure this is correct.	Specifying an incorrect payload mass and/or center of gravity may cause poor robot performance and/or protective stops.	Make sure the specified payload mass and center of gravity are correctly specified.
C159A1	(shoulder). The user specified payload is 0kg, please make sure this is correct.	Specifying an incorrect payload mass and/or center of gravity may cause poor robot performance and/or protective stops.	Make sure the specified payload mass and center of gravity are correctly specified.
C159A2	(elbow). The user specified payload is 0kg, please make sure this is correct.	Specifying an incorrect payload mass and/or center of gravity may cause poor robot performance and/or protective stops.	Make sure the specified payload mass and center of gravity are correctly specified.

C159A3	(wrist 1). The user specified payload is 0kg, please make sure this is correct.	Specifying an incorrect payload mass and/or center of gravity may cause poor robot performance and/or protective stops.	Make sure the specified payload mass and center of gravity are correctly specified.
C159A4	(wrist 2). The user specified payload is 0kg, please make sure this is correct.	Specifying an incorrect payload mass and/or center of gravity may cause poor robot performance and/or protective stops.	Make sure the specified payload mass and center of gravity are correctly specified.
C159A5	(wrist 3). The user specified payload is 0kg, please make sure this is correct.	Specifying an incorrect payload mass and/or center of gravity may cause poor robot performance and/or protective stops.	Make sure the specified payload mass and center of gravity are correctly specified.
C160A	Protective stop: The robot was powered off last time due to a joint position disagreement		a) Verify that the robot position in the 3D graphics matches the real robot, to ensure that the encoders function before releasing the brakes. Stand back and monitor the robot performing its first program cycle as expected. b) If the position is not correct, the robot must be repaired. In this case, click Power Off Robot. c) If the position is correct, please tick the check box below the 3D graphics and click Robot Position Verified

C161A	Protective stop: Large movement of the robot detected while it was powered off. The joints were moved while it was powered off, or the encoders do not function		a) Verify that the robot position in the 3D graphics matches the real robot, to ensure that the encoders function before releasing the brakes. Stand back and monitor the robot performing its first program cycle as expected. b) If the position is not correct, the robot must be repaired. In this case, click Power Off Robot. c) If the position is correct, please tick the check box below the 3D graphics and click Robot Position Verified
C162A	The protective stop was likely caused by incorrectly specified payload mass and/or center of gravity.	Specifying an incorrect payload mass and/or center of gravity may cause poor robot performance and/or protective stops.	Make sure the specified payload mass and center of gravity are correct.
C171A	Issue with blends		
C171A0	A MoveC-waypoint were skipped due to a blend.	The value for the blend radius is too large compared to the distance between the waypoints.	Decrease the blend radius or choose waypoints that are further apart.
C171A1	Blend radius too small in a MoveC		Increase blend in MoveC
C171A3	A ServoC-waypoint were skipped due to a blend.	The value for the blend radius is too large compared to the distance between the waypoints.	Decrease the blend radius or choose waypoints that are further apart.
C171A4	Overlapping Blends in a MoveJ, a waypoint was skipped		Decrease the blend radius or choose waypoints that are further apart.
C171A5	Overlapping Blends in a MoveJ, a waypoint was skipped		Decrease the blend radius or choose waypoints that are further apart.

C171A6	Overlapping Blends in a MoveJ, a waypoint was skipped		Decrease the blend radius or choose waypoints that are further apart.
C171A7	Overlapping Blends in a MoveJ, a waypoint was skipped		Decrease the blend radius or choose waypoints that are further apart.
C171A9	A MoveP-waypoint were skipped due to a blend.	The value for the blend radius is too large compared to the distance between the waypoints.	Decrease the blend radius or choose waypoints that are further apart.
C171A10	Blend radius too small error in a MoveP		
C171A11	Overlapping Blends in a MoveL, a waypoint was skipped		Decrease the blend radius or choose waypoints that are further apart.
C171A12	Overlapping Blends in a MoveL, a waypoint was skipped		Decrease the blend radius or choose waypoints that are further apart.
C171A13	Overlapping Blends in a MoveL, a waypoint was skipped		Decrease the blend radius or choose waypoints that are further apart.
C171A14	Overlapping Blends in a MoveL, a waypoint was skipped		Decrease the blend radius or choose waypoints that are further apart.
C172A	Illegal control mode		
C173A0	Robot motion causes too high joint torques on Base.		Review your accelerations, blends and if there are collisions or excessive torques in the joint, adjust accordingly.
C173A1	Robot motion causes too high joint torques on Shoulder.		Same as C173A0

C173A2	Robot motion causes too high joint torques on Elbow.		Same as C173A0
C173A3	Robot motion causes too high joint torques on Wrist 1.		Same as C173A0
C173A4	Robot motion causes too high joint torques on Wrist 2.		Same as C173A0
C173A5	Robot motion causes too high joint torques on Wrist 3.		Same as C173A0
C173A6	Robot motion causes too high joint torques on Base. Problem identified in program		Same as C173A0
C173A7	Robot motion causes too high joint torques on Shoulder. Problem identified in program		Same as C173A0
C173A8	Robot motion causes too high joint torques on Elbow. Problem identified in program		Same as C173A0
C173A9	Robot motion causes too high joint torques on Wrist 1. Problem identified in program		Same as C173A0
C173A10	Robot motion causes too high joint torques on Wrist 2. Problem identified in program		Same as C173A0
C173A11	Robot motion causes too high joint torques on Wrist 3. Problem identified in program		Same as C173A0

C174A0	Robot motion causes too high jump in joint torques on Base.		
C174A1	Robot motion causes too high jump in joint torques on Shoulder.		
C174A2	Robot motion causes too high jump in joint torques on Elbow.		
C174A3	Robot motion causes too high jump in joint torques on Wrist 1.		
C174A4	Robot motion causes too high jump in joint torques on Wrist 2.		
C174A5	Robot motion causes too high jump in joint torques on Wrist 3.		
C174A6	Base. Problem identified when executing program on a specified line.		
C174A7	Shoulder. Problem identified when executing program on a specified line.		
C174A8	Elbow. Problem identified when executing program on a specified line.		
C174A9	Wrist 1. Problem identified when executing program on a specified line.		

C174A10	Wrist 2. Problem identified when executing program on a specified line.		
C174A11	Wrist 3. Problem identified when executing program on a specified line.		
C187A1	Temperature sensor test failed	Starting temperature were lower than expected	Make sure that the robot is running on the allowed range of temperature.
C187A2	Temperature sensor test failed	Starting temperature were higher than expected	Same as C187A1
C187A3	Temperature sensor test failed	Temperature increased less than expected during warm up	Same as C187A1
C187A4	Temperature sensor test failed	Temperature increased more than expected during warm up	Same as C187A1
C191A	Safety system violation		
C191A1	Joint position limit violated	The maximum range has been exceeded	
C191A2	Joint speed limit violated	The maximum speed has been exceeded	
C191A3	TCP speed limit violated	The maximum speed has been exceeded	
C191A4	TCP position limit violated	The maximum range has been exceeded	
C191A5	TCP orientation limit violated	The maximum orientation has been exceeded	
C191A6	Power limit violated	The maximum power has been exceeded	
C191A7	Joint torque window violated	The maximum torque has been exceeded	
C191A8	Joint torque window too large	The maximum torque has been exceeded	
C191A9	Reduced mode output violation		
C191A10	Safeguard stop output violation		

C191A11	Emergency stop output violation		
C191A12	Momentum limit violation		
C191A13	Robot moving output violation		
C191A14	Robot is not braking in stop mode	During the braking process, the safety system monitors if the robot brakes as expected. If this is not the case, this error is generated	Check TCP configuration, payload and mounting settings
C191A15	Robot is moving in stop mode	When the robot is stopped due to a safety violation or a safeguard stop, the safety system generates this error, if the robot moves while in this mode	a) Check if the robot is physically pushed while safeguard stopped. b) Check TCP configuration, payload and mounting settings
C191A16	Robot did not stop in time		
C191A17	Received a null vector for TCP orientation		
C191A18	Robot not stopping output violation		
C191A19	Invalid safety IO configuration		
C191A20	Configuration information or limit sets not received		
C191A21	The other safety processor detected a violation		
C191A22	Received unknown command from Controller		
C191A23	Invalid setup of safety limits		a) Check Firmware/update firmware. b) Do a Complete rebooting sequence

C191A24	Reduced Mode Output set, while it should not be		a) Check Firmware/update firmware. b) Do a Complete rebooting sequence
C191A25	Reduced Mode Output not set, while it should be		a) Check Firmware/update firmware. b) Do a Complete rebooting sequence
C191A26	Not Reduced Mode Output set, while it should not be		a) Check Firmware/update firmware. b) Do a Complete rebooting sequence
C191A27	Not Reduced Mode Output not set, while it should be		a) Check Firmware/update firmware. b) Do a Complete rebooting sequence
C191A28	Robot Emergency Stop exceeded maximum stop time		a) Check that max payload of the robot has not been exceeded. b) Check TCP configuration, payload and mounting settings
C191A29	System Emergency Stop exceeded maximum stop time		a) Check that max payload of the robot has not been exceeded. b) Check TCP configuration, payload and mounting settings
C191A30	Safeguard Stop exceeded maximum stop time		a) Check that max payload of the robot has not been exceeded. b) Check TCP configuration, payload and mounting settings
C191A31	Operation mode switch is present while the three position switch is missing		
C191A32	Joint speed limit violated – Base		
C191A33	Joint speed limit violated – Shoulder		

C191A34	Joint speed limit violated – Elbow		
C191A35	Joint speed limit violated – Wrist 1		
C191A36	Joint speed limit violated – Wrist 2		
C191A37	Joint speed limit violated – Wrist 3		
C192A	Safety system fault		
C192A1	Robot still powered in emergency stop	When the emergency stop is active, the robot arm powers off. The controller is responsible for sending the power off command. This error is generated if the safety system detects that the robot arm still has power	
C192A2	Robot emergency stop disagreement	E-stop in teach pendant or in robot E-stop circuit problem	Check safety devices and cables/connections to these devices.
C192A3	System emergency stop disagreement	System E-stop circuit problem	Check safety devices and cables/connections to these devices.
C192A4	Safeguard stop disagreement	Safeguard circuit problem	Check safety devices and cables/connections to these devices.
C192A5	Euromap safeguard stop disagreement	Euromap circuit problem	Check cables from Control Board to Euromap and to external machine
C192A6	Joint position disagreement		a) Check TCP configuration, payload and mounting settings. b) Check that safety settings respected
C192A7	Joint speed disagreement		a) Check TCP configuration, payload and mounting settings. b) Check that safety settings respected

C192A8	Joint torque disagreement		a) Check TCP configuration, payload and mounting settings. b) Check that safety settings respected
C192A9	TCP speed disagreement		a) Check TCP configuration, payload and mounting settings. b) Check that safety settings respected
C192A10	TCP position disagreement		a) Check TCP configuration, payload and mounting settings. b) Check that safety settings respected
C192A11	TCP orientation disagreement		a) Check TCP configuration, payload and mounting settings. b) Check that safety settings respected
C192A12	Power disagreement	Power calculation: uP-A and uP-B disagreement	
C192A13	Joint torque window disagreement		
C192A14	Reduced mode input disagreement	Safety I/O uP-A and uP-B disagreement	Check safety devices and cables/connections to these devices
C192A15	Reduced mode output disagreement	Safety I/O uP-A and uP-B disagreement	Check safety devices and cables/connections to these devices
C192A16	Safety output failed	The safety output did not reach the correct value in the expected time	Check for short circuit on I/O or for wrong connection to output.
C192A17	Safeguard stop output disagreement	Safety I/O uP-A and uP-B disagreement	Check safety devices and cables/connections to these devices
C192A18	The other safety processor is in fault		
C192A19	Emergency stop output disagreement	Safety I/O uP-A and uP-B disagreement	Check safety devices and cables/connections to these devices

C192A20	SPI output error detected	Power supply for the I/O is not detected	Check if the connection to the internal power supply is correct. If an external power supply is being used, check if it is powered on and at the correct voltage.
C192A21	Momentum disagreement		
C192A22	Robot moving output disagreement		Check safety devices and cables/connections to these devices
C192A23	Wrong processor ID		
C192A24	Wrong processor revision		
C192A25	Potential brownout detected	Voltage drop on Control Board or defect Safety Control Board	
C192A26	Emergency stop output disagreement		Check safety devices and cables/connections to these devices
C192A27	Safeguard stop output disagreement		Check safety devices and cables/connections to these devices
C192A28	Robot not stopping output disagreement		Check safety devices and cables/connections to these devices
C192A29	Safeguard reset input disagreement		Check safety devices and cables/connections to these devices
C192A30	Safety processor booted up in fault mode		
C192A31	Reduced Mode Output disagreement		Check safety devices and cables/connections to these devices
C192A32	Not Reduced Mode Output disagreement		Check safety devices and cables/connections to these devices
C192A33	A timing issue occurred during startup. Please restart to proceed	Checksum disagreement between safety processors uA and uB	

C192A34	User safety config checksum disagreement between uA and GUI		
C192A35	Robot config checksum disagreement between uA and GUI		
C192A36	Online RAM test failed		
C192A37	Not all safety related functionalities are running		
C192A38	Package too short for CRC calculation		
C192A39	Three position switch input disagreement		
C192A40	Operation mode switch input disagreement		
C193A	One of the nodes is in fault mode		
C193A0	Base Joint		a) See previous error. b) Update the firmware on the joint. c) Do a Complete rebooting sequence
C193A1	Shoulder Joint		a) See previous error. b) Update the firmware on the joint. c) Do a Complete rebooting sequence
C193A2	Elbow Joint		a) See previous error. b) Update the firmware on the joint. c) Do a Complete rebooting sequence

C193A3	Wrist 1 Joint		a) See previous error. b) Update the firmware on the joint. c) Do a Complete rebooting sequence
C193A4	Wrist 2 Joint		a) See previous error. b) Update the firmware on the joint. c) Do a Complete rebooting sequence
C193A5	Wrist 3 Joint		a) See previous error. b) Update the firmware on the joint. c) Do a Complete rebooting sequence
C193A6	Tool		a) See previous error. b) Do a Complete rebooting sequence
C193A7	Screen 1	Control Board has detected an error on Safety processor 1 in Teach pendant	a) See previous error. b) Do a Complete rebooting sequence
C193A8	Screen 2	Control Board has detected an error on Safety processor 2 in Teach pendant	a) See previous error. b) Do a Complete rebooting sequence
C193A9	Euromap 1		a) See previous error. b) Do a Complete rebooting sequence
C193A10	Euromap 2		a) See previous error. b) Do a Complete rebooting sequence
C194A	One of the nodes is not booted or not present		
C194A0	Base Joint		
C194A1	Shoulder Joint		
C194A2	Elbow Joint		
C194A3	Wrist 1 Joint		
C194A4	Wrist 2 Joint		
C194A5	Wrist 3 Joint		
C194A6	Tool		

C194A7	Screen 1	Control Board has detected an error on Safety processor 1 in Teach pendant	
C194A8	Screen 2	Control Board has detected an error on Safety processor 2 in Teach pendant	
C194A9	Euromap 1		
C194A10	Euromap 2		
C194A128	Base not ready while brake release requested	Must be at least in IDLE mode when the brake release is requested	Check for loose communication cable
C194A129	Shoulder not ready while brake release requested	Must be at least in IDLE mode when the brake release is requested	Check for loose communication cable
C194A130	Elbow not ready while brake release requested	Must be at least in IDLE mode when the brake release is requested	Check for loose communication cable
C194A131	Wrist 1 not ready while brake release requested	Must be at least in IDLE mode when the brake release is requested	Check for loose communication cable
C194A132	Wrist 2 not ready while brake release requested	Must be at least in IDLE mode when the brake release is requested	Check for loose communication cable
C194A133	Wrist 3 not ready while brake release requested	Must be at least in IDLE mode when the brake release is requested	Check for loose communication cable
C194A134	Tool not ready while brake release requested	Must be at least in IDLE mode when the brake release is requested	Check for loose communication cable
C195A	Conveyor speed too high	Conveyor speed higher than robot can run	Make sure that conveyor tracking is set up correctly
C195A1	for joint speed safety limit		
C195A2	for TCP speed safety limit		
C195A3	for momentum safety limit		
C196A	MoveP speed too high	Too high speed in relation to blend radius	Reduce speed or increase blend radius in user program
C197A	Blend overlap warning		Review blend values in the program

C200A	Safety Control Board hardware error		Check Safety Control Board functionality
C200A1	Hardware ID is wrong	Safety Control Board: uP-A has detected an error: Wrong Safety Control Board	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Safety Control Board
C200A2	MCU type is wrong	Safety Control Board: uP-A has detected an error	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Safety Control Board
C200A3	Part ID is wrong	Safety Control Board: uP-A has detected an error	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Safety Control Board
C200A4	RAM test failed	Safety Control Board: uP-A has detected an error	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Safety Control Board
C200A5	Register test failed	Safety Control Board: uP-A has detected an error	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Safety Control Board
C200A6	pRom Crc test failed	Safety Control Board: uP-A has detected an error: firmware error	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Safety Control Board
C200A7	Watchdog reset the processor	Safety Control Board: uP-A has detected an error	
C200A8	OVG signal test not passed	Safety Control Board: uP-A has detected an error: over voltage generator	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Safety Control Board

C200A9	3V3A power good pin is low	Safety Control Board: uP-A has detected an error	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Safety Control Board
C200A10	3V3B power good pin is low	Safety Control Board: uP-A has detected an error	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Safety Control Board
C200A11	5V power good is low	Safety Control Board: uP-A has detected an error	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Safety Control Board
C200A12	3V3 voltage too low	Safety Control Board: uP-A has detected an error	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Safety Control Board
C200A13	3v3 voltage too high	Safety Control Board: uP-A has detected an error	a) Do a Complete rebooting sequence. b) If this happens more than two times in a row, replace Safety Control Board
C200A14	48V input is too low		a) Do a Complete rebooting sequence. b) Check 48 V Power supply, current distributer, energy eater and Control Board for issues
C200A15	48V input is too high		a) Do a Complete rebooting sequence. b) Check 48 V Power supply, current distributer, energy eater and Control Board for issues
C200A16	24V IO short circuited	Too high current	a) Do a Complete rebooting sequence. b) Disconnect external I/O connections and check external power supply if connected

C200A17	PC current is too high	Motherboard takes too high current	a) Do a Complete rebooting sequence. b) Check cable between Control Board and Motherboard and check all connections to Motherboard. Also check for short circuit
C200A18	Robot voltage is too low		a) Do a Complete rebooting sequence. b) Check for short circuit in robot arm. c) Check 48 V Power supply, current distributer, energy eater and Control Board for issues
C200A19	Robot voltage is too high		a) Do a Complete rebooting sequence. b) Check 48 V Power supply, current distributer, energy eater and Control Board for issues
C200A20	24V IO voltage is too low		a) Do a Complete rebooting sequence. b) Disconnect I/O, check external power supply if connected and check Control Board for issues
C200A21	12V voltage is too high		a) Do a Complete rebooting sequence. b) Check 12 V Power supply, cables and Control Board for issues
C200A22	12V voltage is too low		a) Do a Complete rebooting sequence. b) Check 12 V Power supply, cables and Control Board for issues
C200A23	It took too long to stabilize 24V		a) Do a Complete rebooting sequence. b) Check 24 V and Control Board for issues

C200A24	It took too long to stabilize 24V IO		a) Do a Complete rebooting sequence. b) Check 24 V and Control Board for issues
C200A25	24V voltage is too high		a) Check external 24 V and Control Board for issues. b) Do a Complete rebooting sequence. c) If this happens more than two times in a row, replace Safety Control Board.
C200A26	24V IO voltage is too high		a) Disconnect I/O's. b) Do a Complete rebooting sequence. c) Check external 24 V and Control Board for issues
C201A	Setup of Safety Control Board failed		
C201A0	Setup of Safety Control Board failed	No data was received from the Control Board at initialization or invalid safety parameters have been received	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C201A1	SCB uA is not responding	No data or invalid data was received from the Control Board uA at initialization	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C201A2	SCB uB is not responding	No data or invalid data was received from the Control Board uB at initialization	Do a Complete rebooting sequence.
C201A3	SCB is not responding	No data or invalid was received from Control Board when requested for configuration parameters	Do a Complete rebooting sequence.
C202A	SCE configuration was illegal, after applying tolerances		

C203A	PolyScope detected a mismatch between the shown and (to be) applied safety parameters	PolyScope continuously verifies that the shown safety parameters are equal to the running parameters	a) Check that the software version is the same or newer than the firmware on the Safety Control Board. b) Reload the installation. c) Do a Complete rebooting sequence
C204A	Protective Stop: Path sanity check failed		
C204A1	Sudden change in target position		
C204A2	Inconsistency between target position and speed	Controller is detecting that position in current cycle has changed much more than it should based on expected joint speed.	a) Either an incorrect payload is mounted, or an external force is pushing the robot. b) Check TCP configuration, payload and mounting settings.
C204A3	Sudden stop	The program contains motions that are not ramped correctly down	To abort a motion, use \stopj\" or \"stopl\" script commands to generate a smooth deceleration before using \"wait\". Avoid aborting motions between waypoints with blend"
C204A4	Robot has not stopped in the allowed reaction and braking time		
C204A5	Robot program resulted in invalid setpoint		Review waypoints in the program
C204A6	Blending failed and resulted in an invalid setpoint		Try changing the blend radius or contact technical support
C204A7	Robot approaching singularity – Acceleration threshold failed		Review waypoints in the program, try using MoveJ instead of MoveL in the position close to singularity
C205A	Target speed does not match target position		

C205A0	Inconsistency between target position and speed		
C206A	Sanity check failed		
C206A0	Target joint speed does not match target joint position change – Base		
C206A1	Target joint speed does not match target joint position change – Shoulder		
C206A2	Target joint speed does not match target joint position change – Elbow		
C206A3	Target joint speed does not match target joint position change – Wrist 1		
C206A4	Target joint speed does not match target joint position change – Wrist 2		
C206A5	Target joint speed does not match target joint position change – Wrist 3		
C207A	Fieldbus input disconnected		Check fieldbus connections (RTDE, ModBus, EtherNet/IP and Profinet) or disable the fieldbus in the installation. Check RTDE watchdog feature. Check if a URCap is using this feature.
C208A	Debug Assertion failed	An assert was executed. Notice: The functionality is exclusively used for testing purposes.	
C209A	A protective stop was triggered (for test purposes only)	A protective stop was triggered. Notice: The functionality is exclusively used for testing purposes.	

