

ABB IRC5/IRC5C Startup Guide (PROGRAM Mode)



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Chapter 1. Overview

This guide will help you set up an ABB robot controller for use with ForgeOS 5.

This guide assumes that you have installed the ABB robot and controller following ABB instructions. Make sure the robot and controller are in working order before moving on. Also make sure you have the required hardware and software.

You will complete these steps:

1. Set up Forge/OS.
2. Transfer robot configuration files to the robot.
3. Program your robot with Forge/OS!



Note:

We recommend backing up your ABB controller. You can save a backup first by following ABB instructions or you can save a backup using RobotStudio later in these steps.

Chapter 2. Hardware Requirements



Image	Part Name	Description	Vendor	Part Number
	Industrial PC (IPC)	Hosts Forge/OS. <div style="border: 1px solid #00a0e3; border-radius: 10px; padding: 10px; background-color: #e6f2ff;">  Note: Refer to the Forge/OS 5 User Manual for IPC requirements. </div>		
	READY pendant	The touch screen interface for Forge/OS.	READY Robotics	112563
	IRC5 Robot Controller	Controls the robot in its native software.	ABB Robotics	
	Windows Computer (or other)	Loads ForgeOS configuration files on the robot controller.		
	24V Power Supply	Powers the READY pendant.	Siemens (or other)	
	Cat5e Shielded Ethernet Cable (x2)	<ul style="list-style-type: none"> • Connects the robot controller to an IPC. • Connects the READY pendant to an IPC. 		

Image	Part Name	Description	Vendor	Part Number
	USB flash drive	Required to transfer robot files from Forge/OS to the robot.	READY Robotics (or other)	R-400030

Chapter 3. Software Requirements

ABB Robotics Options

You need these options to run Forge/OS software on the ABB robot controller and to safely operate the robot with the READY pendant.

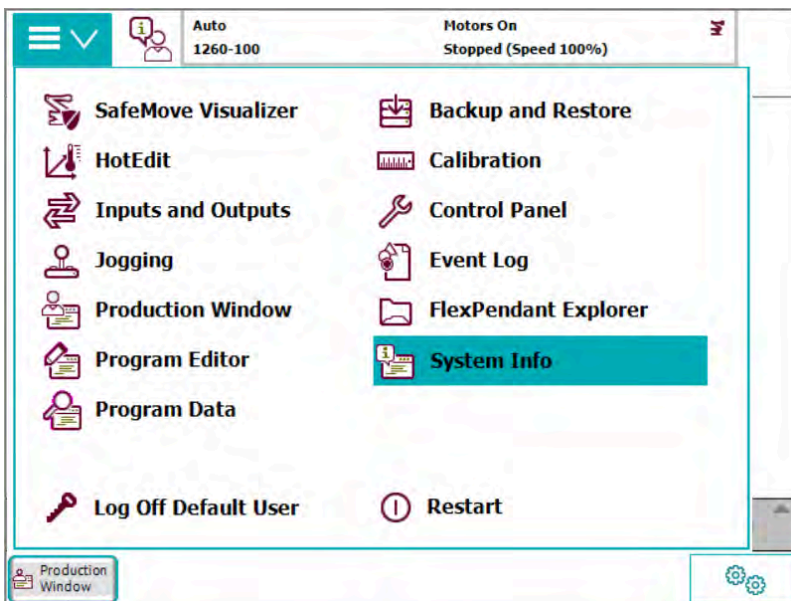
Requirement	Part Number	Description	Supplier
PC Interface	616-1	Required to run Forge software on the ABB controller.	ABB Robotics
Multitasking	623-1	Required to run Forge programs in parallel on the ABB controller.	
RobotStudio, Basic License	2019.5.2 or later	Required on a PC to configure the ABB controller and control hardware.	
RobotWare	6.08.01 or later	Minimum controller version supported by Forge/OS.	
ForgeOS	5.4.0 or later	Minimum ForgeOS version that supports ABB robots.	READY Robotics

