Security Skin

User Guide

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Shenzhen Yuejiang Technology Co., Ltd

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Preface

Purpose

This Document describes the functions, installation guide of Security Skin, making it easy for users to fully understand and use it.

Intended Audience

This document is intended for:

- Customer
- Sales Engineer
- Installation and Commissioning Engineer
- Technical Support Engineer

Change History

Date	Change Description
2021/06/23	The first releases

Symbol Conventions

The symbols that may be founded in this document are defined as follows.

Symbol	Description
⚠DANGER	Indicates a hazard with a high level of risk which, if not avoided, could result in death or serious injury
⚠WARNING	Indicates a hazard with a medium level or low level of risk which, if not avoided, could result in minor or moderate injury, robot damage
⚠NOTICE	Indicates a potentially hazardous situation which, if not avoided, can result in equipment damage, data loss, or unanticipated result
🕮NOTE	Provides additional information to emphasize or supplement important points in the main text

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1. Overview

The safe skin is a safe protective device specially tailored for the robot. The robot can detect obstacles when wearing the safe skin. When an obstacle is detected, the robot is to stop or avoid the obstacle, so as to prevent collision and avoid causing loss of people or property.

A set of safe skin includes forearm safe skin, J4 joint safe skin, J5 joint safe skin and J6 joint safe skin, as shown in the figure below.

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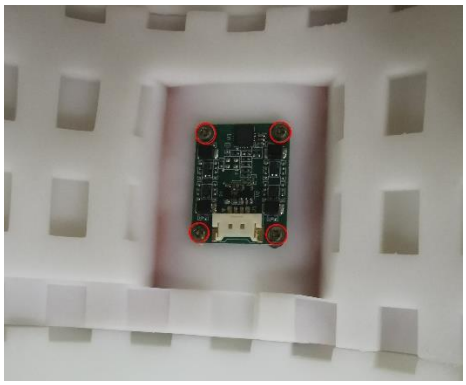
2. Assemble

This chapter describes the installation steps for forearm safe skin, J4 joint safe skin, J5 joint safe skin, and J6 joint safe skin.

2.1 Forearm Safe Skin Installation

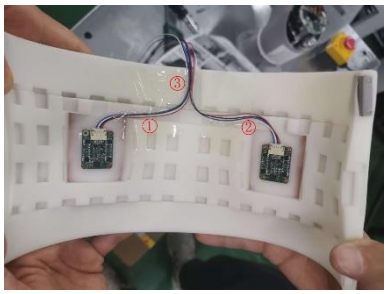
Step 1 Install the two sensor plates on the safe skin of the forearm in the specified position, using the M2 screw.

The four red areas in the figure below are the mounting screw locations.



Step 2 Install the 4 Pin data cable to the interface of the sensor plate.

Step 3 Refer to the following figure for wiring, and fix the 4 PIN data cable at ①②③ position by using the adhesive.



Step 4 Install the forearm safe skin into the forearm.

- Install the forearm safe skin as shown in the following image, with the 4 PIN cables facing up and the 4 PIN cables under the back cover of the J4 joint.
- The sealing line of the safe skin of the forearm should be aligned with the

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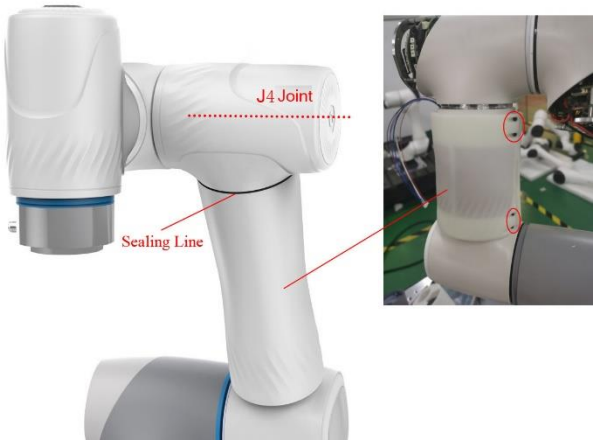
sealing line of the J4 joint.

- Tighten the safe skin of the forearm with 4 M2 screws.