C210A	Socket is read-only when the robot is in local (Teach pendant) control		Set the robot in remote control in PolyScope to enable receiving scripts in the controller
C211A	Operational mode changed		
C211A0	Disabled		
C211A1	Automatic		
C211A2	Manual		
C212A	Name conflict in loaded program		
C212A1	Name conflict(s) occurred between feature names and program variables	Some feature names and program variables share the same name, which may cause confusion.	Rename the program variables.
C213A	No Kinematic Calibration found (calibration.conf file is either corrupt or missing)	Calibration.conf file is either corrupt or missing	A new kinematics calibration may be needed if the robot needs to improve its kinematics, otherwise, ignore this message.
C214A	Kinematic Calibration for the robot does not match the joint(s)	The calibration checksum stored in the calibration.conf does not match the values from the joint(s)	If moving a program from a different robot to this one, re-kinematic calibrate the second robot to improve kinematics, otherwise ignore this message.
C214A1	The Kinematic Calibration checksum does not match the Base checksum	The calibration checksum stored in the calibration.conf does not match the values from the joint(s)	If moving a program from a different robot to this one, re-kinematic calibrate the second robot to improve kinematics, otherwise ignore this message.
C214A2	The Kinematic Calibration checksum does not match the Shoulder checksum	The calibration checksum stored in the calibration.conf does not match the values from the joint(s)	If moving a program from a different robot to this one, re-kinematic calibrate the second robot to improve kinematics, otherwise ignore this message.

C214A3	The Kinematic Calibration checksum does not match the Elbow checksum	The calibration checksum stored in the calibration.conf does not match the values from the joint(s)	If moving a program from a different robot to this one, re-kinematic calibrate the second robot to improve kinematics, otherwise ignore this message.
C214A4	The Kinematic Calibration checksum does not match Wrist 1 checksum	The calibration checksum stored in the calibration.conf does not match the values from the joint(s)	If moving a program from a different robot to this one, re-kinematic calibrate the second robot to improve kinematics, otherwise ignore this message.
C214A5	The Kinematic Calibration checksum does not match for Wrist 2 checksum	The calibration checksum stored in the calibration.conf does not match the values from the joint(s)	If moving a program from a different robot to this one, re-kinematic calibrate the second robot to improve kinematics, otherwise ignore this message.
C214A6	The Kinematic Calibration checksum does not match for Wrist 3 checksum	The calibration checksum stored in the calibration.conf does not match the values from the joint(s)	If moving a program from a different robot to this one, re-kinematic calibrate the second robot to improve kinematics, otherwise ignore this message.
C215A	Kinematic Calibration does not match the robot	The calibration checksum stored in the calibration.conf does not match the values from the joints	Check if the serial number of the robot arm matches the Control Box
C216A	The offset of the joint has changed		The joint has been zeroed by the user. Perform a kinematic calibration to improve kinematics if needed.
C216A1	Base		The joint has been zeroed by the user. Perform a kinematic calibration to improve kinematics if needed.
C216A2	Shoulder		The joint has been zeroed by the user. Perform a kinematic calibration to improve kinematics if needed.

C216A3	Elbow		The joint has been zeroed by the user. Perform a kinematic calibration to improve kinematics if needed.
C216A4	Wrist 1		The joint has been zeroed by the user. Perform a kinematic calibration to improve kinematics if needed.
C216A5	Wrist 2		The joint has been zeroed by the user. Perform a kinematic calibration to improve kinematics if needed.
C216A6	Wrist 3		The joint has been zeroed by the user. Perform a kinematic calibration to improve kinematics if needed.
C217A	Blank space detected at the beginning of a string	Leading blank spaces in strings are ignored in this version	Make sure that these leading blank spaces are intentional otherwise remove them
C218A	A thread used a lot of time	There may be an infinite loop or other command that does not move the robot, this can cause program overload	Add a Wait command or sync () script to split long program sequences and have sequenced processing time
C218A0	Main Robot Program used a lot of time		Use a wait command or sync () script
C218A1	A thread used a lot of time		Use a wait command or sync () script
C219	Change in offset is too high	Following the specified offsets would result in the robot exceeding safety limits	
C219A1	Close to joint speed safety limit		Review program speed and acceleration
C219A2	Close to tool speed safety limit		Review program speed and acceleration
C219A3	Close to momentum safety limit		Review program speed and acceleration

C220A1	Kinematic Calibration	Actual version on the robot arm is not supported	Update Software
C220A2	Kinematic Calibration	Kinematic Calibration file was replaced with file from the arm	Update Software
C220A3	Kinematic Calibration	Kinematic Calibration uploaded to the arm	Update Software
C220A4	Kinematic Calibration	Kinematic Calibration reuploaded to the arm	Update Software
C257A	Unknown message		
C258A	Invalid Payload		Please insert a valid payload
C259A	Filesystem related issue		
C259A0 to C259A81	Critical error	A critical error occurred in the filesystem	a) Do a Complete rebooting sequence b) Update robot Software c) Reimage SD card d) Contact your local Universal Robots service provider for assistance.
C260A	Brake Release	Brake release not responding properly	a) Check the brake release system b) Do a Complete rebooting sequence c) Contact your local Universal Robots service provider for assistance.
C260A0	Critical error	A critical error occurred during Brake Release	a) Do a Complete rebooting sequence b) Ensure the mounted payload, TCP and CoG matches your configuration. c) Update robot software d) For further assistance, contact your local Universal Robots service provider.
C260A1 to C260A21	Brake Release	Motor moved only	
C261A	Temperature Sensor		

C261A0 to C261A3	Critical error	A critical error occurred in the temperature sensor	a) Do a Complete rebooting sequence b) Contact your local Universal Robots service provider for assistance.
C261A4 to C261A15	Temperature is too high (degrees Celsius)	Ambient temperature is too high or low. Temperature sensor read a temperature outside the allowed range.	a) Check robot's environment and make sure the robot is operating within recommended limits. b) Do a Complete rebooting sequence
C262A	Communication		
C262A0 to C262A18	Critical error	A critical error occurred in the communication framework	a) Check communications external and internal b) Do a Complete rebooting sequence c) Check for ESD noise d) Update software e) Contact your local Universal Robots service provider for assistance.
C263A	Motor Encoder		
C263A0 to C263A31	Critical error on Motor Encoder	A critical error occurred in the Motor Encoder.	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C264A	Task Manager		
C264A0 to C264A11	Critical error on Task Manager	A critical error occurred in the task manager. Overload of the task manager.	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C265A	Joint Encoder		
C265A0 to C265A30	Critical error on Joint encoder	A critical error occurred in the Joint Encoder	a) Do a Complete rebooting sequence b) Update robot's software c) Check for ESD noise d) Update software e) Contact your local Universal Robots service provider for assistance.

C267A	Bootloader error	Corrupted firmware	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C267A0 to C267A11	Critical error on Bootloarder	A critical error occurred during Firmware upgrade. Hardware configuration mismatch.	Check your image, SCB, MB or TP for bootloader fixes. Update software.
C268A0	Special Command	Received unhandled command cmd	
C268A1	Special Command	Recieved Set Zero Command at too high speed	
C269A	Transceiver	Fieldbus transmitting and receiving of information failed	
C269A0 to C269A70	Transceiver		
C271	Low-level runtime thread	Process running behind	a) Check that the program and client interface is not taking unnecessary resources.
C271A1 to C271A5	Runtime is too much behind	One of the threads might be using too much time	Consider using a Wait or sync() to split long program sequences that do not move the robot.
C272A	Missing joint calibration		
C272A0 to C272A6	Critical error – the calibration is missing	calibration could not be loaded	a) Update software b) Contact your local Universal Robots service provider for assistance.
C273A	Cross monitoring		
C273A0	Critical error	A critical disagreement error occurred in the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.

C273A1	Cross monitoring	Float value on A-side	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A2	Cross monitoring	Float value on B-side	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A3	Cross monitoring	Unsigned value on A-side	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A4	Cross monitoring	Unsigned value on B-side	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A5	Disagreement on Safety Control Board State	A critical disagreement occurred within the safety system.	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A6	Disagreement on Robot State	A critical disagreement occurred within the safety system.	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A7	Disagreement on Safety State	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.

C273A8	Disagreement on position	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A9	Disagreement on velocity	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A10	Disagreement on current	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A11	Disagreement on temperature	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A12	Disagreement on Teach Pendant State	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A13	Disagreement on Teach Pendant Emergency Stop	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A14	One processor entered Fault State	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.

C273A15	One processor entered Violation State	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A16	Joint State disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A17	Joint Constant Data CRC disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A18	Joint target current disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A19	Torque Window disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A20	Torque Error disagreement	A critical disagreementoccurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A21	Target Velocity disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.

C273A22	Target Acceleration disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A23	Recovery Mode CRC disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A24	Robot Configuration CRC disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A25	User Configuration CRC disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A26	Maximum stopping time disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A27	Stopping Time Torque Overload disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A28	Disagreement error on a specific joint	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.

C273A29	Tool speed disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A30	Safety Mode Limit disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A31	Hand Protection Distance disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A32	Elbow Sphere speed disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A33	Momentum disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A34	Power disagreeement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A35	Elbow position disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.

C273A36	Workpiece Rotation disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A37	Disagreement on Workpiece Position	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A38	Disagreement on motor parameter (R_pp)	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A39	Disagreement on motor parameter (L_pp)	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A40	Disagreement on motor parameter (Kb)	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A41	Disagreement on motor parameter (Kt)	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A42	Disagreement on motor parameter (T)	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.

C273A43	Disagreement on the Teach Pendant's Three-Position Enabling Device	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A44	Disagreement on the active status of the Teach Pendant's Three-Position Enabling Device	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A45	Cross monitoring	Disagreement on user safety configuration version, major	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A46	Cross monitoring	Disagreement user safety configuration version, minor	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A47	Disagreement on state	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A48	Disagreement on Injection-Molding-Machine-Interface Emergency Stop input	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A49	Disagreement on Injection-Molding-Machine-Interface Emergency Stop output	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.

C273A50	Disagreement on Injection-Molding-Machine-Interface Safeguard input	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A51	Disagreement on Injection-Molding-Machine-Interface type	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A52	Disagreement on Torque Parameters CRC	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A53	Target Torque disagreement	A critical disagreement occurred within the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A54	Cross monitoring	Disagreement on hardware configuration CRC	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A55	Cross monitoring	Disagreement on compensation current	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C273A56	Cross monitoring	Disagreement on external torque target	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C274A1	Control box fan error	Fan is not running	
C274A2	Control box fan error	Monitoring data timed out	

C274A3	Control box fan error	Check Fan speed	
C275A0 to C275A6	Brake release		Check payload settings. Check for robot stuck.
C276A	Uart between microprocessor		
C276A0 to C276A14	Critical error	A critical error occurred in the UART driver	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C277A1 to C277A11	Memory	Memory allocation	Release some memory from the programs or check URCap or too much files in the robot
C278A	Servo in Joint A processor		
C278A0 to C278A13	Critical error	A critical error occurred in the servo module	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C279A	Flash in joint		
C279A0 to C279A20	Critical error	A critical error occurred in the flash driver	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C280A	Real-time error		
C280A0 to C280A9	Critical error	A critical real-time error occurred	a) Do a Complete rebooting sequence b) Update software c) Check communication between joints d) Contact your local Universal Robots service provider for assistance.
C281A	Robot State Machine		

C281A0	Critical error	A critical State Machine error occurred	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C281A1	Robot State Machine	An invalid transition occurred in the code	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C281A2	Robot State Machine	An invalid Robot State occured	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C281A3	Joint entered the Fault State		a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C281A4	Joint entered the Violation State		a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C281A5	Robot State Machine	Shutdown took too long, check robot voltage	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C281A6	Robot State Machine	Moved to an unhandled state	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.

C281A7	Teach Pendant entered the Fault State		a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C281A8	Teach Pendant entered the Violation State		a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C281A9	Joint moved too far before robot entered RUNNING State	A Joint moved more than the permissible range during the Brake Release procedure.	a) Do a Complete rebooting sequence b) Ensure the mounted payload, TCP and CoG matches your configuration. c) Update software d) Contact your local Universal Robots service provider for assistance.
C281A10	Robot State Machine	Failed to power on the Robot arm	a) Do a Complete rebooting sequence b) Ensure the mounted payload, TCP and CoG matches your configuration. c) Update software d) Contact your local Universal Robots service provider for assistance.
C281A11	Robot State Machine	Caused by specified joint	a) Do a Complete rebooting sequence b) Ensure the mounted payload, TCP and CoG matches your configuration. c) Update software d) Contact your local Universal Robots service provider for assistance.

C281A12	Robot State Machine	Caused by specified state	a) Do a Complete rebooting sequence b) Ensure the mounted payload, TCP and CoG matches your configuration. c) Update software d) Contact your local Universal Robots service provider for assistance.
C281A13	Robot State Machine	Check aggregate joint mode status	a) Do a Complete rebooting sequence b) Ensure the mounted payload, TCP and CoG matches your configuration. c) Update software d) Contact your local Universal Robots service provider for assistance.
C281A14	IMMI entered the Fault State		a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C281A15	IMMI entered the Violation State		a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C282A1	Systick	Systick Sync: SoC frequency synchronization started	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C282A2	Systick	Systick Sync: SoC frequency synchronization in progress, sample number x of 16 unexpected	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.

C282A3	Systick	Systick Sync: SoC frequency synchronization in progress, received 'SoC period' unexpected sample	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C282A4	Systick	Systick Sync: SoC frequency synchronization in progress, received 'SoC ISR Latency' unexpected sample	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C282A5	Systick	Systick Sync: unexpected SoC period	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C282A6	Systick	Systick Sync: unexpected SysTick timer LOAD value [cpu-clock-cycles]	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C282A7	Systick	Systick Sync: SoC frequency synchronization finished	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C282A8	Systick	Systick Sync: SoC Phase synchronization started	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C282A9	Systick	Systick Sync: SoC Phase error	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.

C282A10	Systick	Systick Sync: unexpected estimated Systick counter value at SoC	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C282A11	Systick	Systick Sync: unexpected estimated Systick counter ticks to next SoC	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C282A12	Systick	Systick Sync: SoC Phase synchronization finished	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C282A13	Systick	The internal SoC count value has been resynchronized with the FPGA SoC count.	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C282A14	Systick	SOC status data failed to update in a timely manner	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C283A	Safety system		
C283A0	Critical error	A critical error occurred in the safety system	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C283A1	Robot is not braking when in Stop Mode		
C283A2	Robot is moving when in Stop Mode		

C283A3	Power not removed from the motors while in Emergency Stop		
C283A4	Failed to power on the Robot arm		
C283A5	Invalid pin-configuration received		
C283A6	Trying to reassign pin configuration with specified configuration		
C283A7	Joint exceeded the velocity limit		
C283A8	The System Emergency Stop Output is not active	Failed to activate the System Emergency Stop Output. The output is active when voltage is low	a) Make sure output is not short circuited to a power supply
C283A9	System Emergency Stop Output disagreement within the safety system	The input signals are not switching simultaneously or are incorrectly connected.	a) Ensure both inputs are properly connected b) Contact your local Universal Robots service provider for assistance.
C283A10	Robot Emergency Stop Input disagreement within the safety system	The input signals are not switching simultaneously or are incorrectly connected.	a) Ensure both inputs are properly connected b) Contact your local Universal Robots service provider for assistance.
C283A11	System Emergency Stop Input disagreement within the safety system	The input signals are not switching simultaneously or are incorrectly connected.	a) Ensure both inputs are properly connected b) Contact your local Universal Robots service provider for assistance.
C283A12	Safeguard Stop Input disagreement within the safety system	The input signals are not switching simultaneously or are incorrectly connected.	a) Ensure both inputs are properly connected b) Contact your local Universal Robots service provider for assistance.

C283A13	Safeguard Reset Input disagreement within the safety system	The input signals are not switching simultaneously or are incorrectly connected.	a) Ensure both inputs are properly connected b) Contact your local Universal Robots service provider for assistance.
C283A14	Operation Mode input disagreement within the safety system.	The input signals are not switching simultaneously or are incorrectly connected.	a) Ensure both inputs are properly connected b) Contact your local Universal Robots service provider for assistance.
C283A15	Three-Positional Enabling Device Input disagreement within the safety system	The input signals are not switching simultaneously or are incorrectly connected.	a) Ensure both inputs are properly connected b) Contact your local Universal Robots service provider for assistance.
C283A16	Safety system	Operation Mode Switch is defined and no Three-Positional Device is defined.	a) Ensure both inputs are properly connected b) Contact your local Universal Robots service provider for assistance.
C283A17	Lost several Teach Pendant safety packages in a row		a) Check that the teach pendant is proper connected b) Do a Complete rebooting sequence c) Update software c) Contact your local Universal Robots service provider for assistance.
C283A18	Lost too many Joint safety packages in a row.		a) Check that the joints are proper connected b) Do a Complete rebooting sequence c) Update software c) Contact your local Universal Robots service provider for assistance.
C283A19	Safety system	Incorrect gravity vector sent from the controller	a) Check that the joints are proper connected b) Do a Complete rebooting sequence c) Update software c) Contact your local Universal Robots service provider for assistance.

C283A20	Safety system	Wrong payload mass sent from the controller	a) Check that the joints are proper connected b) Do a Complete rebooting sequence c) Update software c) Contact your local Universal Robots service provider for assistance.
C283A21	Safety system	Wrong payload center of gravity sent from the controller	a) Check that the joints are proper connected b) Do a Complete rebooting sequence c) Update software c) Contact your local Universal Robots service provider for assistance.
C283A22	Teach Pendant is connected while it is disabled in robot configuration	If the Teach Pendant is enabled, it is connected. If it is disabled, it is not connected.	Disconnect the Teach Pendant or enable it in the configuration.
C283A23	Safety system	Lost several safety packages in a row from other safety processor	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C283A24	Safety system	Got several safety packages too early in a row from other safety processor	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C283A25	Safety system	Got a ready message from an unexpected source	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C283A26	Force limitation: exceeded torque window		a) Ensure the mounted payload, TCP and CoG matches your configuration. b) Slow down movements c) Contact your local Universal Robots service provider for assistance.

C283A27	Mismatch on Robot Configuration CRC between the safety system and PolyScope		a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C283A28	Mismatch on User Configuration CRC between the safety system and PolyScope		a) Do a Complete rebooting sequence b) Make new .installation c) Update software d) Contact your local Universal Robots service provider for assistance.
C283A29	Safety system	Trying to reapply a part of the User Configuraton.	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C283A30	Safety system	Trying to reapply a part of the Robot Configuraton,	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C283A31	Safety system	Trying to reapply normal limits	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C283A32	Safety system	Trying to reapply reduced limits	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C283A33	Safety system	Trying to reapply safety CRC	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.

C283A34	Error while trying to apply safety configuration		a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C283A35	Reduced Mode Output disagreement within the safety system		a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C283A36	Not Reduced Mode Output disagreement within the safety system		a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C283A37	Robot Moving Output disagreement within the safety system		a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C283A38	Robot Not Stopping Output disagreement within the safety system		a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C283A39	Safety system	Several safety packages were received too late from the SCB processor	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C283A40	Reduced Mode Input disagreement within the safety systems	The input signals are not switching simultaneously or are incorrectly connected.	a) Ensure both inputs are correctly connected. b) Contact your local Universal Robots service provider for assistance.

C283A41	TCP Velocity violates limits of maximum stopping time		a) Ensure the mounted payload, TCP and CoG matches your configuration. b) Slow down movements c) Check safety setting d) Contact your local Universal Robots service provider for assistance.
C283A42	TCP Velocity violates limits of maximum stopping distance		a) Ensure the mounted payload, TCP and CoG matches your configuration. b) Slow down movements c) Check safety setting d) Contact your local Universal Robots service provider for assistance.
C283A43	Joint moved too quickly toward a Joint position limit		a) Ensure the mounted payload, TCP and CoG matches your configuration. b) Slow down movements c) Check safety setting d) Contact your local Universal Robots service provider for assistance.
C283A44	The tool moved too fast towards an orientation limit		a) Ensure the mounted payload, TCP and CoG matches your configuration. b) Slow down movements c) Check safety setting d) Contact your local Universal Robots service provider for assistance.
C283A45	The Elbow moved too fast towards a safety plane		a) Ensure the mounted payload, TCP and CoG matches your configuration. b) Slow down movements c) Check safety setting d) Contact your local Universal Robots service provider for assistance.