Confirming Software Requirements

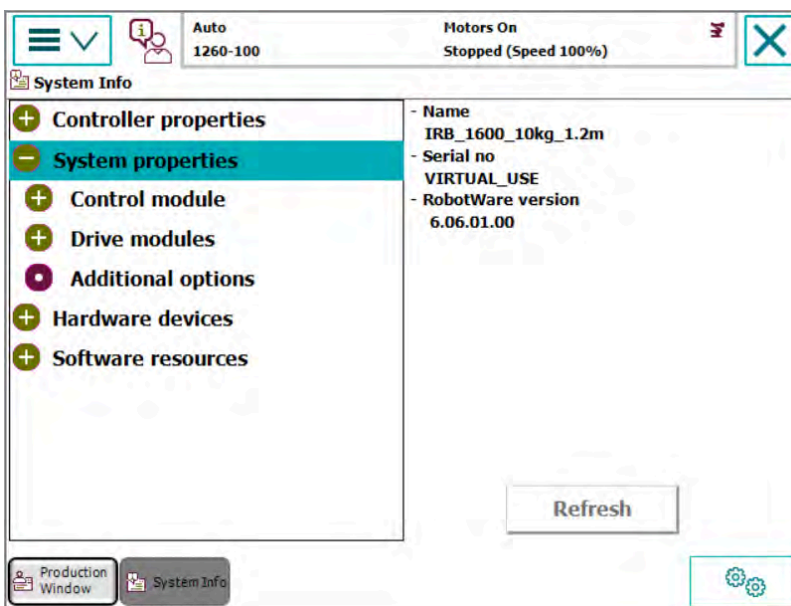
Follow these steps to check the software version and ABB options on an IRC5 or IRC5C robot controller.

1. Plug the ABB controller into a power source. Follow ABB instructions for powering the ABB controller.
2. Turn the power switch on the ABB controller clockwise to power the controller on. Wait for the controller to boot up.
3. On the ABB teach pendant, follow these steps to find the RobotWare version:

a. Tap the menu button, then tap **System Info**.



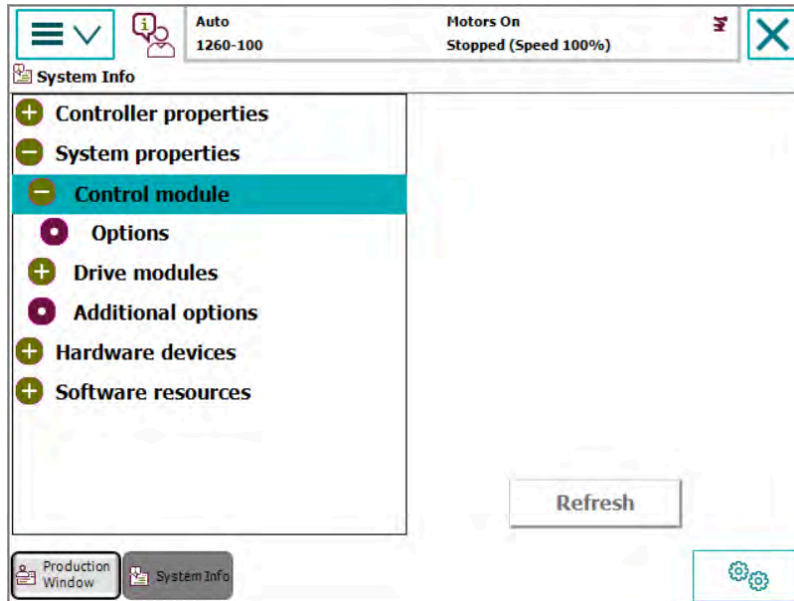
b. In the System Info menu, tap **System properties**. Look for the **RobotWare version** on the right.