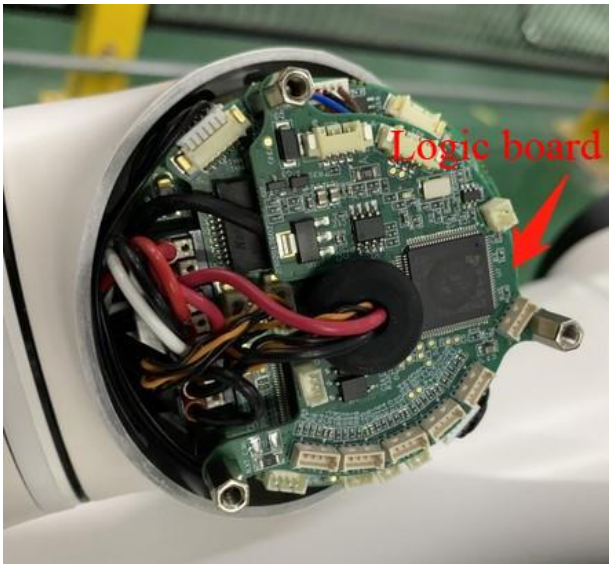


2.2 J4 Joint Safe Skin and J5 Joint Safe Skin Installation

The safe skin installation of J4 joint and J5 joint are similar. This section takes J4 joint as an example to illustrate the steps.

Step 1 Remove the rubber ring, back cover, screws and fixing plate of the back cover of the J4 joint，and place them aside for use.

Step 2 Attach the logic board of the safe skin to the stud of the J4 joint and lock it tightly.



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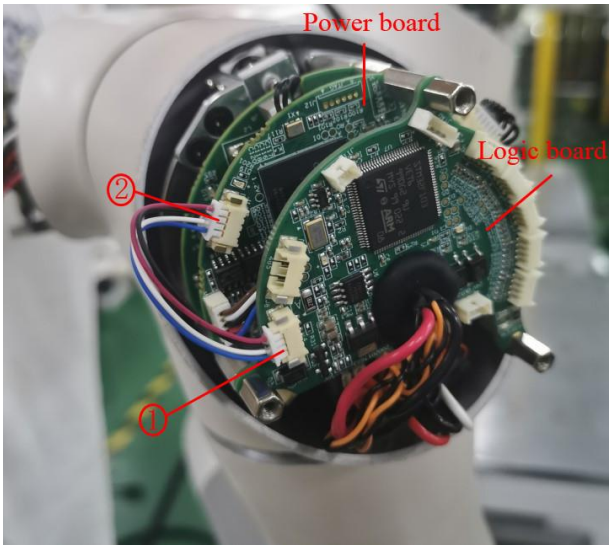
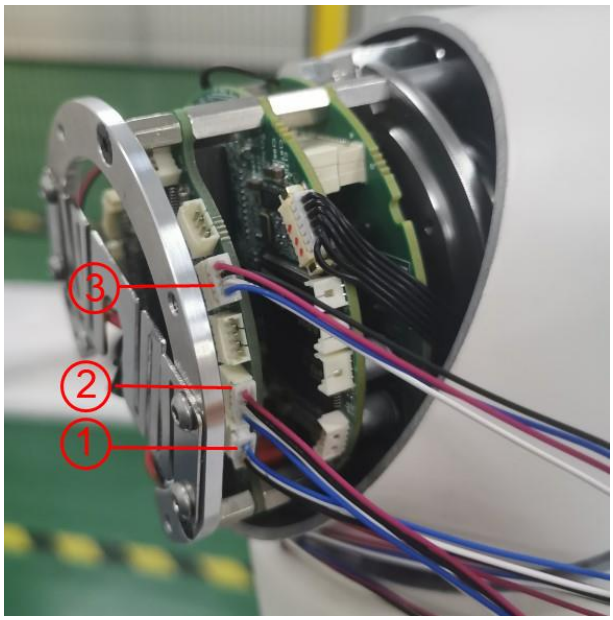
Step 3 As shown in the figure below, connect the interface at logic board position ① of the safety skin with the interface at power board position ② of the robot with a data cable.



Step 4 Take one data cable as the data cable of J4 joint and connect it to the interface at location ① of logic board.

Step 5 (only applicable to J4 joint safe skin) Connect the right data cable of the safe skin of the forearm to the interface at location ② of the logic board; Connect the left data cable of the safe skin of the forearm to the interface at location ③ of the logic board.

Step 6 Install the 3 studs on the logic board for the safe skin and attach the fixing plate to the studs.