C283A46	The tool moved too fast towards a safety plane		a) Ensure the mounted payload, TCP and CoG matches your configuration. b) Slow down movements c) Check safety setting d) Contact your local Universal Robots service provider for assistance.
C283A47	Joint position limit exceeded		a) Ensure the mounted payload, TCP and CoG matches your configuration. b) Slow down movements c) Check safety setting d) Contact your local Universal Robots service provider for assistance.
C283A48	Tool position limit exceeded		a) Ensure the mounted payload, TCP and CoG matches your configuration. b) Slow down movements c) Check safety setting d) Contact your local Universal Robots service provider for assistance.
C283A49	Tool orientation limit exceeded		a) Ensure the mounted payload, TCP and CoG matches your configuration. b) Slow down movements c) Check safety setting d) Contact your local Universal Robots service provider for assistance.
C283A50	Elbow position limit exceeded		a) Ensure the mounted payload, TCP and CoG matches your configuration. b) Slow down movements c) Check safety setting d) Contact your local Universal Robots service provider for assistance.

C283A51	Tool moved with a speed which exceeds the speed limit		a) Ensure the mounted payload, TCP and CoG matches your configuration. b) Slow down movements c) Check safety setting d) Contact your local Universal Robots service provider for assistance.
C283A52	Elbow moved with a speed of which exceeds the speed limit		a) Ensure the mounted payload, TCP and CoG matches your configuration. b) Slow down movements c) Check safety setting d) Contact your local Universal Robots service provider for assistance.
C283A53	Maximum Tool Center Point Speed in Reduced Mode is invalid		Ensure the Reduced Mode Limit is less than or equal to the Normal Mode limit.
C283A54	Maximum Elbow Speed in Reduced Mode is invalid		Ensure the Reduced Mode limit is less than or equal to the Normal Mode Limit.
C283A55	Maximum Joint Speed of a specified joint in Reduced Mode is invalid		Ensure the Reduced Mode Limit is less than or equal to the Normal Mode Limit.
C283A56	Maximum Momentum in Reduced Mode is invalid		Ensure the Reduced Mode Limit is less than or equal to the Normal Mode Limit.
C283A57	Maximum stopping time in Reduced Mode is invalid		Ensure the Reduced Mode Limit is less than or equal to the Normal Mode Limit.
C283A58	Maximum stopping distance in Reduced Mode is invalid		Ensure the Reduced Mode Limit is less than or equal to the Normal Mode Limit.
C283A59	Reduced Mode Output is not active	Failed to activate the Reduced Mode Output. The output is active when voltage is low	Make sure output is not short circuited to a power supply

C283A60	Reduced Mode Output is not inactive	Failed to deactivate the Reduced Mode Output. The output is inactive when voltage is high	Make sure output is not short circuited to ground
C283A61	Not Reduced Mode Output is not active	Failed to activate the Not Reduced Mode Output. The output is active when voltage is low	Make sure output is not short circuited to a power supply
C283A62	Not Reduced Mode Output is not inactive	Failed to deactivate the Not Reduced Mode Output. The output is inactive when voltage is high	Make sure output is not short circuited to ground
C283A63	Robot is moving while Robot Moving Output is not active	Failed to activate the Robot Moving Output. The output is active when voltage is low	Make sure output is not short circuited to a power supply
C283A64	Tool Direction Vector Length for Normal Mode is not 1.0		Reconfigure Tool orientation
C283A65	Tool Direction Vector Length for Reduced Mode is not 1.0		Reconfigure Tool orientation
C283A66	Robot Momentum exceeds the Momentum limit		
C283A67	Robot Power exceeds the Power limit		
C283A68	Error caused by a specified joint	A critical safety error	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C283A69	Safety system	Float value	
C283A70	Safety system	Unsigned value	
C283A71	Safety system	Safety is disabled but the app type is not MAIN-NS (No Safety)	

C283A72	The motor configuration sent by the Control Box is invalid	The motor configuration sent is unusable with this firmware revision.	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C283A73	Safe Home Position Output disagreement within the safety system		Review your home position
C283A74	The Safe Home Position Output is active while not allowed	The Safe Home Position Output is active while the robot is not in Safe Home Position	Make sure output is not short circuited to power supply or ground
C283A75	Safety system	The user config versions received differ	
C283A76	Safety system	Controller reported a fault	
C283A77	Safety system	The user config versions is higher than supported	
C283A78	Safety system	The user config versions is lower than supported	
C283A79	Safety system	Safe home position out of range	
C283A80	Safety system	Force limit calculation got an unsupported joint size	
C283A81	The robot configuration specifies an unsupported joint size	The safety system is not certified to work with the specified joint size	Upgrade to a newer software version
C283A82	The connected Teach Pendant type does not match the configuration	The connected Teach Pendant is not the same type as the one selected in the safety configuration	a) Check that the Teach Pendant is properly connected and matches the one in the safety configuration b) Conduct a complete rebooting sequence c) Update software d) Contact your local Universal Robots technical support

C283A83	The configured Teach Pendant has no Three-Positional Enabling Device	The safety configuration enables the Teach Pendant's Three-Positional Enabling Device, but the configured Teach Pendant does not have a Three-Positional Enabling Device	a) Check that the correct Teach Pendant is selected in the safety configuration b) Conduct a complete rebooting sequence c) Update software d) Contact your local Universal Robots technical support
C283A84	Safety system	Received an invalid Teach Pendant type in the user configuration	
C283A85	Automatic Safeguard Stop Input disagreement within the safety system	The input signals are not switching simultaneously, or are incorrectly connected	a) Ensure both inputs are properly connected b) Contact your local Universal Robots service provider for assistance
C283A86	Automatic Safeguard Reset Input disagreement within the safety system	The input signals are not switching simultaneously, or are incorrectly connected	a) Ensure both inputs are properly connected b) Contact your local Universal Robots service provider for assistance
C283A87	Injection-Molding-Machine-Interface is connected while it is disabled in the robot configuration	If the Injection-Molding-Machine-Interface is enabled, it must be connected. If it is disabled, it must be disconnected	Disconnect the Injection-Molding-Machine-Interface or enable it in the configuration
C283A88	Lost more than allowed Injection-Molding-Machine-Interface safety packages in a row		a) Check that the Injection-Molding-Machine-Interface is properly connected b) Conduct a complete rebooting sequence c) Update software d) Contact your local Universal Robots service provider for assistance

C283A89	The connected Injection-Molding-Machine-Interface type does not match the configuration	The connected Injection-Molding-Machine-Interface is not the same type as the one selected in the safety configuration	a) Check that the Injection-Molding-Machine-Interface is properly connected and matches the one in the safety configuration b) Conduct a complete rebooting sequence c) Update software d) Contact your local Universal Robots service provider for assistance
C283A90	Invalid Injection-Molding-Machine-Interface type in the user configuration	The configuration provided by the user safety configuration is invalid	a) Ensure the correct IMMI type is selected in the Safety Configuration b) Conduct a complete rebooting sequence c) Update software d) Contact your local Universal Robots service provider for assistance
C283A91	The Injection-Molding-Machine-Interface System Emergency Stop Output is not active	Failed to activate the System Emergency Stop Output on the Injection-Molding-Machine-Interface. The output is active when voltage is high	Make sure output is not short circuited to ground
C283A92	Safety system	Target torque is outside the allowed range	
C283A93	Safety system	Sanity check of target torque is outside the allowed range	
C283A94	Automatic Safeguard Stop input is configured but no Three-Position Enabling device is configured		a) Ensure that a Three-Positional Device is enabled in the Safety Configuration b) Conduct a complete rebooting sequence c) Update software d) Contact your local Universal Robots service provider for assistance
C283A95	IO Data has not been updated before latching it		

C283A96	Received an invalid IMMI type in the user configuration		
C283A97	Safety system	The payload inertia diagonal sent from the controller must be non-negative	
C283A98	Safety system	The payload inertia sent from the controller must be within valid range	
C283A99	Safety system	Received an invalid value as part of the runtime safety configuration	
C284A	Brake Release		
C284A0 to C284A20	Critical error	A critical error occurred during Brake Release	a) Conduct a complete rebooting sequence b) Ensure the mounted payload, TCP, and CoG matches your configuration c) Check if there is no interference with the joints d) Contact your local Universal Robots service provider for assistance
C285A	Joint Keep-Alive System		
C285A0 to C285A15	Critical error	A critical error occurred in the Joint Keep-Alive System	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C286A	Motor Controller		
C286A1 to C286A2	ME Index seen and PWM margin too small		
C287A	Saved files in tool		
C287A0 to C287A3	Critical error	A critical error occurred during file loading/saving	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C288A	IO Control		

C288A1 to C288A3	Wrong control mode		Check for configuration under installation window
C289A	Tool Connector		
C289A1	Short circuit detected on Digital Output: high side	Tool Digital Output pin has been turned off due to either a short-circuit or an overload was detected.	Check connections to make sure Tool Digital Output currents are within specified limits.
C289A2	Short circuit detected on Digital Output: low side	Tool Digital Output pin has been turned off due to either a short-circuit or an overload was detected.	Check connections to make sure Tool Digital Output currents are within specified limits.
C289A4	10 second Average tool IO Current is outside of the allowed range.	The average current sum of the Tool Connector Power and Digital Output pins is outside of the allowed range.	Check connections to make sure tool Digital Output currents are within specified limits.
C289A5	Unable to remove tool Digital Output fault.	Unable to remove the overload on tool Digital Output, therefore the robot powered down.	Check connections to make sure the Tool Digital Output currents are within specified limits.
C289A6	Current on the POWER pin is outside of the allowed range.	Too high current on tool connector power pin	Check connections to make sure the Tool Digital Output currents are within specified limits.
C289A7	Current on the Digital Output pins is outside of the allowed range.	Too high current on tool connector Digital Output pins.	Check connections to make sure the Tool Digital Output currents are within specified limits.
C289A8	Current on the ground pin is outside of the allowed range.	Too high current on tool ground pin	Check connections to make sure the Tool Digital Output currents are within specified limits.
C289A9	Maximum current on the POWER pin is outside of the allowed range	Too high current on tool power pin	Check connections to make sure the Tool Digital Output currents are within specified limits.
C290A1	I2C	The I2C bus was busy too long	
C290A2	I2C	Function called too early after last call or the slave chip did not answer	

C290A3	I2C	A peripheral unit has set the alert pin	
C290A4	I2C	Communication timeout detected	
C290A6	I2C	An error was detected in the i2c acknowledge handshake	
C290A7	I2C	I2C detected arbitration loss	
C290A8	I2C	I2C detected error on the I2C-bus	
C290A9	I2C	I2C error interrupt called with unhandled error-flag	
C290A10	I2C	I2C peripheral issue, several unhandled events	
C291A1	EEPROM	Addressed data is out of memory bounds	
C291A2	EEPROM	I2C communication error	
C291A3	EEPROM	Write to EEPROM failed	
C291A4	EEPROM	Read from EEPROM failed	
C291A5	EEPROM	Verification of written data failed	
C291A6	EEPROM	Difference in data when comparing the source and the data written	
C291A7	EEPROM	Writing of a page in EEPROM failed	
C292A	Online RAM test		
C292A0 to C292A15	Critical error	A critical error occurred during RAM test	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C293A	Exception caught		
C293A1 to C293A30	Unexpected exception/interrupt		a) Do a Complete rebooting sequence b) Update software

C294A	ADC	Analog to Digital converter	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C294A0 to C294A9	Critical error	A critical error occurred in the ADC driver	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C295A	PCB	Wrong PCB type. Likely a hardware error.	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C295A0	Wrong PCB type	The printed circuit board is wrong	
C296A	Start up check		
C296A0	Critical error	A critical error occurred during startup	a) Check 10A fuse b) Do a Complete rebooting sequence c) Update software d) Contact your local Universal Robots service provider for assistance.
C296A1	SCB IO failed to power on		Ensure the IO Power Connector on the Safety Control Board is connected to the 24VDC
C296A2	Start up check	One or more Motor phases is short circuited to ground	
C296A3	Start up check	Motor Indication Signal does not work	
C296A4	Start up check	Phase 1 is not connected.	
C296A5	Start up check	Phase 2 is not connected.	
C296A6	Start up check	Phase 3 is not connected.	
C296A7	Start up check	Motor test results were invalid.	

C296A8	Start up check	Motor PWM output is not zero in Joint State	
C296A9	Start up check	Robot Voltage was present during self-diagnostics	
C296A10	Start up check	Time out during self-diagnostics	
C296A11	Start up check	Data was received while trying to disable communication	
C296A12	Start up check	Sequence number did not match expected sequence	
C296A13	Start up check	Check the expected sequence number	
C296A14	Start up check	Check the actual sequence number	
C296A15	Start up check	Interval between messages did not match expectations	
C296A16	Start up check	Check the expected interval ticks	
C296A17	Start up check	Check the measured interval ticks	
C296A18	Start up check	Motor Kt value is outside manufacturer specifications	
C296A19	Start up check	Motor Kb value is outside manufacturer specifications	
C296A20	Start up check	Motor R value is outside manufacturer specifications	
C296A21	Start up check	Motor L value is outside manufacturer specifications	
C296A22	Start up check	Processor uB has been in Booting state for too long	
C296A23	Start up check	Cross-monitoring data was invalid for too long while booting	
C296A24	Start up check	Motor Tau value is outside manufacturer specifications	

C297A	Joint validation	Validation during power up.	a) Do a Complete rebooting sequence b) Check that SD card and robot type match. c) Update software d) Contact your local Universal Robots service provider for assistance.
C297A0	Critical error	A critical error occurred during Joint validation	a) Do a Complete rebooting sequence b) Check that SD card and robot type match. c) Update software d) Contact your local Universal Robots service provider for assistance.
C297A1	Joint validation	Received Node ID from an unexpected device	
C297A2	Joint validation	Received Node ID an unexpected node	
C297A3	Joint validation	Joint processors disagree on Joint Size	
C297A4	Joint validation	Joints disagree with configuration on Joint Size	
C297A5	Joint validation	Found Joint disabled in configuration	
C297A6	Joint validation	Joint processors disagree on Joint ID.	
C297A7	Joint validation	Node ID differs from the stored ID.	
C297A8	Joint validation	Invalid robot configuration	
C297A9	Joint validation	Joint IDs need updating	
C297A10	Joint validation	Timeout while waiting for Node IDs	
C297A11	The Robot arm does not match the Control Box	One or more joints do not match stored Robot Configuration	a) Do a Complete rebooting sequence b) Check that SD card and robot type match. c) Update software d) Contact your local Universal Robots service provider for assistance.

C298A	Hand protection		
C298A0	Tool is too close to the lower arm	The tool is too close to the lower Robot arm	a) Check wrist position. b) Verify mounting c) Do a Complete rebooting sequence d) Update software e) Contact your local Universal Robots service provider for assistance
C299A	Tool communication		
C299A0	Communication error detected	A problem with the Tool communication was detected.	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C299A1	Tool communication	TX buffer overflow	
C299A2	Tool communication	New message started unexpectedly	
C299A3	RX framing error	Framing error detected on received data	a) Check external equipment connection b) Verify the communication configuration matches the hardware. c) Do a Complete rebooting sequence d) Update software e) Contact your local Universal Robots service provider for assistance
C299A4	RX Parity error	Parity error detected on received data	a) Check external equipment connection b) Verify the communication configuration matches the hardware. c) Do a Complete rebooting sequence d) Update software e) Contact your local Universal Robots service provider for assistance
C299A5	Tool communication	RX buffer overflow.	
C300A1	Safety message	Safety message received from an unexpected node.	

C300A2	Safety message	Safety message response received with an unexpected sequence number.	
C300A3	Safety message	Duplicate safety message response received with sequence number.	
C301A	Safety message monitor	Safety processors does not agree.	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance
C301A0	Critical error	A critical error occurred in safety message monitoring	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C301A2	Safety message monitor	Mode data mismatch	Same as C301A0
C301A3	Safety message monitor	Position data mismatch	Same as C301A0
C301A4	Safety message monitor	Revolution data mismatch	Same as C301A0
C301A5	Safety message monitor	Temperature data mismatch	Same as C301A0
C301A6	Safety message monitor	Torque data mismatch	Same as C301A0
C301A7	Safety message monitor	Velocity data mismatch	Same as C301A0
C301A8	Safety message monitor	Input state data disagreement	Same as C301A0
C301A10	Safety message monitor	Safety monitor: Don't have the corresponding x-mon data	Same as C301A0
C301A12	Safety message monitor	Target current data mismatch	Same as C301A0
C301A14	Safety message monitor	Target Velocity data mismatch	Same as C301A0
C301A15	Safety message monitor	Target Acceleration data mismatch	Same as C301A0

C301A16	Safety message monitor	Issue with setting up the UART mon RX address in TP	Same as C301A0
C301A17	Safety message monitor	Issue with setting up the UART mon RX CITER register in TP	Same as C301A0
C301A18	Safety message monitor	Issue with setting up the UART mon RX BITER register in TP	Same as C301A0
C301A19	Safety message monitor	Issue with setting up the MK02 UART TX, address is incorrect	Same as C301A0
C301A20	Safety message monitor	Issue with setting up the MK02 UART TX, CITER REG is incorrect	Same as C301A0
C301A21	Safety message monitor	Issue with setting up the MK02 UART TX, BITER REG is incorrect	Same as C301A0
C301A25	Safety message monitor	Node uA's communication to SCB disabled	Same as C301A0
C301A26	Safety message monitor	Motor parameter (R_pp) data mismatch	Same as C301A0
C301A27	Safety message monitor	Motor parameter (L_pp) data mismatch	Same as C301A0
C301A28	Safety message monitor	Motor parameter (Kb) data mismatch	Same as C301A0
C301A29	Safety message monitor	Motor parameter (Kt) data mismatch	Same as C301A0
C301A30	Safety message monitor	Motor parameter (T) data mismatch	Same as C301A0
C301A31	Safety message monitor	Safety Message was not received	Same as C301A0
C301A32	Safety message monitor	Function indicating if we should monitor data is not configured	Same as C301A0
C301A33	Safety message monitor	Function to parse messages is not configured	Same as C301A0
C301A34	Safety message monitor	Function to handle messages is not configured	Same as C301A0

C301A35	Safety message monitor	Function to handle disable communication requests is not configured	Same as C301A0
C301A36	Safety message monitor	IMMI Safety IO estop input mismatch	Same as C301A0
C301A37	Safety message monitor	IMMI Safety IO estop output mismatch	Same as C301A0
C301A38	Safety message monitor	IMMI Safety IO safeguard input mismatch	Same as C301A0
C301A39	Safety message monitor	Target torque data mismatch	Same as C301A0
C301A40	Safety message monitor	compensation current mismatch	Same as C301A0
C302A	Tool configuration		Please check your configuration on the installation tab
C302A1	Invalid Robot Type	The tool received an invalid robot type	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance
C303A	System status		a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance
C303A0	Critical error	A critical system error occurred	Same as C303A
C303A1	System status	Starting up	Same as C303A
C303A2	System status	Shutting down	Same as C303A
C303A3	System status	Reset caused by unknown reasons	Same as C303A
C303A4	System status	Reset caused by power loss	Same as C303A
C303A5	System status	Reset caused by window watchdog	Same as C303A
C303A6	System status	Reset caused by independent watchdog	Same as C303A
C303A7	System status	Reset caused by software	Same as C303A
C303A8	System status	Reset caused by power on	Same as C303A

C303A9	System status	Reset caused by reset pin	Same as C303A
C303A10	System status	Reset caused by brown out	Same as C303A
C303A11	System status	Reset caused by a loss of lock in the PLL	Same as C303A
C303A12	System status	Reset caused by a loss of external clock.	Same as C303A
C303A13	System status	Reset caused by LLWU module wakeup source	Same as C303A
C303A14	System status	Reset caused by peripheral failure to acknowledge attempt to enter Stop Mode	Same as C303A
C303A15	System status	Reset caused by EzPort receiving the RESET command while the device is in EzPort mode	Same as C303A
C303A16	System status	Reset caused by host debugger system setting of the System Reset Request bit	Same as C303A
C303A17	System status	Reset caused by core LOCKUP event	Same as C303A
C303A18	System status	Reset caused by JTAG	Same as C303A
C303A19	System status	Unexpected core frequency configured	Same as C303A
C304A	Self monitoring		
C304A0	Critical error	A critical error occurred in physical, logical, and temporal monitoring (PLATM)	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C304A3	Close to the gearbox shear limit. Encoders disagree on the Joint position	The Joint acceleration or deceleration is too high, or there is a mechanical problem in the gear related to encoder mounting.	a) Reduce acceleration in the user program. b) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance or Replace Joint if necessary.

C304A4	Either the encoder was inappropriately mounted, or the gearbox is loose or broken. Difference between the encoders is present	Mechanical problem in gear related to encoder mounting.	a) Reduce acceleration in the user program. b) Check TCP/Payload and Cog c) Do a Complete rebooting sequence d) Update software e) Contact your local Universal Robots service provider for assistance or Replace Joint if necessary.
C304A6	Motor phase resistance is too high.	The lead/connector is broken, or the Motor phase lead has become disconnected or loose.	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance
C305A	Robot Power Control		
C305A0	Critical error	A critical error in power control module	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C305A1	Power supply voltage too low	Robot voltage is lower than 40V.	a) Check for loose connections b) Do a Complete rebooting sequence c) Update software d) Contact your local Universal Robots service provider for assistance.