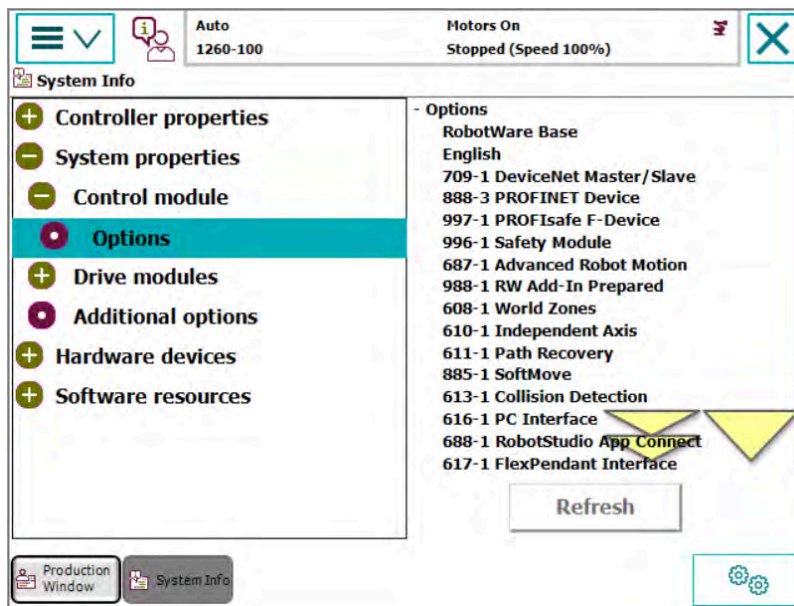
c. If you see a version number below the minimum supported version, **contact ABB Robotics to upgrade**.

4. On the ABB teach pendant, follow these steps to view installed ABB options:

a. In the System Info menu, under **System properties**, tap **Control module**.



b. Tap **Options**, then view the list of installed options on the right. Check for each of the required options.



c. If you are missing any of the required ABB options, **contact ABB Robotics to upgrade**.

Chapter 4. Connecting the READY pendant

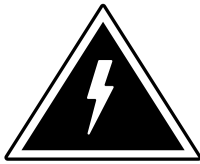
The READY pendant includes these safety outputs:

1. Key Switch (Robot Operation Mode)
2. Three-Position Enabling Switch
3. Emergency Stop Button



The end of the READY pendant cable includes:

1. One RJ45 Ethernet cable for communication with the IPC.
2. 15 Flying leads—2 for power, 12 for safety I/O, and 1 unused lead.



Electric Shock Warning: Disconnect all components from power sources before attempting this installation.

1. Follow these substeps to connect the READY pendant communication, power, and safety wiring.

You will route the READY pendant flying leads to the destinations in this table:

Pendant Flying Leads	Function	Controller Terminal
Brown	Enabling Switch Circuit 1	N/A
Yellow	Enabling Switch Circuit 1	N/A
Green	Enabling Switch Circuit 2	N/A
Grey	Enabling Switch Circuit 2	N/A
Pink	24V DC	Power Supply
Grey/Pink	Emergency Stop Circuit 1	XS7 (terminals 1 and 3)
Red/Blue	Emergency Stop Circuit 1	XS7 (terminal 2)
White/Green	Emergency Stop Circuit 2	XS8 (terminals 1 and 3)
Green/Brown	Emergency Stop Circuit 2	XS8 (terminal 2)
Black	0V DC	Power Supply
Violet	Key Switch Circuit 1	N/A
White/Pink	Key Switch Circuit 1	N/A
White	Key Switch Circuit 2	N/A
Blue	Key Switch Circuit 2	N/A
White/Blue	-	N/A

- a. Connect the READY pendant's Ethernet cable to the IPC. You may connect the pendant through an Ethernet switch to increase the number of Ethernet ports.
 - b. Connect the pendant's power leads to a 24V DC, 2.5A source. Connect the Pink wire to +24V and the Black wire to 0V.
 - c. Connect the remaining safety I/O leads to your control panel or safety cabinet. Make your own cable/wiring for the 12 safety signals long enough to reach their destinations in the table. Include ferrules at the end of your wiring to insert in the terminal blocks.
2. If you install external safety fencing, connect the fence contact safety inputs as shown below:

Function	Terminal
Fence: Circuit 1	XS9 (terminals 10 and 12)
Fence: Circuit 1	XS9 (terminal 11)
Fence: Circuit 2	XS9 (terminals 4 and 6)
Fence: Circuit 2	XS9 (terminal 5)

3. If you do not install external safety fencing:
 - a. Connect XS9 terminals 10, 12 and 11 with a jumper wire.
 - b. Connect XS9 terminals 4, 6 and 5 with a jumper wire.

Chapter 5. Connecting the IRC5 and IPC

Forge/OS must communicate with the ABB controller. In this section, you connect the IPC and robot controller using a Cat5e STP Ethernet cable.