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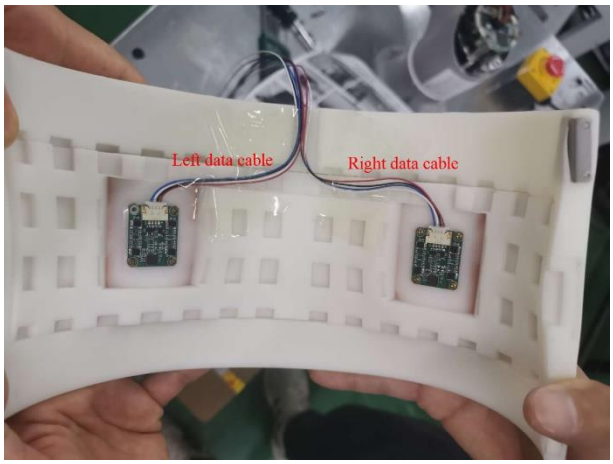
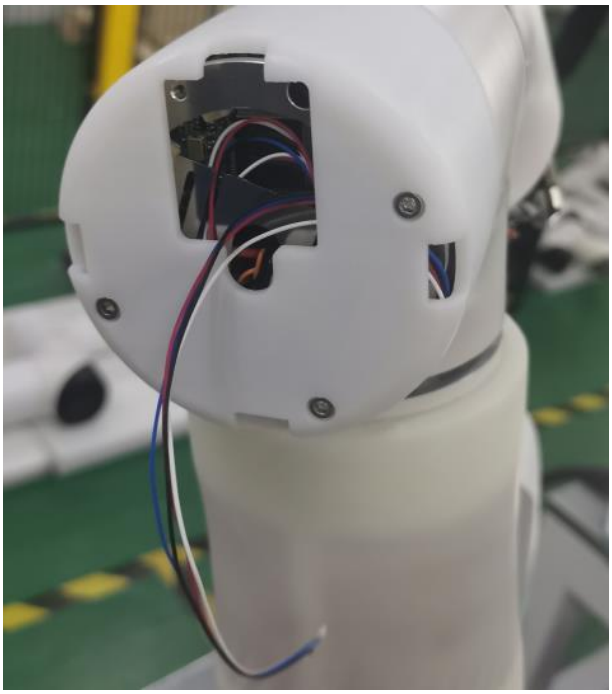


Step 7 Install the back cover of J4 joint safe skin on the J4 joint, draw out the other end of the data cable of J4 joint, and lock the back cover with the three hexagonal screws removed previously.



Step 8 Install the sensor plate on the specified position of the J4 joint safe skin with M2 screws; connect the cable of J4 joint to the interface of the sensor plate.

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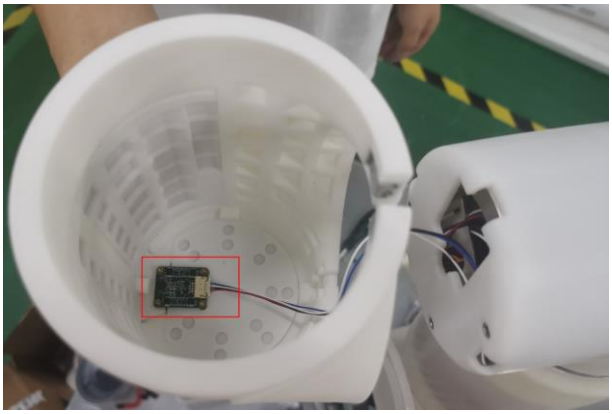

Step 9 Install the J4 joint safe skin into the J4 joint position of the robot.

Tighten the J4 joint safe skin with M2 screws.

2.3 J6 Joint Safe Skin Installation

Step 1 Remove the rubber ring, back cover, screws, keyboard module and fixing plate of the back cover of the J6 joint, and place them aside for use.

Step 2 Install the logic board of the safe skin on the stud of the J6 joint and lock it tightly.