C305A2	Robot cable not connected		a) Make sure the cable between Control Box and Robot Arm is correctly connected and it has no damage. b) Check for loose connections c) Do a Complete rebooting sequence d) Update software e) Contact your local Universal Robots service provider for assistance Contact your local Universal Robots service provider for assistance.
C305A3	Short circuit in Robot detected or the wrong Robot is connected to the Control Box.		a) Check for loose connections b) Make sure the cable between Control Box and Robot Arm is correctly connected and it has no damage. c) Check for loose connections d) Do a Complete rebooting sequence e) Update software f) Contact your local Universal Robots service provider for assistance.
C305A4	Robot voltage rising slower than expected		a) Verify the power supply voltage b) Verify Control Box and Robot Arm are correctly paired c) Check for loose connections d) Do a complete rebooting sequence e) Contact your local Universal Robots service provider for assistance
C305A5	Robot Power Control	Attempted to start Energy Eater with powered robot	

C305A6	Power supply voltage too high	Power supply is higher than 56V	a) Make sure the cable between Control Box and Robot Arm is correctly connected and it has no damage. b) Check for loose connections c) Do a Complete rebooting sequence d) Update software e) Contact your local Universal Robots service provider for assistance.
C305A7	Robot Power Control	Energy Eater was active when trying to turn on the Robot arm	
C305A8	The Robot Voltage is too high when powering on the Robot		a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C305A9	The Power State was not OFF when trying to power on the Robot		a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance
C305A10	Robot Power Control	The Delay Callback setup failed	
C305A11	The power to the robot arm was not removed fast enough after violation		a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance
C306A	Joint	Joint error	
C306A0	Critical error	A critical error occurred in a Joint	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.

C306A1	Not stopping fast enough	Joint was unable to come to a full stop fast enough.	a) Either an incorrect payload is mounted, or an external force is pushing the robot b) Do a Complete rebooting sequence c) Update software d) Contact your local Universal Robots service provider for assistance.
C306A2	Joint	Velocity failed to pass sanity check	
C306A3	Joint	Acceleration failed to pass sanity check	
C306A4	Joint	Joint does not have a stored id	
C306A5	Joint	Joint ID could not be stored	
C306A6	Joint	control-package sequence number mismatched with expected sequence number	
C306A7	Joint	Several instances of mismatched control-package sequence numbers within last second	
C306A8	Joint	Sanity check of control-package sequence numbers recovered after detecting bad sequence numbers	
C306A9	Joint moved more than allowable limit	Potential mechanical failure of the joints brakes	b) Do a Complete rebooting sequence c) Update software d) Contact your local Universal Robots service provider for assistance.
C306A10	Joint	Current detected in motor exceeded limits, check current	
C306A11	Joint	Check PWM duty cycle for motor phase A	
C306A12	Joint	Check PWM duty cycle for motor phase B	
C306A13	Joint	Check PWM duty cycle for motor phase C	
C307A	Data B		
C308A	Data A		
C309	Keep-Alive System		

C309A	Critical error	A critical error occurred in the Keep-Alive System	a) Conduct a complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance
C309A0	Keep-Alive System	Critical error	
C309A1	Keep-Alive System	Keep-Alive System message with wrong sequence received from SCB-uPA.	
C309A2	Keep-Alive System	Timeout reached while waiting for a Keep-Alive System message from SCB-uPA.	
C309A3	Keep-Alive System	Go-to-Fault command received a Keep-Alive System message from SCB-uPA.	
C309A4	Keep-Alive System	A Keep-Alive System message with wrong sequence received from SCB-uPB.	
C309A5	Keep-Alive System	Timeout reached while waiting for Keep-Alive System message from SCB-uPB.	
C309A6	Keep-Alive System	Go-to-Fault command received in Keep-Alive System message from SCB-uPB.	
C309A7	Keep-Alive System	Keep-Alive System message received from an unauthorized source	
C309A8	Keep-Alive System	uPA handler received an invalid value	
C309A9	Keep-Alive System	uPB handler received an invalid value	

C309A10	Lost more than allowed Keep-Alive System messages in a row from Safety Control Board-uPA	An invalid amount of Keep-Alive System messages have been lost from the Safety Control Board Processor A	a) Conduct a complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance
C309A11	Lost more than allowed Keep-Alive System messages in a row from Safety Control Board-uPB	An invalid amount of Keep-Alive messages have been lost from the Safety Control Board Processor B	a) Conduct a complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance
C309A12	Keep-Alive System	Go-to-Violation command received in Keep-Alive System message from SCB-uPA.	
C309A13	Keep-Alive System	Go-to-Violation command received in Keep-Alive System message from SCB-uPB.	
C309A14	Keep-Alive System	Invalid command received in Keep-Alive System message from SCB-uPA.	
C309A15	Keep-Alive System	Invalid command received in Keep-Alive System message from SCB-uPB.	
C311A0	Delay Callback	The timer is not available	
C312A	Data validation		
C312A0	Critical error	A critical error occurred during data validation	a) Do a Complete rebooting sequence b) Check for ESD noise. c) Update software d) Contact your local Universal Robots service provider for assistance.
C312A1	Data validation	Missed several packages	
C312A2	Data validation	Unexpected sequence	
C312A3	Data validation	Several failures in a row	
C312A4	Data validation	Received a package at an unexpected time	
C312A5	Data validation	Package had unexpected type	

C313A0	App version	Check build version	
C313A1	App version	Check git sha	
C313A2	App version	Check CRC code	
C313A3	App version	Check build major version	
C313A4	App version	Check build minor version	
C313A5	App version	Check build patch version	
C314A	SPI IO	IO sanity check error.	
C314A0	Critical error	A critical error occurred related to IO	a) Do a Complete rebooting sequence b) Check IO connections c) Update software d) Contact your local Universal Robots service provider for assistance.
C314A1	SPI IO	Control bits read wrongly	
C314A2	SPI IO	Output readback does not match the produced value	
C314A3	SPI IO	Safeguard bit transition to low	
C314A4	SPI IO	Emergency Stop bit transition to low	
C314A5	Expected OSSD pulse were not detected on the Configurable Output (CO)	The generated OSSD pulses on the safety output were not seen during readback	a) Verify if safety output is not connected to any power supply or another safety output b) Update software c) Contact your local Universal Robots service provider for assistance
C314A6	An unexpected OSSD pulse was detected on Configurable Output (CO)	An OSSD pulse was detected on the safety output readback, but was not generated by the hardware	a) Verify if safety output is not connected to ground or another safety output b) Update software c) Contact your local Universal Robots service provider for assistance
C315A	Watchdog	The system watchdog is not working as expected	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.

C315A0 to C315A23	Self-test failed	The system watchdog is not working as expected	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C316A	MCU	Micro Control Unit	
C316A0	Unknown ID	The Microcontroller Identifier does not match an expected value. Firmware does not match hardware.	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance
C316A1	This version of the firmware is obsolete and needs to be updated	The firmware in the robot is too old and needs to be updated	a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance.
C317A0	Failure injection	Injecting type unexpected	
C317A1	Failure injection	Missing handler for specified type	
C317A2	Failure injection	Invalid data provided to specified type	
C317A3	Failure injection	Throw report	
C318A0	Stack monitor	The stack level watermark is breached	
C319A0	Filesys Diagnostic Tool	Read operation started, at specified start address	
C319A1	Filesys Diagnostic Tool	Read operation was succesfully completed	
C319A2	Filesys Diagnostic Tool	Read operation failed, due to illegal address	
C319A3	Filesys Diagnostic Tool	Received data for unexpected address	
C319A4	Filesys Diagnostic Tool	Unxpected address	
C319A5	Filesys Diagnostic Tool	Erased sector at specified address	
C319A6	Filesys Diagnostic Tool	Write operation was succesfully completed	

C320A0 to C320A41	REDnet BLVDS	Data transmission error	
C321A0 to C321A41	REDnet RS485	Data transmission error	
C322A0	Switch	Switch : Priority package timeout on specified ports	
C322A1	Switch	Switch : Data package timeout on specified ports	
C323A0	SCB Endpoint	Endpoint : Priority data debug channel overflow	
C323A1	SCB Endpoint	Endpoint : data debug channel overflow	
C323A2	SCB Endpoint	Endpoint : Priority data inbound timeout from specified port.	
C323A3	SCB Endpoint	Endpoint : Data inbound timeout from specified port.	
C323A4	SCB Endpoint	Endpoint : Priority data outbound timeout to specified port.	
C323A5	SCB Endpoint	Endpoint : Data outbound timeout to specified port.	
C324A0	TP UART	UART : FiFo overflow	
C324A1	TP UART	UART : Length mismatch	
C324A2	TP UART	UART : Unexpected SOM	
C325A53 to C335A66	SPI uA	uA SPI : Unsupported command	
C327A0	PCIe	PCIe Control-Data : Blocked	
C327A1	PCIe	PCIe Priority-Data : Blocked	
C327A2	PCIe	PCIe data-data : Blocked	
C328A	Transceiver miscellaneous		
C328A0	Transceiver miscellaneous	The SoC arrived too early	

C328A1	Transceiver miscellaneous	Timeout while waiting for the SoC, the SoC was lost or delayed more than expected	
C328A2	Flash device is not supported, check JEDEC data for device	The flash device's JEDEC ID does not match a supported flash device	a) Conduct a complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance
C329A1	AXI STREAM	FiFo overflow on interface	
C329A2	AXI STREAM	FiFo overflow cleared	
C330A	Injection Molding Machine Interface IMMI IO		
C330A1	Injection-Molding-Machine-Interface E-Stop output readback does not match the produced value	First byte: produced value, second byte: read value	Check E-stop output
C330A2	Injection-Molding-Machine-Interface Moulding Area Free output readback does not match the produced value	First byte: produced value, second byte: read value	Check output
C330A3	Injection-Molding-Machine-Interface 24V IO voltage outside acceptable range	The voltage measured on the 24V IO rail is lower than expected	a) Check the fuses on the Injection-Molding-Machine-Interface b) Verify there are no short circuits on the 24V IO connectors c) Contact your local Universal Robots service provider for assistance
C330A4	Injection-Molding-Machine-Interface 48V voltages outside acceptable range	The voltages measured on the 48V rails are lower than expected	a) Check the fuses on the Injection-Molding-Machine-Interface b) Verify there are no short circuits on the IO connectors c) Contact your local Universal Robots service provider for assistance

C331A	Friction model		
C331A0	Critical error	A critical error occurred in the friction model module	a) Conduct a complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance
C332A	Servo configuration		
C332A0	Critical error on Servo configuration	A critical error occurred in the servo configuration module	a) Conduct a complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance
C332A1	Servo configuration	The configuration file could not be loaded	
C332A2	Servo configuration	The configuration file could not be updated	
C332A3	Servo configuration	Failed to create configuration file, due to unknown PCB_type	
C332A4	Servo configuration	Failed to acquire the motor datasheet, due to unsupported motor	
C333A0	File message	Critical error	
C333A1	File message	File type is not supported	
C333A2	File message	All arguments are mandatory	
C333A3	File message	Protocol version is not supported	
C333A4	File message	File part is unexpected	
C333A5	File message	CRC is invalid	
C333A6	File message	Unexpected CRC value	
C333A7	File message	Unique ID is invalid	
C333A8	File message	Unexpected unique ID	
C333A9	File message	File version is not supported	
C333A10	File message	File ID is deleted	

C334A	Protective Stop: Position deviation while in Locked Axis feature	Robot deviated from constrained axes while in Constrained Freedrive. The maximum range was reached.	a) Unlock constrained axis b) Move robot back to reachable postions
C336A1	Hardware configuration manager	An illegal write request to a memory area	
C337A0	Control parameters	Critical error	
C337A1	Control parameters	A selected set of control parameters was not allowed in this application	
C337A2	Control parameters	A selected set of control parameters was not known or was incorrectly applied	
C400A	Protective Stop: Elbow position close to safety plane limits	Robot joint 2 – Elbow has reached the Safety Plane limits	Move robot Elbow joint away from the safety plane
C401A	Protective Stop: Exceeding user safety settings for stopping time	You have exceeded the safety settings, watch out for high values not allowed in the robot	a) Check speeds and accelerations in the program b) Check usage of TCP, payload and CoG correctly c) Check external equipment activation if correctly set
C402A	Protective Stop: Exceeding user safety settings for stopping distance	Protective Stop activated by the stopping distance set in the safety settings. The value was higher so the robot stopped preventing higher distance of stop	Same as C401A
C403A	Protective Stop: Danger of clamping between the Robot's lower arm and tool	Robot has entered Protective Stop due to reach maximum point to prevent a clamp situation between joint and robot itself	Same as C401A
C404A	Unexpected behavior		
C404A0	Runtime sends data too often	Communication overload	a) Check external equipment communication frequency b) Check if wait command or sync() script code are used in the program

C404A1	Runtime tries to receive data too often	Communication overload	Same as C404A0
C450A	Force-Torque sensor		
C450A0	Sensor data invalid	Force-Torque sensor is defective or not mounted correctly	a) Do a Complete rebooting sequence b) Check for loose connections c) Update software d) Contact your local Universal Robots service provider for assistance.
C450A1	Sensor cannot be used, therefore it is disabled	Force-Torque sensor version is newer than the Robot software	Same as C450A0
C450A2	Force-Torque sensor	Channel signal became invalid	
C450A3	Force-Torque sensor	Check frequency	
C450A4	Force-Torque sensor is expected, but it cannot be detected	Force-Torque sensor is expected, but no signals from the sensor can be detected.	a) Do a Complete rebooting sequence b) Check for loose connections c) Check for damages to the Tool/sensor d) Update software e) Contact your local Universal Robots service provider for assistance.
C450A5	Force-Torque sensor is detected but not calibrated	Force-Torque sensor is installed, but no calibration was found	Same as C450A5
C499A	Motor encoder calibration status		a) Conduct a complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance
C499A0	Actual position isn't final. Position error	Motor encoder calibration status	Same as C499A
C499A1	Actual position has an error. Position error	Motor encoder calibration status	Same as C499A

C499A2	Actual position has a an error and isn't final. Position error	Motor encoder calibration status	Same as C499A
C499A3	Target position	Motor encoder calibration status	Same as C499A
C499A4	Actual average position	Motor encoder calibration status	Same as C499A
C499A5	Actual position variance	Motor encoder calibration status	Same as C499A
C499A6	Actual position min to max delta	Motor encoder calibration status	Same as C499A
C499A7	Actual sample position number	Motor encoder calibration status	Same as C499A
C720A2	LVD (low voltage detection)	Low Voltage warning level reached	Same as C720A
C710A	ROM Test		a) Do a complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance
C710A0	Critical error	A critical error occurred during ROM validation	Same as C710A
C710A1	ROM corrupted	A critical error occurred during ROM validation	Same as C710A
C710A2	Failed to validate CRC on invariant data in RAM	A critical error occurred during ROM validation	Same as C710A
C710A3	Unexpected size of invariant data	A critical error occurred during ROM validation	Same as C710A
C710A4	Failed to validate CRC on code segment in RAM	A critical error occurred during ROM validation	Same as C710A
C720A	Low Voltage Detection (LVD)		a) Do a Complete rebooting sequence b) Check for loose connections d) Update software e) Contact your local Universal Robots service provider for assistance

C720A0	Reset due to Low Voltage Dectection (LVD) or power off	Voltage needed values is not reaching the necessary values to work. Out of range	Same as C720A
C720A1	Low Voltage warning level reached	Voltage needed values is not reaching the necessary values to work. Out of range	Same as C720A
C740A	Hardware monitoring		a) Do a Complete rebooting sequence b) Update software c) Contact your local Universal Robots service provider for assistance
C740A0	Critical error	A critical error occurred during hardware monitoring	Same as C740A
C740A1	1V2 voltage is outside of the allowed range		Same as C740A
C740A2	1V8 voltage is outside of the allowed range		Same as C740A
C740A3	2V5 voltage is outside of the allowed range		Same as C740A
C740A4	3V3 voltage is outside of the allowed range		Same as C740A
C740A5	PC 3V3 voltage is outside of the allowed range		Same as C740A
C740A6	uA's 3V3voltage is outside of the allowed range		Same as C740A
C740A7	uB's 3V3 voltage is outside of the allowed range		Same as C740A
C740A8	5V voltage is outside of the allowed range		Same as C740A
C740A9	12V voltage is outside of the allowed range		Same as C740A

C740A10	24V voltage is outside of the allowed range		Same as C740A
C740A11	48V voltage is outside of the allowed range		Same as C740A
C740A12	58V voltage is outside of the allowed range		Same as C740A
C740A13	-4V voltage is outside of the allowed range		Same as C740A
C740A14	Robot voltage is outside of the allowed range		Same as C740A
C740A15	Robot current is outside of the allowed range		Same as C740A
C740A17	Inrush protected 48V voltage is outside of the allowed range		Same as C740A
C740A20	24V SPI IO voltage	24V voltage IO is outside its limits (Below 23,0V above 25,7V)	a) Do a Complete rebooting sequence b) Check for loose connections c) Check for damages to the Tool/sensor d) Update software e) Contact your local Universal Robots service provider for assistance
C740A21	24V SPI IO current	24V current IO is outside its limits	a) Do a Complete rebooting sequence b) Check for loose connections c) Check for damages to the Tool/sensor d) Update software e) Contact your local Universal Robots service provider for assistance

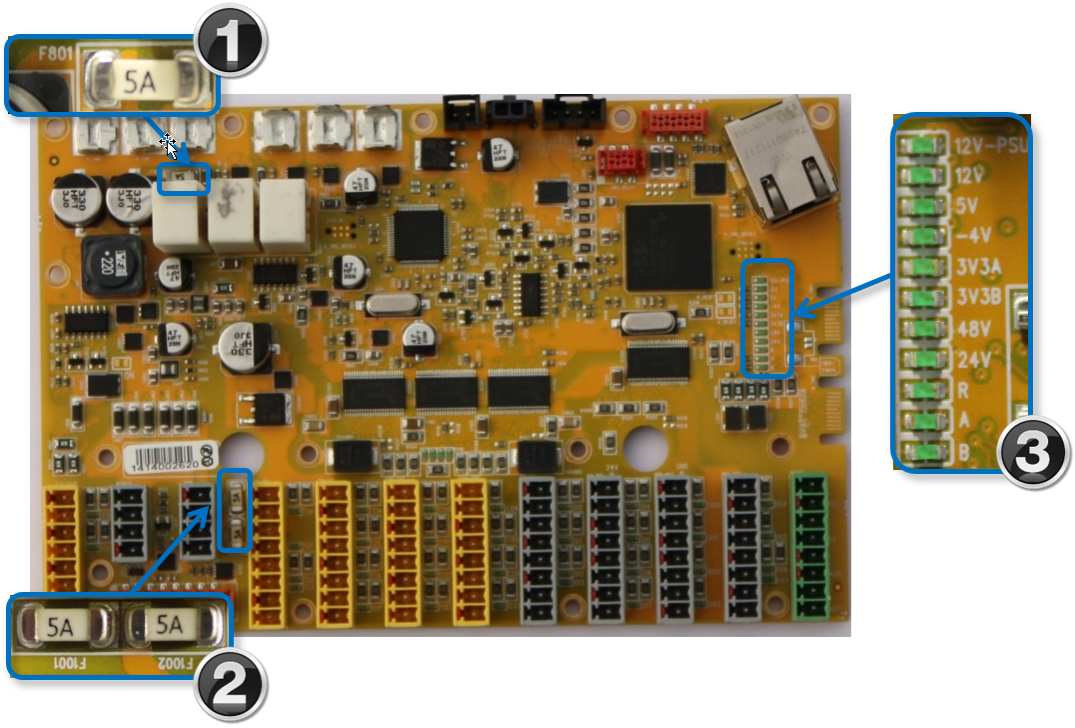
C740A22	The solenoid voltage is not 0 before activation		Same as C740A
C740A23	The solenoid voltage is not 48V after activation		Same as C740A
C740A24	The left Three-Position Enabling button is inconsistent	Check for connections problem. Check 3PE functionality	a) Do not press the button repeatedly b) Remove any pressure off the button c) Press the button with more pressure, if light pressing may not work d) Update software e) Contact your local Universal Robots service provider for assistance
C740A25	The right Three-Position Enabling button is inconsistent	Check for connections problem. Check 3PE functionality	Same as C740A24
C740A26	State for the Three-Position Enabling button	Check for connections problem. Check 3PE functionality	Same as C740A24
C900A	Debug message data		

7.2. LED indicators and Fuses on Safety Control Board

Safety Control Board (SCB)

1. Fuse 48 V:
   The 5A fuse (F801) “48V” protects all 48V in the system inclusive of Euromap from over current.
   This information is only for troubleshooting. Do NOT replace the fuse under any circumstances.
   In case of failure, ONLY replace the SCB with a new tested board.
2. Fuse 24 V:
   2 x 5A fuses (F1001 and F1002) in parallel protect the DI/DO 24 V supply on the Safety Control Board, whether the 24 V is from the controller or external power supply. Do NOT replace the fuses under any circumstances. In case of failure ONLY replace the SCB with a new tested board.
3. LED indicators:

- 12V-PSU On when the power plug is connected.
- 12V System: On when the main controller power has been activated.
- 5V On when “12V System” is on and indicates that 5V is present.
- -4V On when “12V System” is on and indicates that – 4V to analog I/O is present.
- 3V3A On when 5V is on and indicates 3.3V for logic Safety circuit A is present.
- 3V3B On when 5V is on and indicates 3.3V for logic Safety circuit B is present.
- 48V Indicates 48 V is present on the Safety Control Board
- 24V 48V is detected and ok, indicates that internal 24 V is present for I/Os
- R 48 V present on robot arm
- A Indicates Status for Logic A: a blink sequence
- B Indicates status for Logic B: a blink sequence



7.2.1. Normal Startup Sequence for a CB3.x UR5

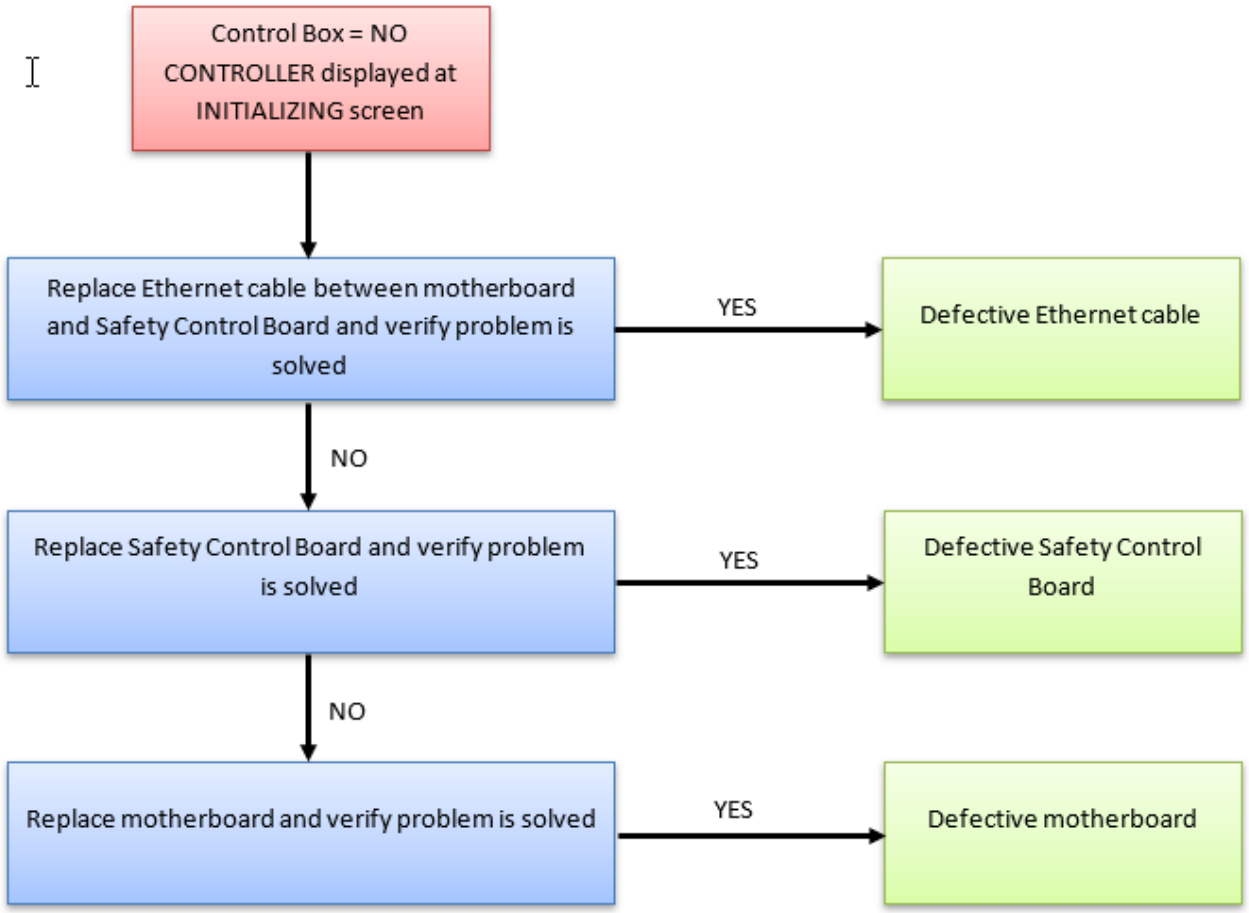
1. The 12V-Power supply LED is on when the power plug is connected to a working power supply.
2. When the power button on the teach pendant is pressed, all LED indicators are turned on except for the 48V, 24V and R LEDs. The A and B LEDs also exhibit a special behavior by intermittently turning off and on ("blinking") once triggered.
3. The final phase of the startup sequence occurs (immediately) after the Polyscope software is done loading. At this stage, the 48V and 24V LED indicators become active (are switched on).

If the 48V LED indicator is off all the time in the startup sequence, measure the voltage as described below:
See the E-Plan diagram: Schematic Overview

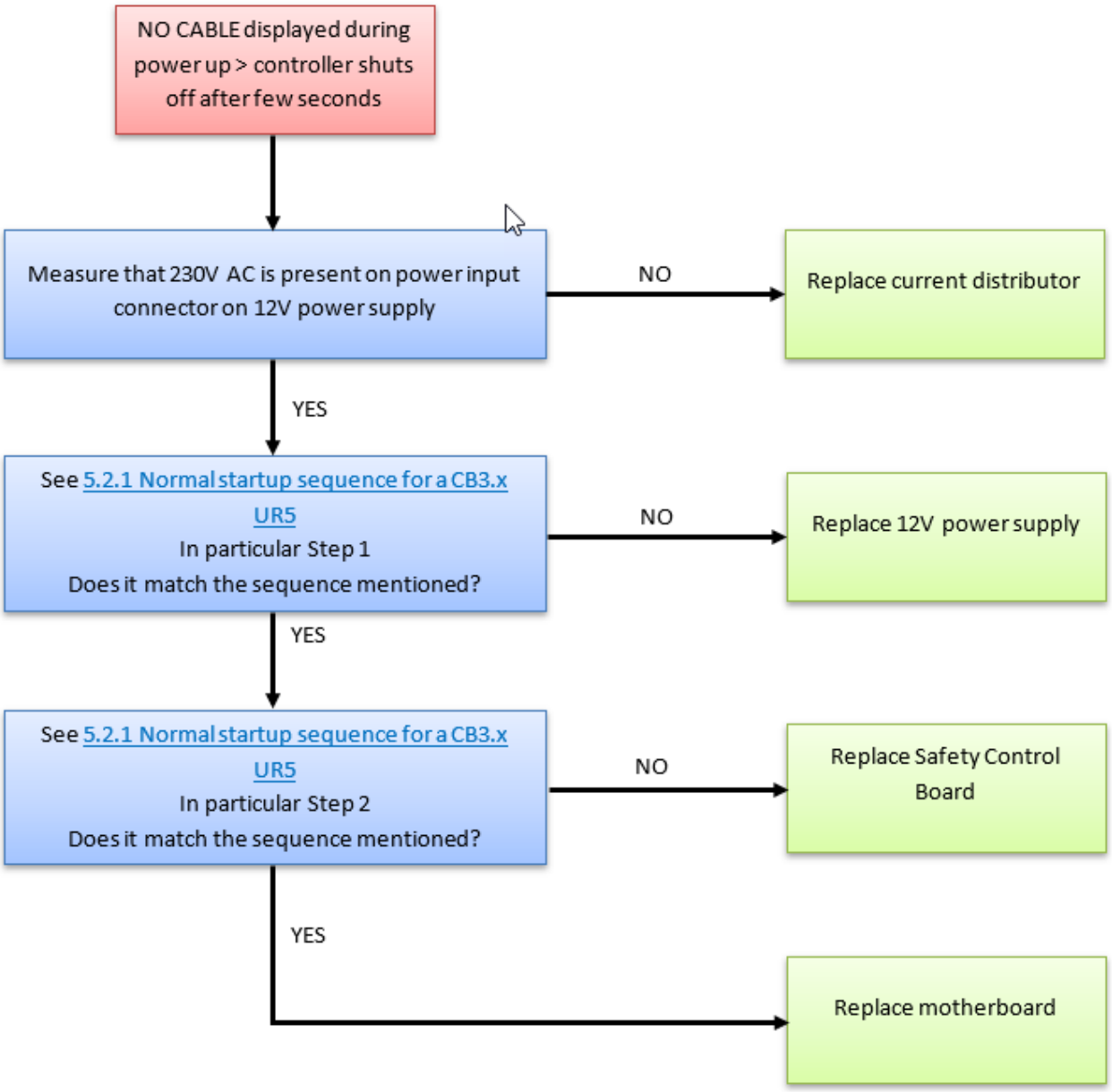
1. Measure the 48V on the Safety Control Board (SCB) where the 48V comes from the 48V power supply. And check this 1 second pulse.
    1. The voltage is measured on the Safety Control Board.
    That means the Safety Control Board is defect.
    2. No voltage is measured on the Safety Control Board. Then measure the 230 V on the input side of the 48V power supply.
    If the voltage pulse of 1 second is present the Power supply is defect.
    3. No voltage is measured on the input of the power supply. Then measure the 230 V on the input side of the Current distributor.
    If the voltage is present the current distributor is defect.

7.3. Error Phenomena

7.3.1. Control Box: NO CONTROLLER Displayed in Initializing

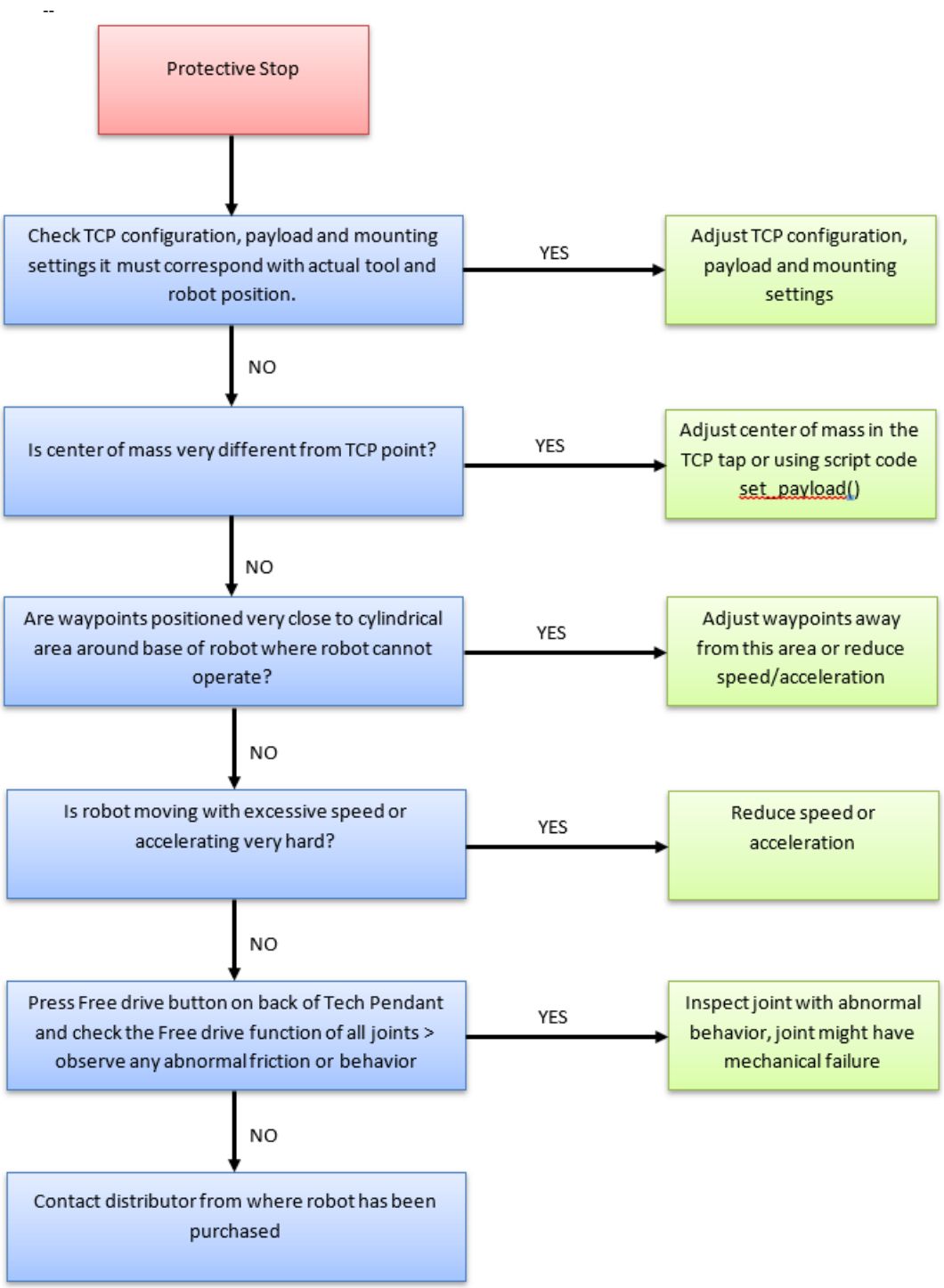


7.3.2. NO CABLE Displayed During Power Up



7.3.3. Protective Stop

Read also article 18939 on the support site www.universal-robots.com/support



Ignoring protective stops is considered abuse of the robot which voids the warranty.

These faults can be hidden from view under the following two circumstances:

1. Personnel simply resetting a fault without review of why the fault has happened.

> **WARNING**
>
> Ignoring protective stops masks fault detection!
> Pay careful attention to protective stops.
> Learn why they happen to improve your programs and preserve fault detection!

Protective stops must never be acknowledged and reset automatically, it must always be a deliberate action by a user to resume after a protective stop.

In general, protective stops are designed to inform the user that the robot has stopped due to an external event such as hitting an obstacle or similar. In case the robots are pushed close to the limits, the robots can generate protective stops to indicate that they are not capable of following the desired trajectory. After a protective stop, the following must be done before resuming operation:

i. **If there has been a collision or similar:**
Remove the obstacle and ensure that operators are out of the way before resuming operation. See Section 2 of Service Manual (see link below).

ii. **If there has been NO collision or similar:**
The robot is operating too close to the limits, the application should be adjusted to reduce the load on the robot, for instance by reducing accelerations, by correct use of blends or similar measures.

Protective stops are indications of issues, including program or production issues – not only safety issues. An application which results in daily protective stops is not designed correctly and needs to be modified.

2. If an automatic acknowledgment and reset of a protective stop has been programmed – no one will see the protective stop.

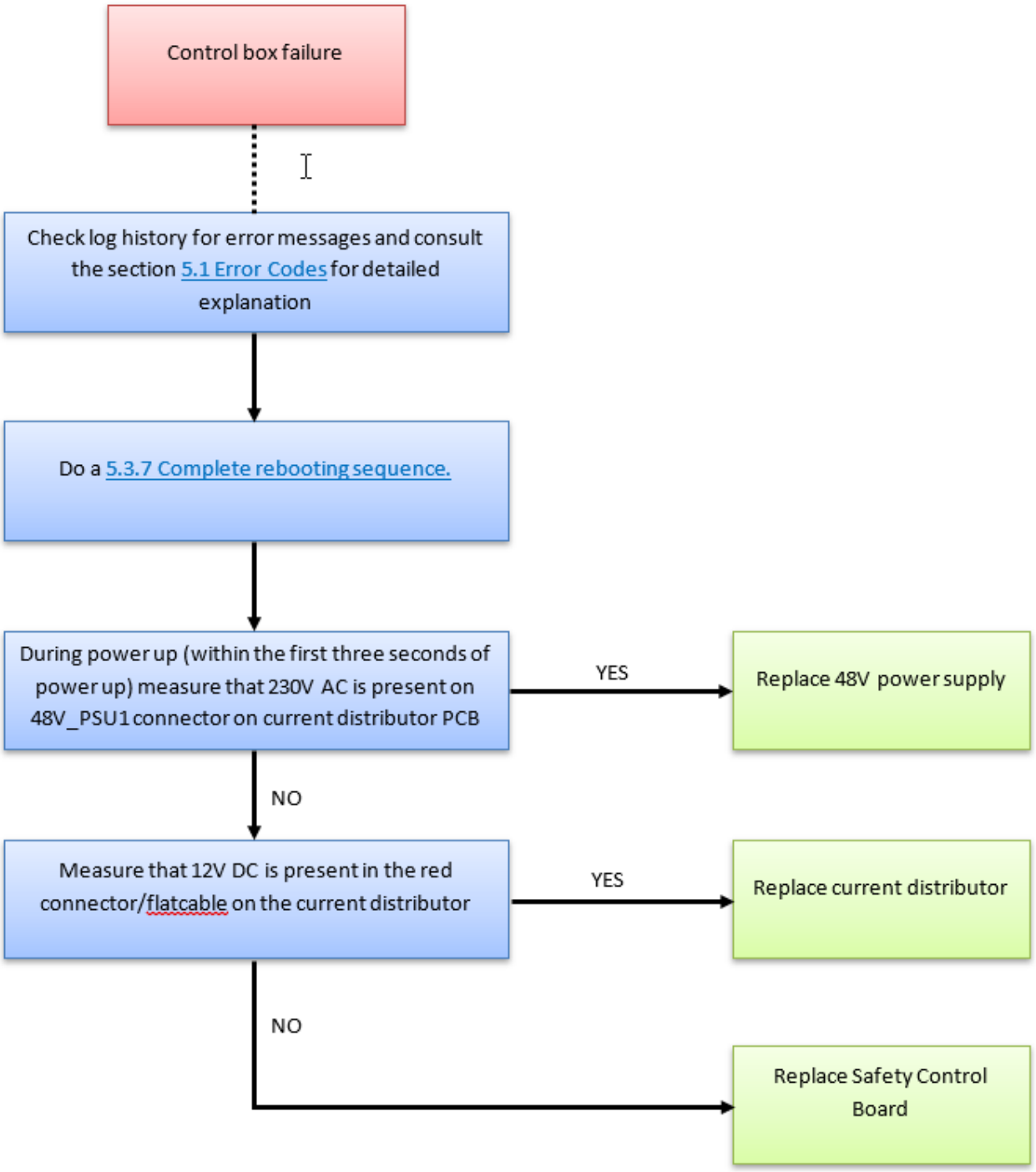
> **WARNING**
> Automatic acknowledgment and reset of protective stops masks faults that will lead to a failure condition.
>
> When there is a protective stop, verify the cause.
> If there has been no collision, then adjust the program

If an integrator has set-up the application program to do automatic acknowledgement and reset of protective stops, the customer should contact the integrator change the program immediately, as such override voids the product warranty and masks fault detection.

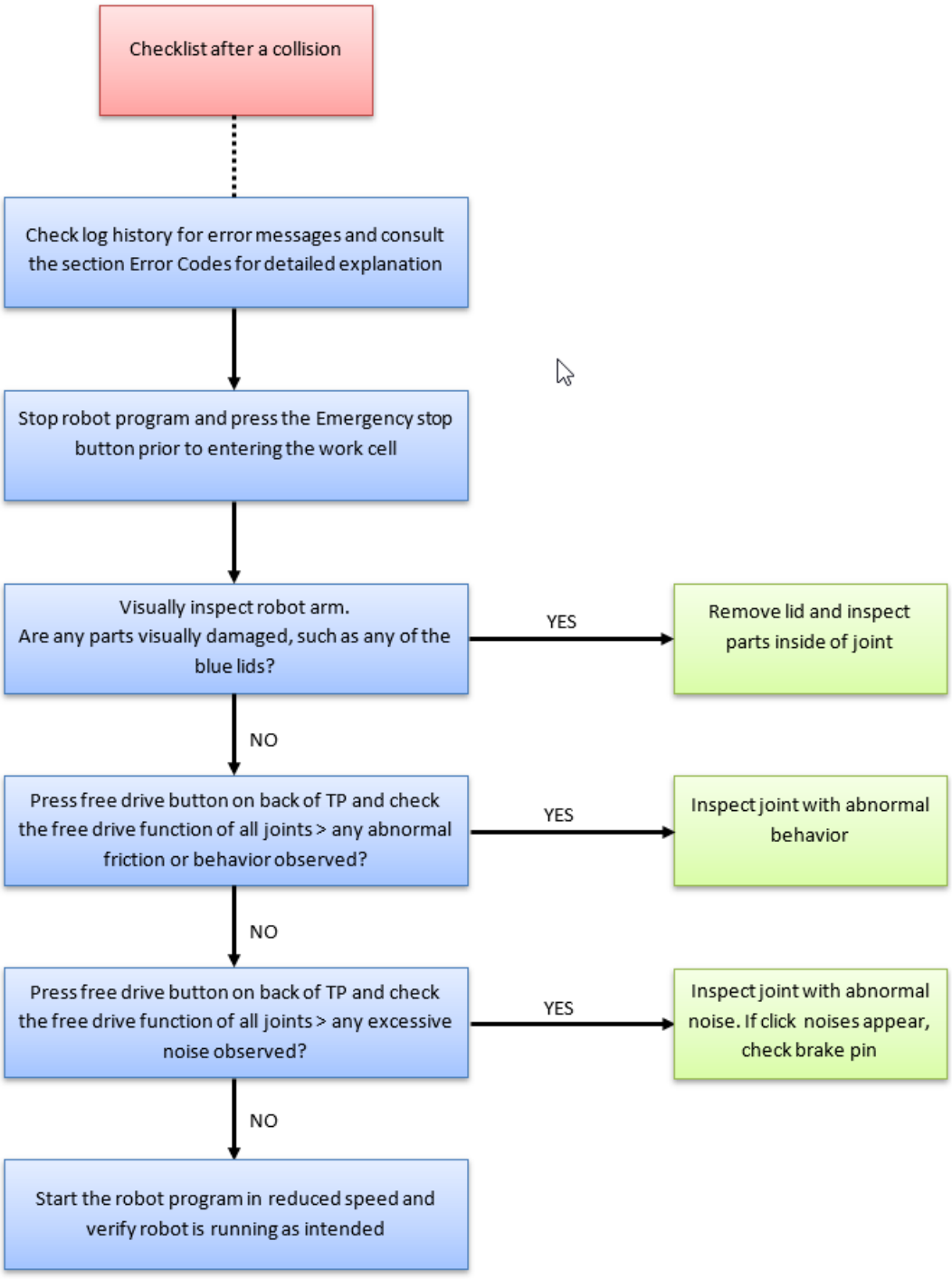
7.3.4. Power on Failure in Initializing

If power turns off a few seconds after Robot Power is turned On in the Initializing window, there are many possible causes for this phenomenon.