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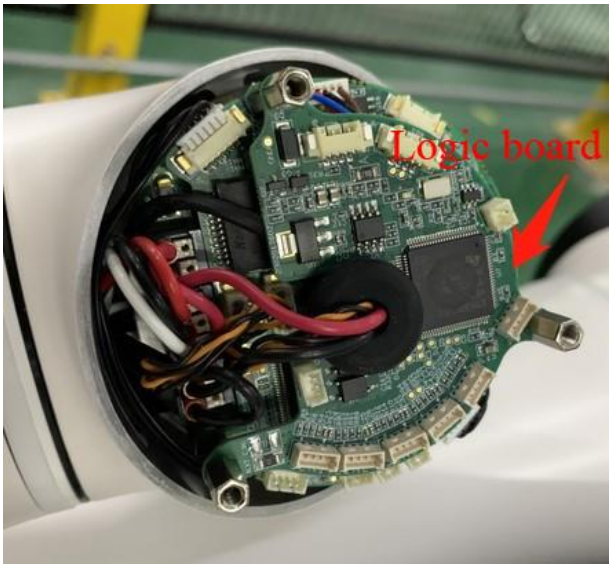
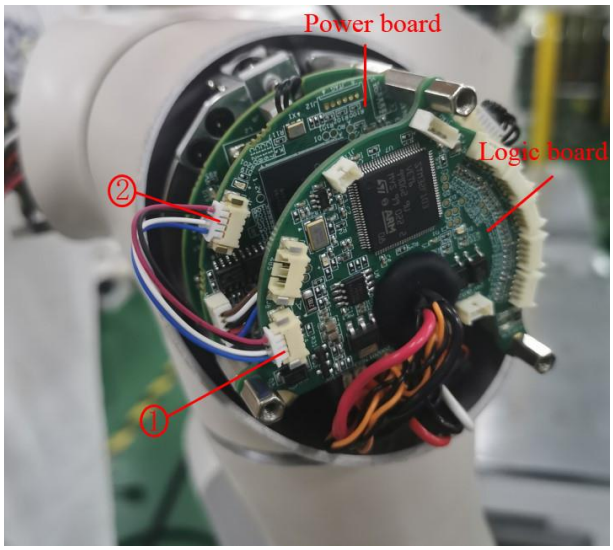


Step 3 As shown in the figure below, connect the interface at logic board position ① of the safety skin with the interface at power board position ② of the robot with a data cable.



Step 4 Take one data cable as the data cable of J6 joint and connect it to the interface at position ① of logic board.

Step 5 Install the 3 studs on the logic board for the safe skin and attach the fixing plate to the studs.

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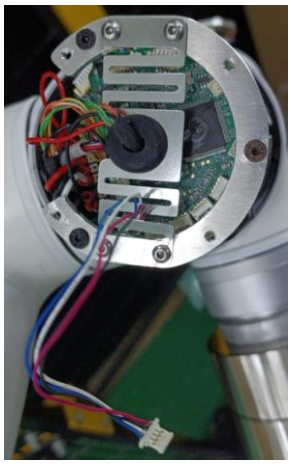
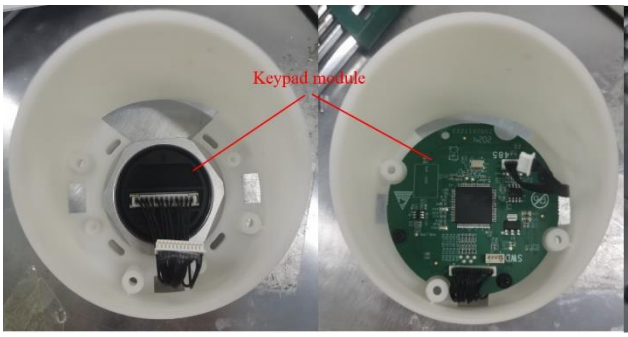
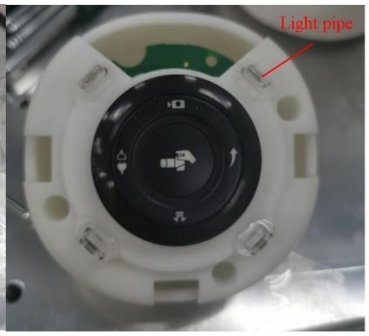
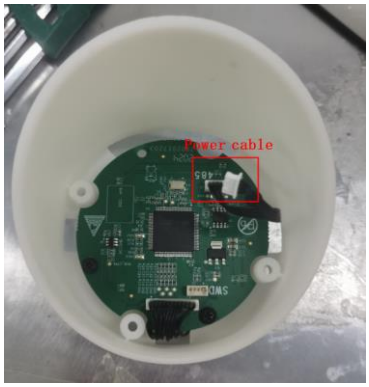


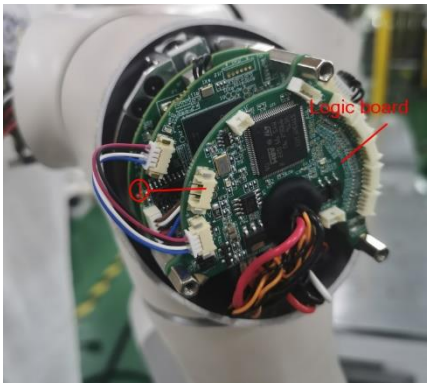
Step 6 Dip the light pipe with glue and then install it on the J6 joint safe skin back cover from the outside to the inside. Install the keypad module on the back cover of J6 joint safe skin and lock it with the hex screws removed previously.