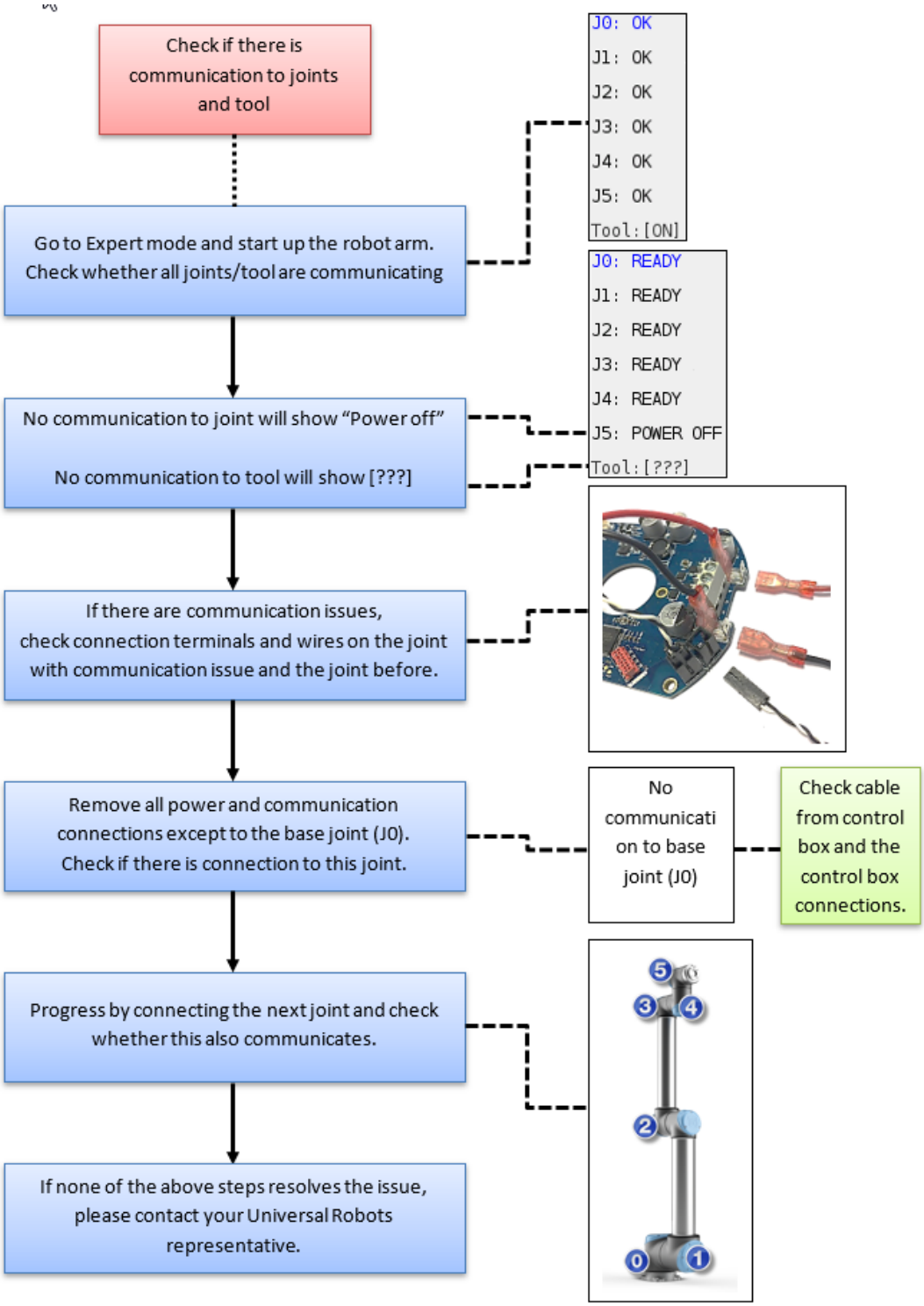
Most likely it is a control box failure or a communication failure with a joint or the tool.



7.3.5. Checklist After a Collision

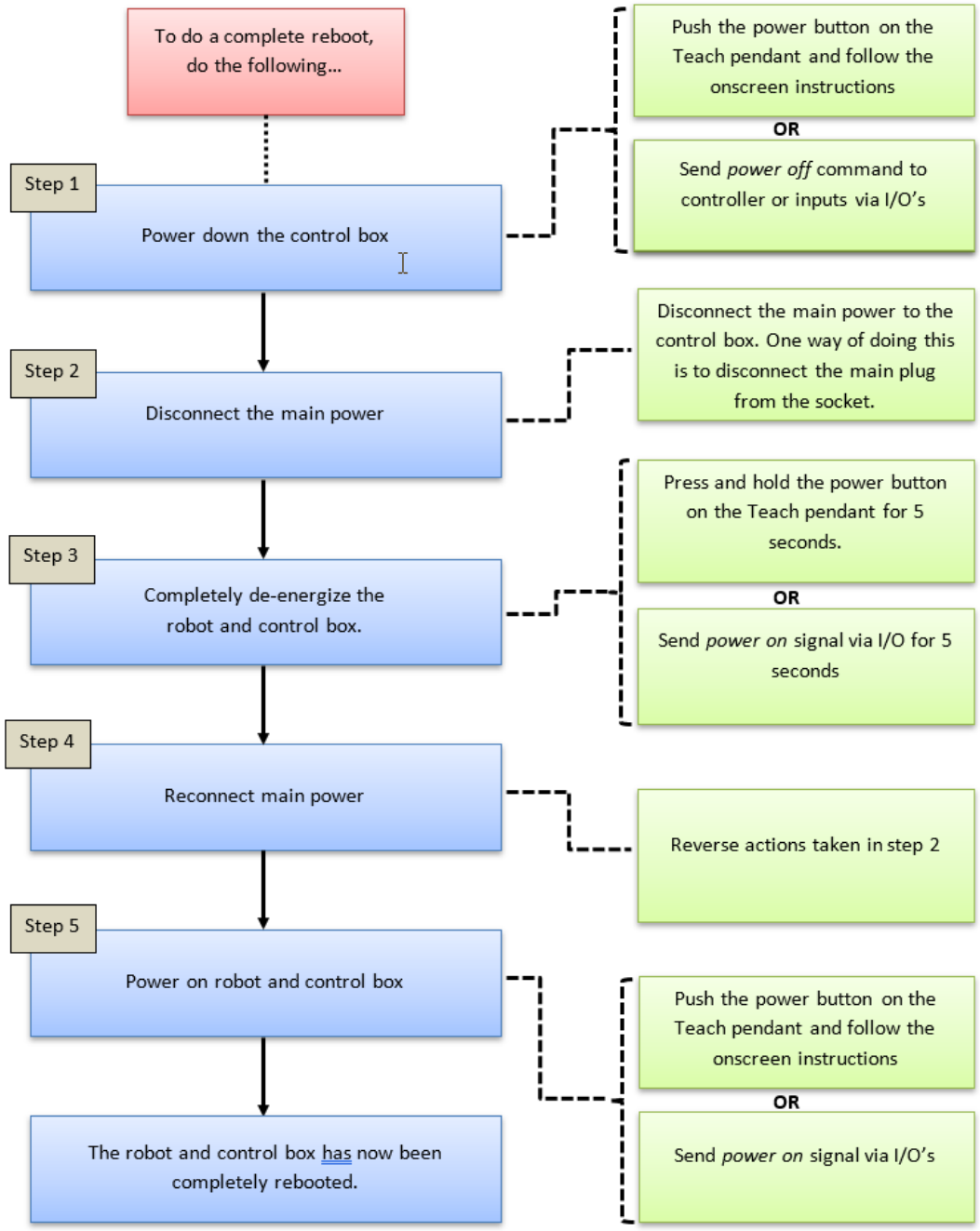


7.3.6. Communication to Joints and Tool



7.3.7. Complete Rebooting Sequence

To do a complete reboot of the robot system follow these 5 steps:



7.4. Electrical Drawing

Diagrams in pdf or in E-plan format, can be found on the support site: www.universal-robots.com/support/

F26_001_UR

UNIVERSAL ROBOTS

Company	Universal Robots
Drawing number	3.0.5.2
Project name	Universal Robots UR5
Created on	25-09-2014
Edit date	02-12-2015
Number of pages	19

2

			Date	02-12-2015	Universal Robots		Project Front Page	
			Ed.					
			Appr.					
Modification	Date	Name	Original		Replacement of	Replaced by		Dwg. No.: 3.0.5.2 Page 1 of 19

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Page	Page description	Supplementary page field	Date	Edited by	X
/ 1	Project Front Page		02-12-2015	VKV	
/ 2	Table of Contents (index)		02-12-2015	VKV	
=UR5 / 10	Overview UR5		02-12-2015	VKV	
=UR5 / 11	Controller UR5 - CB3.0		02-12-2015	VKV	
=UR5 / 12	Controller UR5 - CB3.1		02-12-2015	VKV	
=UR5 / 13	Robot arm UR5		02-12-2015	VKV	
=UR5 / 15	UR5 Controller I/O		02-12-2015	VKV	
=UR5 / 16	UR5 Controller I/O		02-12-2015	VKV	
=UR5 / 17	UR5 Controller I/O		02-12-2015	VKV	
=UR5 / 18	UR5 Controller I/O		02-12-2015	VKV	
=UR5 / 19	UR5 Controller I/O		02-12-2015	VKV	
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=UR5 / 22	UR5 Controller I/O		02-12-2015	VKV	
=UR5 / 23	UR5 Controller I/O		02-12-2015	VKV	
=UR5 / 24	UR5 Controller I/O		02-12-2015	VKV	
=UR5 / 25	UR5 Controller I/O		02-12-2015	VKV	
=UR5 / 26	UR5 Controller I/O		02-12-2015	VKV	
=UR5 / 27	UR5 Tools I/O		02-12-2015	VKV	
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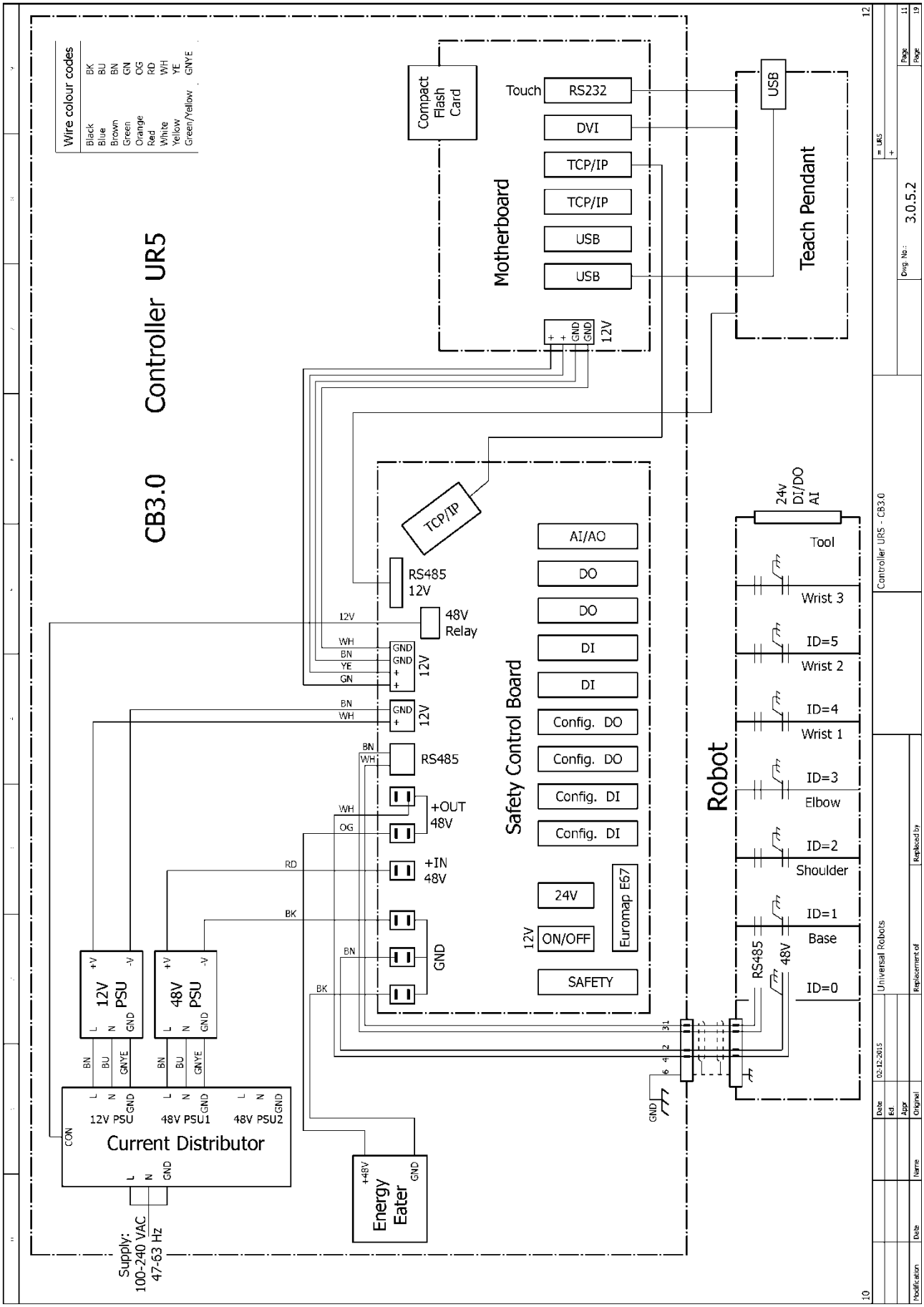
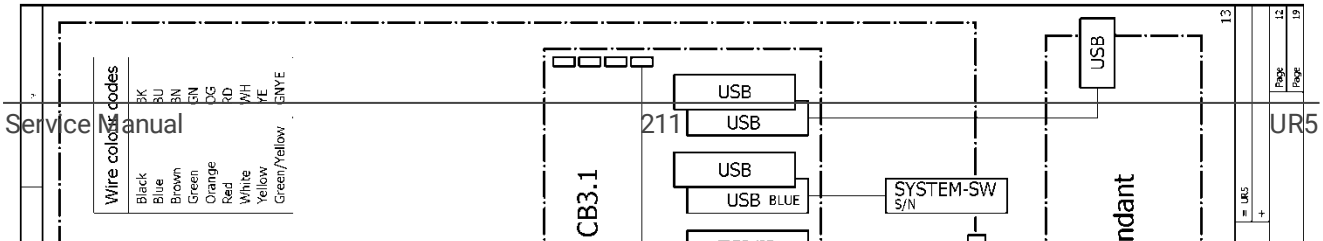
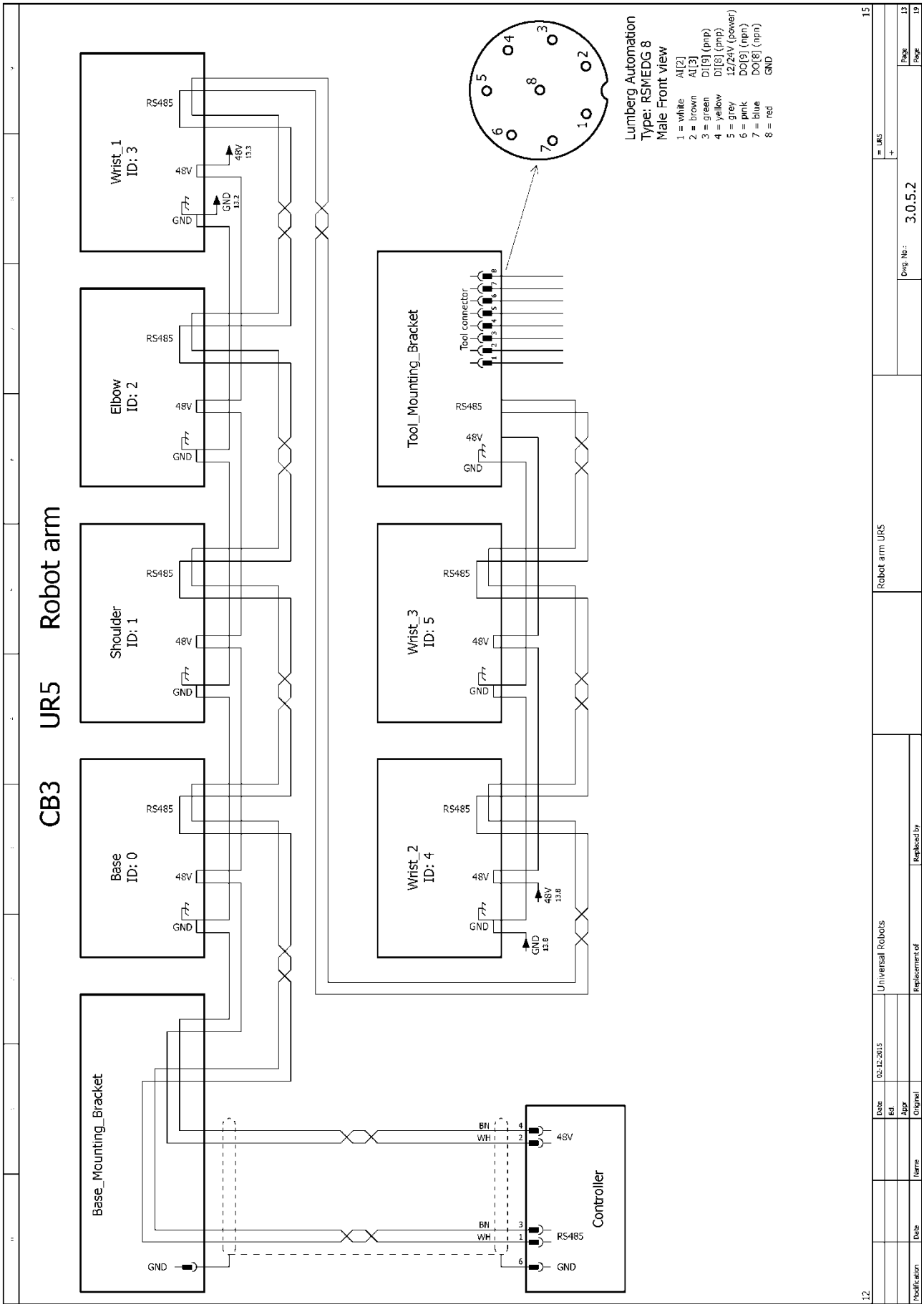
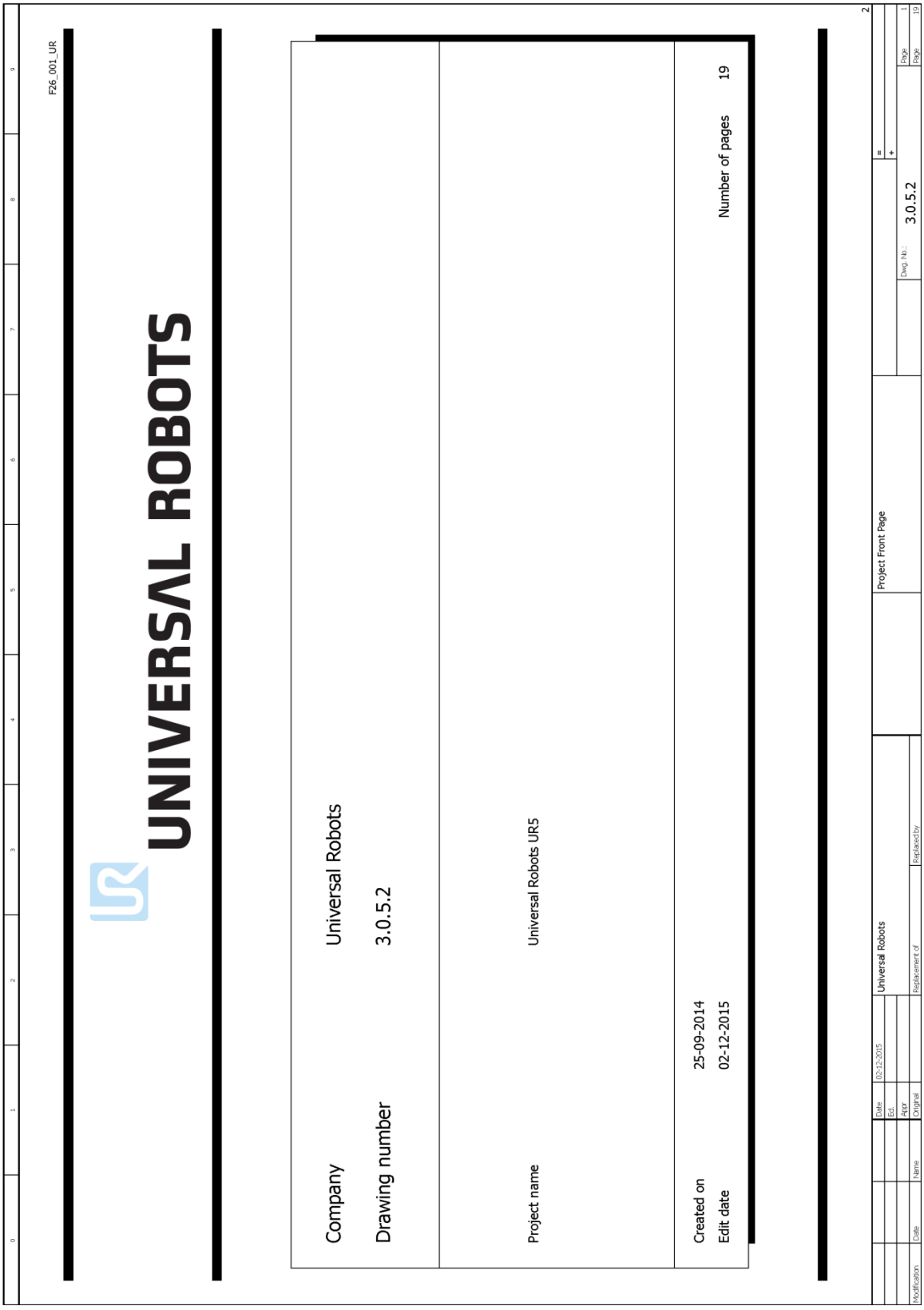