Step 7 Connect the power cable of the keypad module to the interface at the logic board position ① of the safe skin.





Step 8 Install the back cover of J6 joint safe skin on the J6 joint, draw out the other end of the data cable of the J6 joint, and lock the back cover with the three hexagonal screws removed previously.

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Step 9 Install the sensor plate in the specified position on the J6 joint safe skin with M2 screws.

Step 10 Install the J6 joint safe skin into the J6 joint, and install the data cable of the J6 joint on the interface of the sensor plate.

Step 11 Tighten the safe skin of the J6 joint safe skin with M2 screws.

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3. Operation

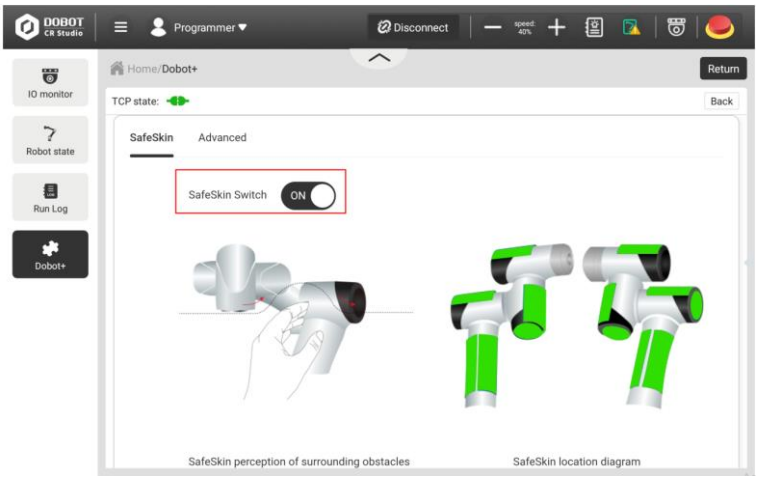
When the safe skin detects an obstacle in the operating area, it supports two processing modes: one is the proximity pause mode, and the other is the automatic obstacle avoidance mode. Among them, automatic obstacle avoidance mode needs to use programming instructions (script or blocky programming) to turn on or off. When the safe skin function is enabled in APP, the default processing mode is proximity pause mode.

- Proximity pause mode: Approach to pause mode Automatic obstacle avoidance mode: in the process of robot automatic operation, when an obstacle approaches the safe skin and is detected, the robot will quickly plan to pause and enter the pause state. When the safe skin detects that the obstacle is leaving (disappearing), the robot will resume operation automatically.
- Automatic obstacle avoidance mode: In the process of automatic operation, when an obstacle approaches the safe skin and is detected, the robot will judge the position of the obstacle according to the algorithm, and then the robot arm will avoid the obstacle.
- When the safe skin is in the **On** state, as long as something touches the safe skin, the robot will immediately stop. At this time, there will be a pop-up window in APP or other upper computer software, and the robot will not resume running until it is manually confirmed to continue running the script. In addition, you can choose to quit running in the pop-up window.

3.1 Safe Skin Settings and Display

Step 1 Click "Set > DoBot + > Electronic Skin" on the App to enter the safe skin page for relevant Settings.

Step 2 Click "Electronic Skin Switch" to turn on (or off) the safe skin function.



For each sensing area of the safe skin, there is a special color block to display. When the obstacle in the sensing area gradually approaches the robot, the color of the color block will change accordingly.