7.4.1. Schematic Overview

Diagrams in pdf or in E-plan format, can be found on the support site: www.universal-robots.com/support



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Page	Page description	Supplementary page field	Date	Edited by	X
/ 1	Project Front Page		02-12-2015	VKV	
/ 2	Table of Contents (index)		02-12-2015	VKV	
=UR5 / 10	Overview UR5		02-12-2015	VKV	
=UR5 / 11	Controller UR5 - CB3.0		02-12-2015	VKV	
=UR5 / 12	Controller UR5 - CB3.1		02-12-2015	VKV	
=UR5 / 13	Robot arm UR5		02-12-2015	VKV	
=UR5 / 15	UR5 Controller I/O		02-12-2015	VKV	
=UR5 / 16	UR5 Controller I/O		02-12-2015	VKV	
=UR5 / 17	UR5 Controller I/O		02-12-2015	VKV	
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=UR5 / 21	UR5 Controller I/O		02-12-2015	VKV	
=UR5 / 22	UR5 Controller I/O		02-12-2015	VKV	
=UR5 / 23	UR5 Controller I/O		02-12-2015	VKV	
=UR5 / 24	UR5 Controller I/O		02-12-2015	VKV	
=UR5 / 25	UR5 Controller I/O		02-12-2015	VKV	
=UR5 / 26	UR5 Controller I/O		02-12-2015	VKV	
=UR5 / 27	UR5 Tools I/O		02-12-2015	VKV	
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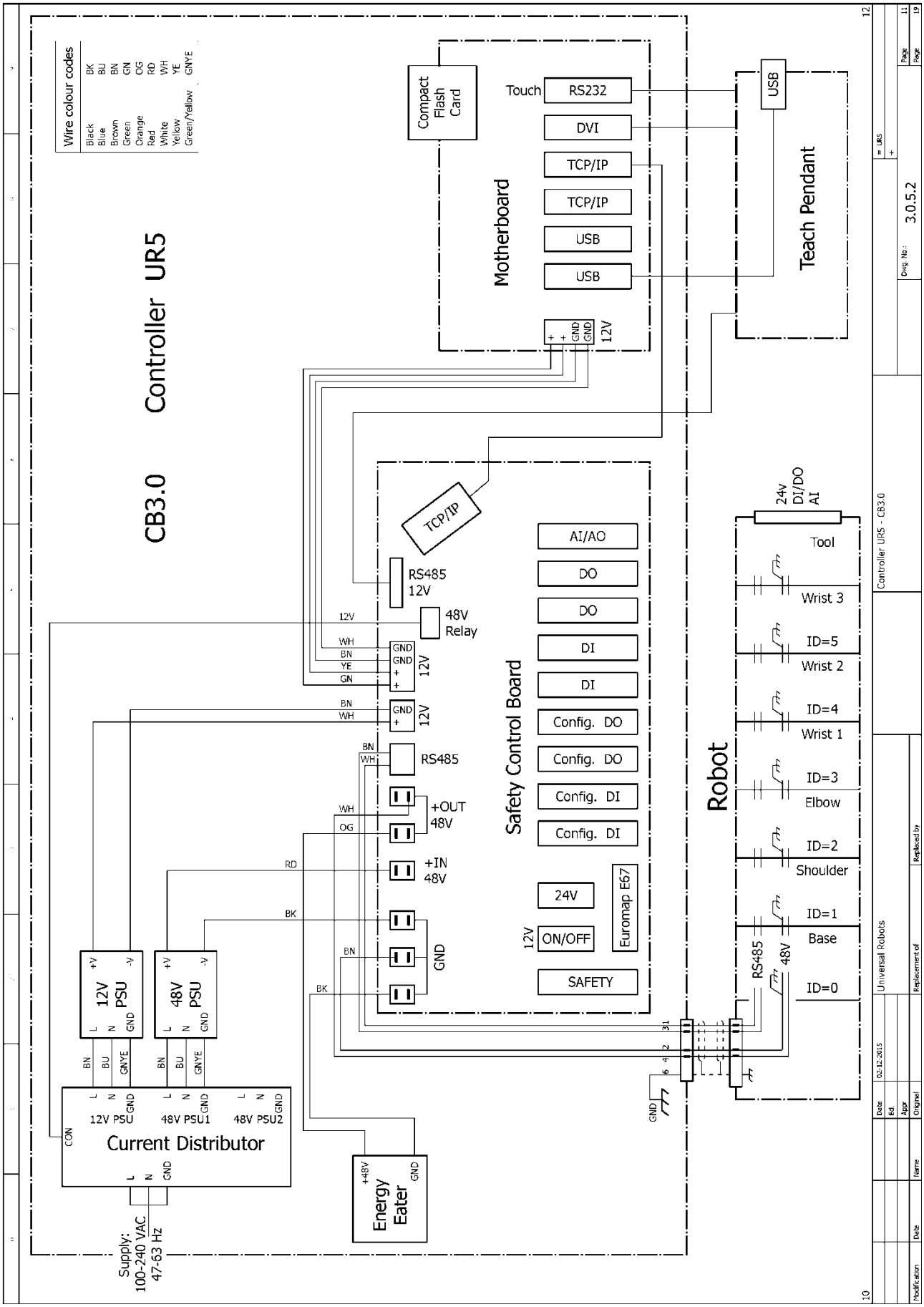
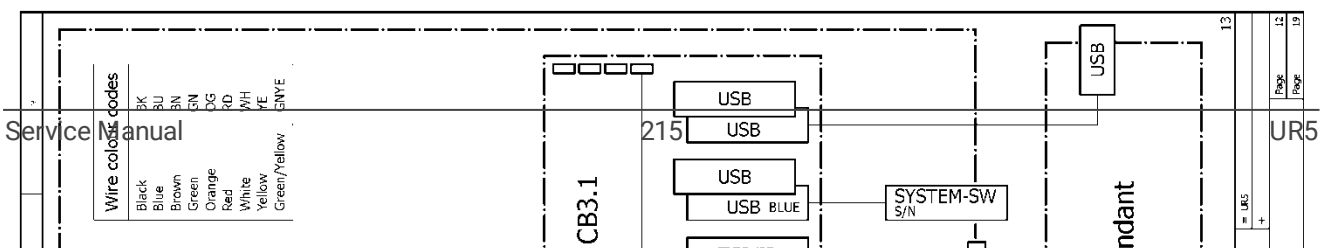
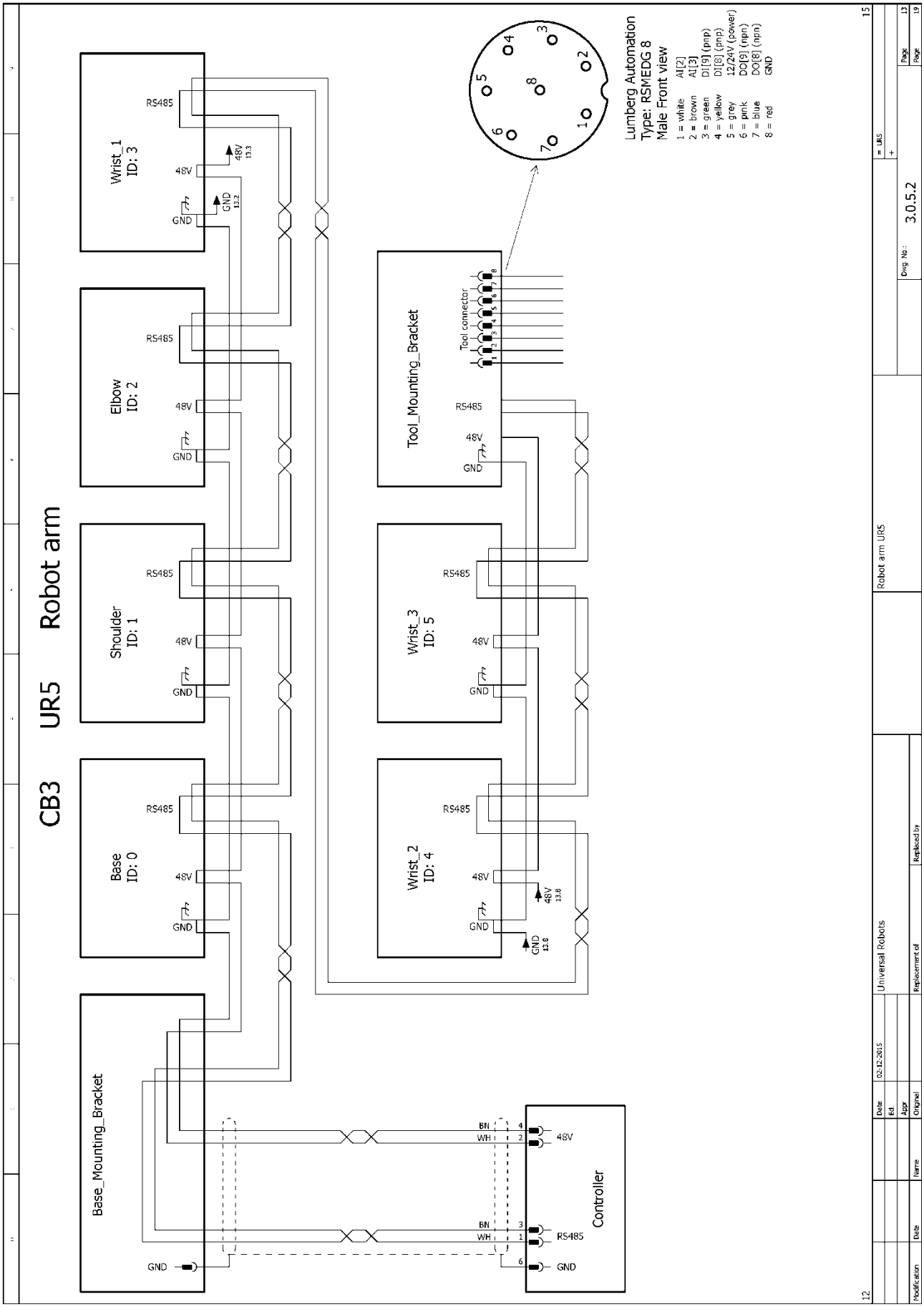
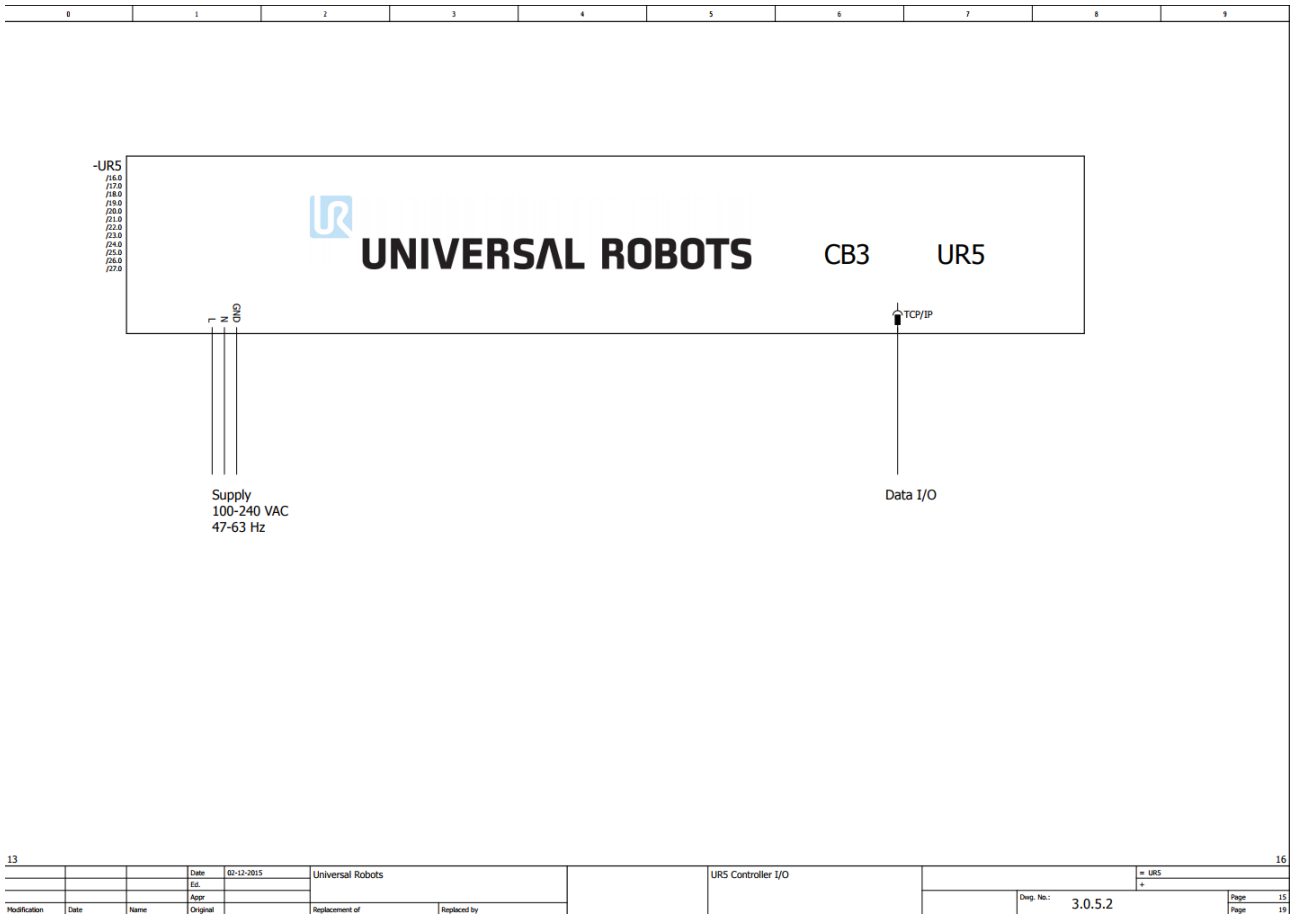


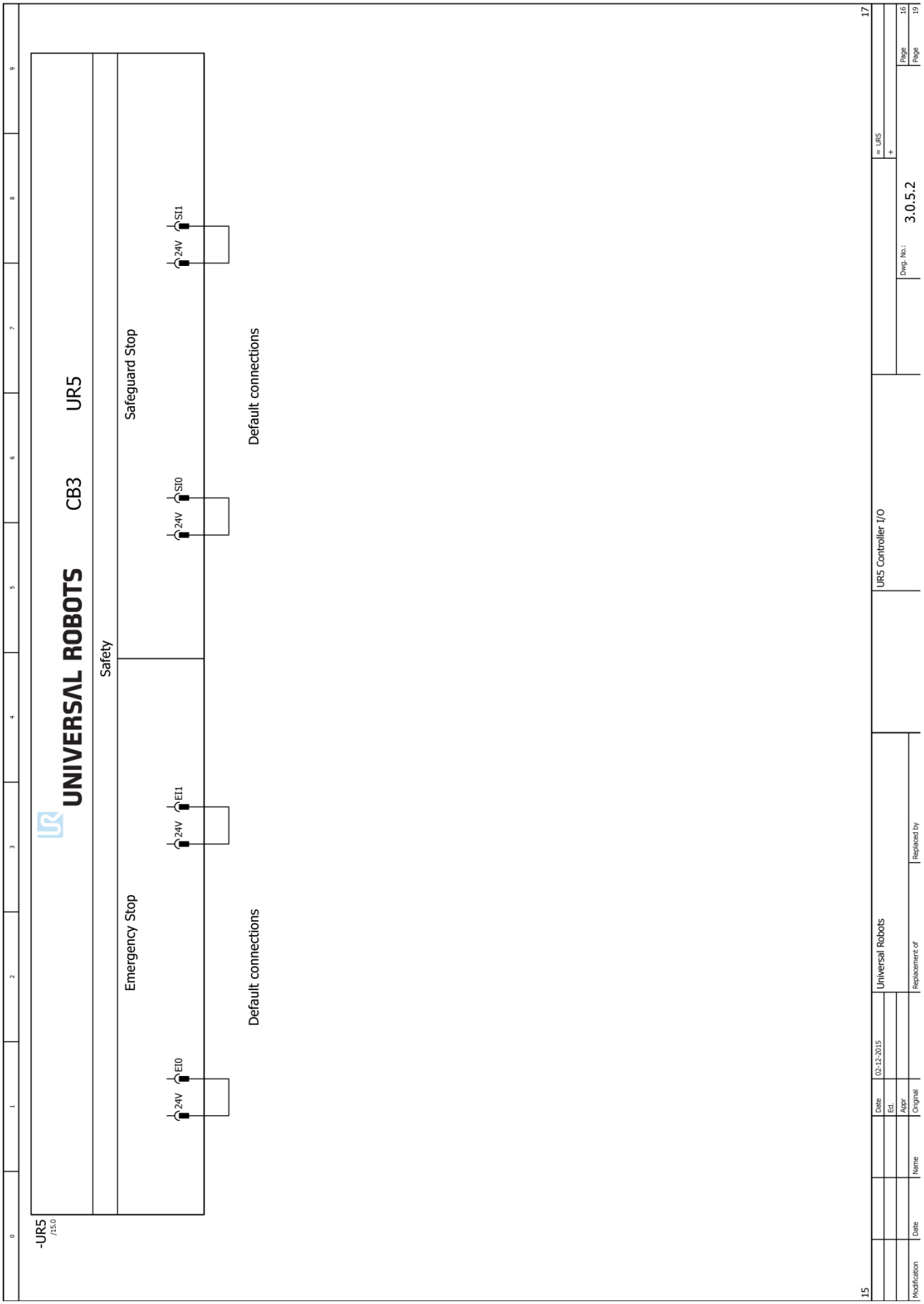


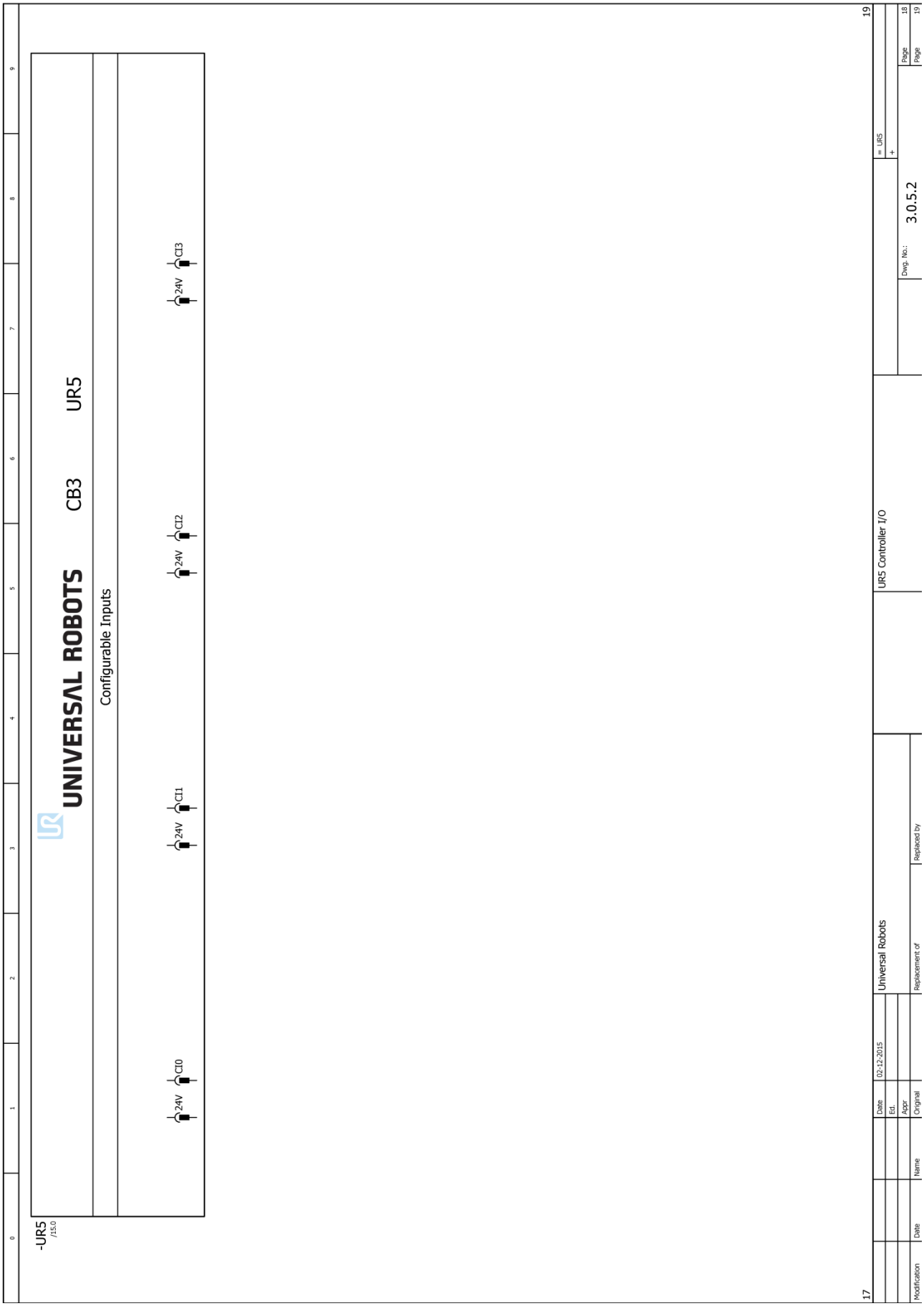


7.4.2. E-Plan Diagrams

Diagrams in pdf or in E-plan format, can be found on the support site: https://www.universal-robots.com/support/







-UR5
/15.0

UNIVERSAL ROBOTS CB3 UR5

Configurable Outputs

			Date	02-12-2015	Universal Robots		UR5 Controller I/O
			Ed.				
			Appr				
Modification	Date	Name	Original		Replacement of	Replaced by	

Dwg. No.: 3.0.5.2

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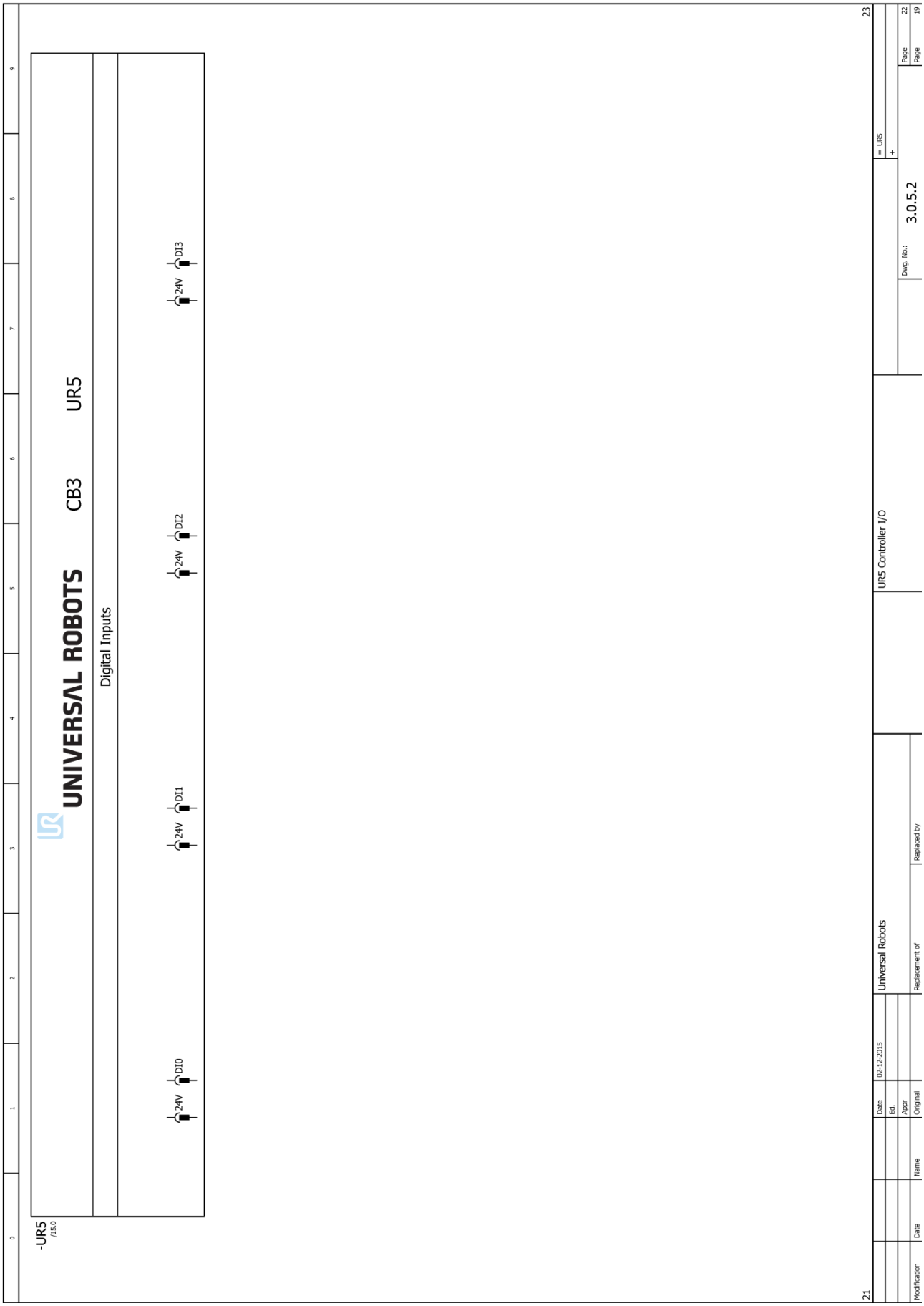
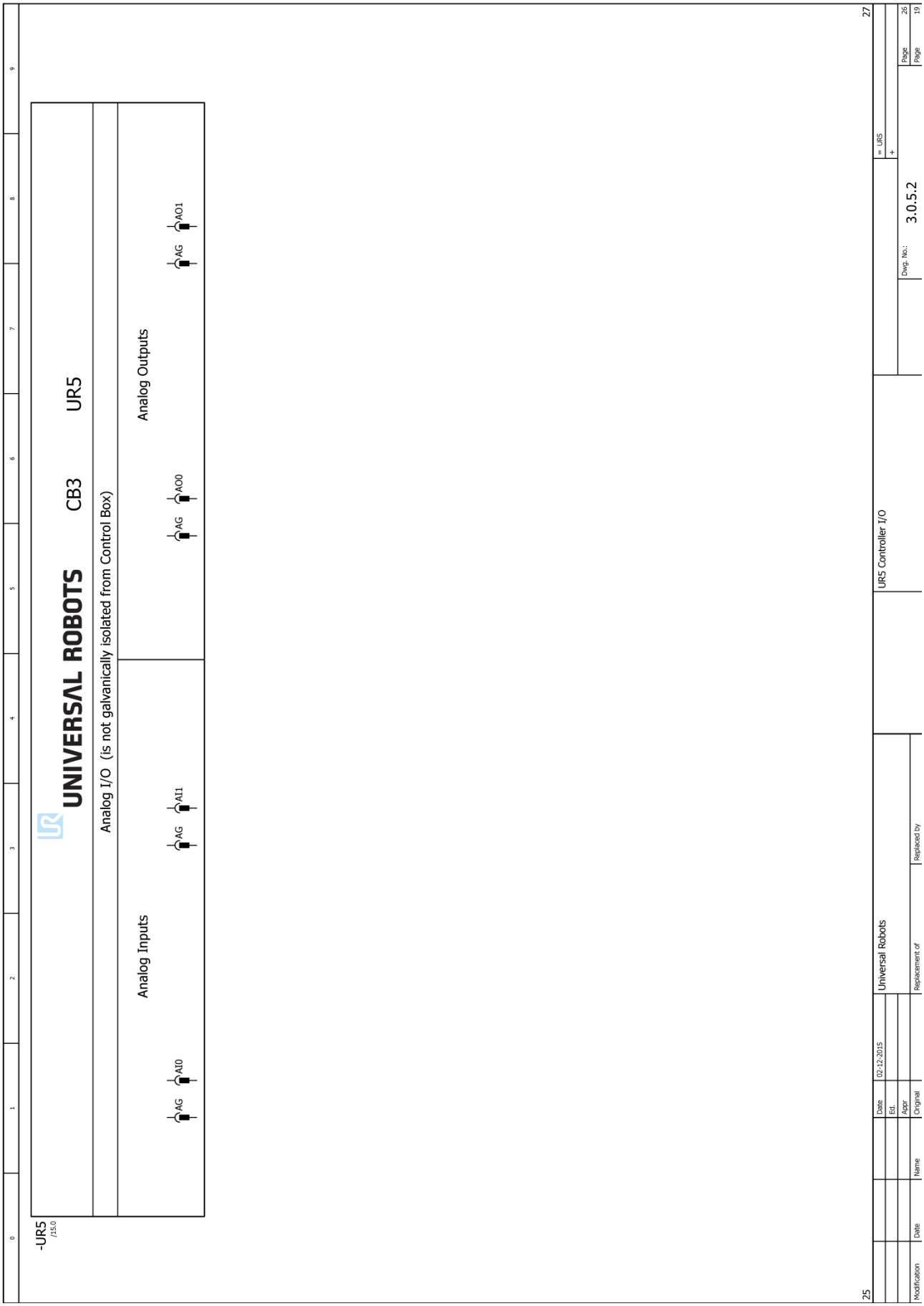


-UR5
/15.0

UNIVERSAL ROBOTS CB3 UR5

Digital Outputs

			Date	02-12-2015	Universal Robots		UR5 Controller I/O	
			Ed.					
			Appr					
Modification	Date	Name	Original		Replacement of	Replaced by		Dwg. No.: 3.0.5.2



8. Spare Parts

> **NOTICE**
> The Spare Parts list incl. parts for other types of Robots. Please take extra notice when looking up part numbers and descriptions.

8.1. Robot arm

CB3 part no.	CB2 Part no.	Product Name	UR3	UR5	UR10	All
103303		Flat-ring sealing set UR3, external	*			
103413		Lid set complete UR3 incl. seal	*			
122020		Tool Mounting Bracket UR3	*			
122030		Base Mounting Bracket Incl. Cable 6m UR3	*			
124120		Joint Size 0 Wrist 1 UR3	*			
124220		Joint Size 0 Wrist 2 UR3	*			
124320		Joint Size 0 Wrist 3 UR3	*			
124321		Joint Size 1 Elbow UR3	*			
124122		Joint Size 2 Base UR3	*			
124222		Joint Size 2 Shoulder UR3	*			
104003		Elbow counterpart and lower arm kit UR3	*			
103305	103305	Flat-ring sealing set UR5, external		*		
103405	103405	Lid set complete UR5 incl. seal		*		
122041		Tool Mounting Bracket UR5 CB3		*		
	122039	Tool Mounting Bracket UR5 CB2+		*		
122050	122050	Base Mounting Bracket Incl. Cable 6m UR5		*		
122121		Joint Size 1 Wrist 1 UR5 CB3		*		
	122011	Joint Size 1 Wrist 1 UR5 CB2+		*		
122221		Joint Size 1 Wrist 2 UR5 CB3		*		
	122012	Joint Size 1 Wrist 2 UR5 CB2+		*		
122321		Joint Size 1 Wrist 3 UR5 CB3		*		
	122013	Joint Size 1 Wrist 3 UR5 CB2+		*		

122123		Joint Size 3 Base UR5 CB3		*		
	122031	Joint Size 3 Base UR5 CB2+		*		
122223		Joint Size 3 Shoulder UR5 CB3		*		
	122032	Joint Size 3 Shoulder UR5 CB2+		*		
122323		Joint Size 3 Elbow UR5 CB3		*		
	122033	Joint Size 3 Elbow UR5 CB2+		*		
123100	123100	Elbow counterpart and lower arm UR5		*		
103310	103310	Flat-ring sealing set UR10, external			*	
103410	103410	Lid set complete UR10 incl. seal			*	
122061		Tool Mounting Bracket UR10 CB3			*	
	122059	Tool Mounting Bracket UR10 CB2+			*	
122071	122071	Base Mounting Bracket UR10			*	
106424	106424	UR10 Base plug w/wire			*	
122122		Joint Size 2 Wrist 1 UR10 CB3			*	
	122021	Joint Size 2 Wrist 1 UR10 CB2+			*	
122222		Joint Size 2 Wrist 2 UR10 CB3			*	
	122022	Joint Size 2 Wrist 2 UR10 CB2+			*	
122322		Joint Size 2 Wrist 3 UR10 CB3			*	
	122023	Joint Size 2 Wrist 3 UR10 CB2+			*	
122324		Joint Size 3 Elbow UR10 CB3			*	
	122034	Joint Size 3 Elbow UR10 CB2+			*	
122124		Joint Size 4 Base UR10 CB3			*	
	122042	Joint Size 4 Base UR10 CB2+			*	
122224		Joint Size 4 Shoulder UR10 CB3			*	
	122043	Joint Size 4 Shoulder UR10 CB2+			*	
104001	104001	Elbow counterpart and lower arm kit UR10. (incl. lid, gasket, screws, etc.)			*	
103500		Wire bundle kit for size 0	*			
103501		Wire bundle kit for size 1	*	*		
103502		Wire bundle kit for size 2	*		*	
103503		Wire bundle kit for size 3		*	*	
103504		Wire bundle kit for size 4			*	
103508		Wire bundle kit for lower arm				*
103509		Wire bundle kit for upper arm				*
103810		UR10 Elbow lock			*	

8.2. Controller

CB3 part no	CB2 Part no	Product Name	UR3	UR5	UR10	All
102203		Controller excl. Teach Pendant UR3 CB 3.2	*			
102205		Controller excl. Teach Pendant UR5 CB3.2		*		
102200		Controller excl. Teach Pendant UR10 CB3.2			*	
124920		Controller OEM CB3.2 UR3	*			
124923		Controller OEM CB3.2 UR5		*		
124925		Controller OEM CB3.2 UR10			*	
122091		Teach Pendant complete CB3.x				*
	122092	Teach Pendant complete CB2/CB2.1		*	*	
122673		Euromap E67 module	*			
	106700	Euromap E67 kit CB2 (incl. Bypass plug and cable)		*	*	
106800		Euromap E67 kit CB3 (incl. Bypass plug and cable)				*
107100		Euromap E67 kit CB3.2 (incl. Bypass plug and cable)				
123670	123670	Euromap E67 cable 6m				*
122671	122671	Euromap E67 Bypass Plug				*
122650		Motherboard kit CB2.1 and CB3.1 (incl. RAM)				*
	122700	Masterboard kit CB2		*	*	
	122420	CB2.0 to CB2.1 Motherboard Upgrade Kit		*	*	
122430		CB3.0 to CB3.1 Motherboard Upgrade Kit		*	*	
171030	171030	RAM module CB2.0 and CB3.0		*	*	
171031		RAM module CB2.1 and CB3.1				*
171022	171022	Flash card CB2 and CB3		*	*	
122421	122421	Flashcard for Robot incl. SW and Serial no. CB2 and CB3		*	*	
177002	177002	Power Supply Unit 12V				*
177003	177003	Power Supply Unit 48V				*
122431	122431	USB for Robot incl. SW and Serial no. CB2.1 and CB3.1				*
172080	172080	Current Distributor PCB				*
172290		Safety Control Board				*

107000		Safety Control Board Terminal Kit (12 terminals and jumper)				*
122745		Energy-eater incl. Fan CB3				*
122746		Energy-eater incl. Fan CB3.2				*
177503	177503	Filter kit for controller (incl. two filters)				*
139033	139033	Bracket for Mounting Teach Pendant				*
132407	132407	Bracket for Mounting Controller				*
164231	164231	Cable Base to controller UR10			*	
		Power Cable				

8.3. Tools

CB3 part no	CB2 Part no	Product Name	UR3	UR5	UR10	All
109011	109011	Tool kit UR3/UR5/UR10 (kit includes all of the parts marked with *)				*
109101	109101	* Spanner hex 5,5mm				*
109102	109102	* Spanner hex 7,0mm				*
109110	109110	* Spanner hex 10,0mm			*	
109103	109103	* Screwdriver torx T10				*
109104	109104	* Torque screwdriver torx T8 + T10				*
109111		* Torque screwdriver torx T10	*			
109112		* Torque screwdriver torx T20	*			
109105	109105	* Torque wrench hex 5,5mm Size 1 and Size 2				
109106	109106	* Torque wrench hex 7,0mm Size 3				*
109107	109107	* Torque wrench hex 10,0mm Size 4			*	
109180	109180	* ESD Wrist strap				*
164084	164084	* Bypass cable (for setting joint-ID)				*
185500		Dual calibration tool				*
131501	131501	Bracket for mounting robotarm UR5 (Item profile)		*		
131502	131502	Bracket for mounting robotarm UR5 (BOSCH profile)		*		
131503		Bracket for mounting robotarm UR3 (Item & BOSCH profile)	*			
131510	131510	Bracket for mounting robotarm UR10 (Item & BOSCH profile)			*	
131095		Lid tool protective cap alu. for tool connector		*		

173100	173100	Cable for tool external with angle connector				*
173101		Cable for tool external w/90-degree connector			*	*

9. Packing of Robot

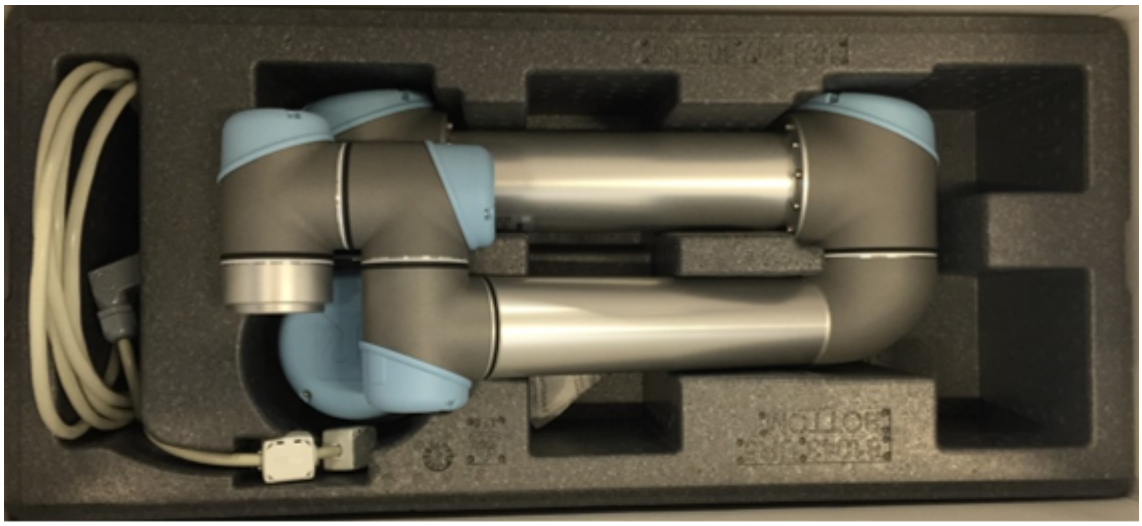
Packing of robot and controller box for shipment

NOTICE

Remove any external tooling and external electrical connections before shipment. Universal Robots may reject the shipment if 3rd party products cannot be unmounted safely or they prohibit to the execution of required post repair tests. Universal Robots assume no responsibility for 3rd party goods return shipment. Please ensure the robot, controller and teach pendant is packed responsibly. Universal Robots will always return Universal Robots products in original Universal Robots packaging.

- Download correct put_in_box program regarding robot type and packing material from www.universal-robots.com/support/
- Upload the program to the robot. See 4.3 Using Magic files on how this can be done.
- Load the program and follow instructions given when running the program.
- Note: If robot cannot run or power is not available, it is possible to manually release the brakes for each joint individually and pack the robot accordingly. For brake release, see 3.1.3 Brake release
- Power down, disconnect power and robot arm from controller.

- Pack robot arm and controller box in designated boxes. Make sure the robot arm is correctly orientated within the box.



10. Change Log

Date	Revision	Action	Changes
3. May 2014	UR5_ en_3.0	Added	Revision 3.0 released
19. June 2014	UR5_ en_3.0.1	Changed	Pictures and illustrations changed to match 3. gen. robot
29. July 2014	UR5_ en_3.0.2	Changed	Error codes, Spareparts changed to match 3. Gen robot and ESD handling added
20. Oct. 2014	UR5_ en_3.1.1	Changed	Electrical doc., E-plan, Spare parts update and error code update. New structure for disassemble/assemble guide. ESD handling modified.
January 2016	UR5_ en_3.1.2	Changed	Update of electrical drawings, Joint spare part adaption, error codes. Dual robot calibration. Added Motherboard 3.1
October 2016	UR5_ en_3.2.0	Added	3.1.19 Wire bundle installation guide
December 2016		Added	3.1.4 Bolt length for joints
		Added	Error code C71A12
		Added	3.1.5 Added tolerance to Size 3 torque
		Corrected	5.2 LED startup sequence
		Added	3.2.4 Motherboard 3.1 upgrade instructions
		Added	4.4 Backup of data
		Corrected	Various spellings, word, setup
February 2017		Changed	7. Packing robot
		Added	1.4 Warning signs
		Added	Tolerance description to C50A5 and C50A6
October 2017		Added	Troubleshooting 5.3.6
		Added	Error code C103A3
		Corrected	Error code C20A1 description
		Added	Steps when replacing 48V power supply
January 2018		Added	Troubleshooting 5.3.7
		Corrected	“how to fix” text corrected on many error codes
September 2018	UR5_ en_3.2.1	Added	Inspection plan to chapter 2

May 2019	UR5_ en_3.2.2	Updated	Inspection plan to chapter 2
		Updated	1.4 Warning signs
August 2019	UR5_ en_3.2.3	Added	More guidance to section 3.1.4
August 2019	UR5_ en_3.2.4	Added	Merge control box details
Sep. 2019	UR5_ en_3.2.5	Added	More info in section 5.3.3 Protective stop
Oct. 2019	UR5_ en_3.2.6	Changed	Title and wording in section 2
September 2020		Added	Update Error Codes