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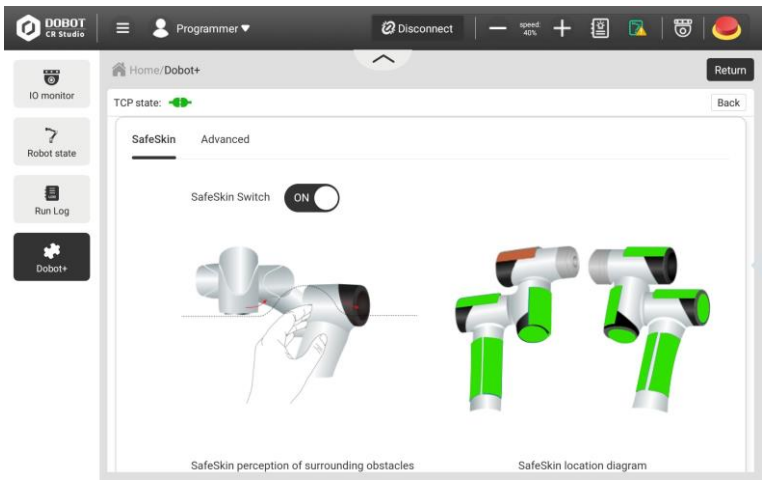
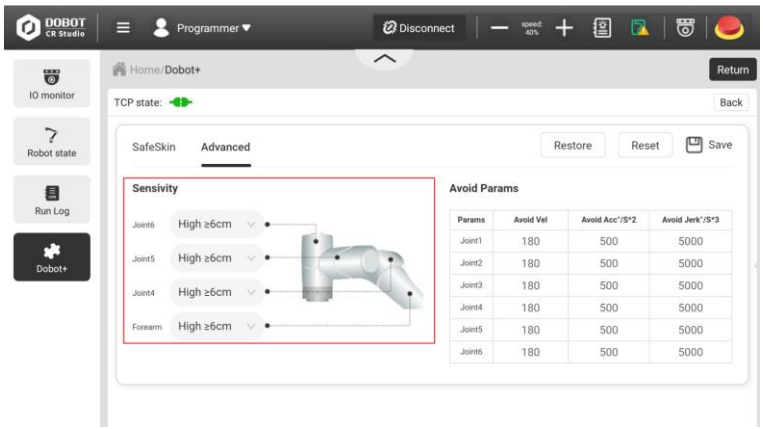
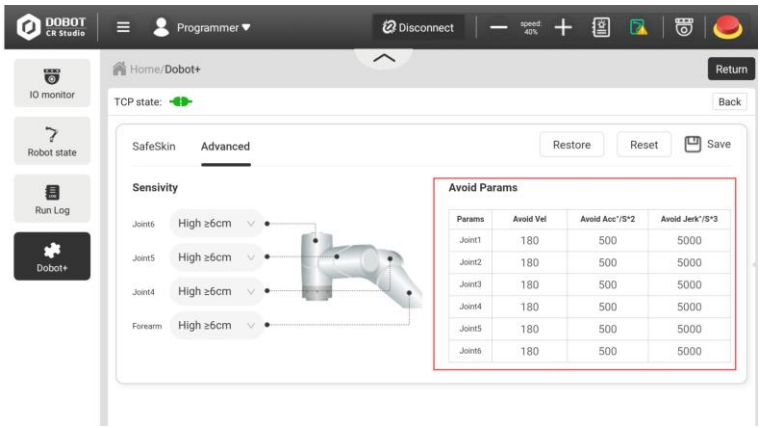


Step 3 Set the sensitivity of each safe skin in the Basic Settings screen.

Setting sensitivity alone can improve the suitability of safe skin in scenes with complex structures. For example, in a fixed working track, if a safe skin is very close to a fixed mechanism, the sensitivity of that skin can be lowered to ensure that the robot will not frequently trigger proximity pause or obstacle avoidance actions due to the action of that skin.



Step 4 (Optional) When the automatic obstacle avoidance function is enabled using the programming instructions, set the avoidance parameters of each joint in the basic setting interface: avoid velocity, avoid acceleration and avoid plus acceleration.



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3.2 Programming Language

Function	SetSafeSkin (status)
Description	Set the state of safe skin
Parameter	Status: safe skin status, 0: Turn off safe skin; 1: Open safe skin
Return	None
Example	SetSafeSkin (1) Turn on the safe skin function

Function	SetObstacleAvoid (status)
Description	Set states of safe skin obstacle avoidance mode • This instruction does not work if Dobot+ internal safe skin is off state • This directive only works within the script. If you exit the script, the safe skin returns to the default proximity pause mode
Parameter	Status: states of safe skin obstacle avoidance mode, 0: Turn off safe skin obstacle avoidance mode; 1: Open safe skin obstacle avoidance mode
Return	None
Example	SetObstacleAvoid (1) Open safe skin obstacle avoidance mode

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