1. Find a Cat5e STP Ethernet cable long enough to reach from the IPC to the ABB controller.
2. Plug one end of the Ethernet cable into a LAN port on the IPC and the other end into port **X6 (WAN)** on the IRC5.

Chapter 6. Powering On the System

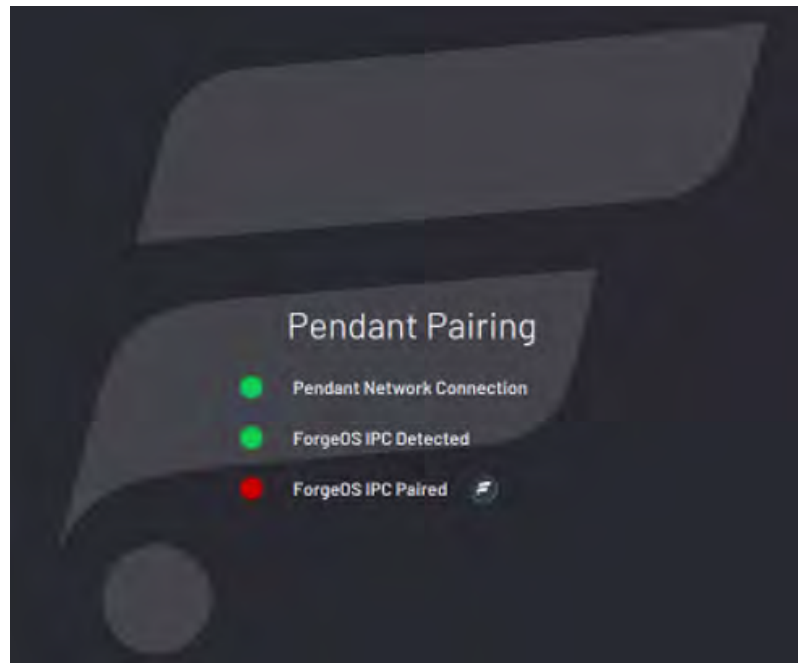
1. Plug the ABB controller into a power source. Follow ABB instructions for powering the ABB controller.
2. Turn the power switch on the ABB controller clockwise to power the controller on.
3. Plug your IPC's power cable into a power outlet.
4. Power on your IPC and other devices.
5. If there are issues, power off each device, disconnect from power supplies, and check your wiring.

Chapter 7. Signing In to Forge/OS

Follow these steps to pair the READY pendant with the IPC and sign in to Forge/OS 5.

1. If you need to install Forge/OS 5 on your IPC, stop here and follow all the steps in [Appendix A \(on page 33\)](#), then come back to these steps.
2. The READY pendant automatically finds and pairs with the IPC. The three LEDs on the screen help you track the status:
 - **Pendant Network Connection:** This condition is satisfied when the READY pendant has a valid network connection (i.e., the Ethernet cable is plugged in).
 - **Forge/OS IPC Detected:** This condition is satisfied when the READY pendant detects a Forge/OS IPC on the network.
 - **Forge/OS IPC Paired:** This condition is satisfied when the READY pendant successfully pairs with the IPC. If pairing fails, it is automatically retried indefinitely.

When a condition is not satisfied, the LED is red. When a condition is in progress of becoming satisfied, a spinner around a READY logo appears to the right of the text. When a condition becomes satisfied, the LED turns green.



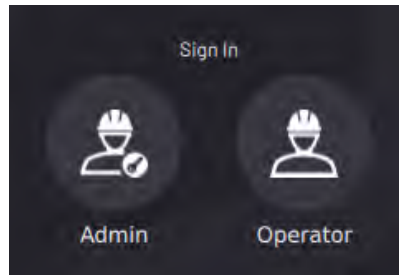
The UI shows the real-time state of each step. For example, if the pendant loses its network connection during pairing, all steps become undone.

If the READY pendant spends more than 60 seconds on any step, troubleshooting text displays. Common things to check are if the READY pendant network cable is plugged in, if the IPC is powered on, if the READY pendant and IPC are connected to the same network, and if there's only one READY pendant and one IPC on that network.

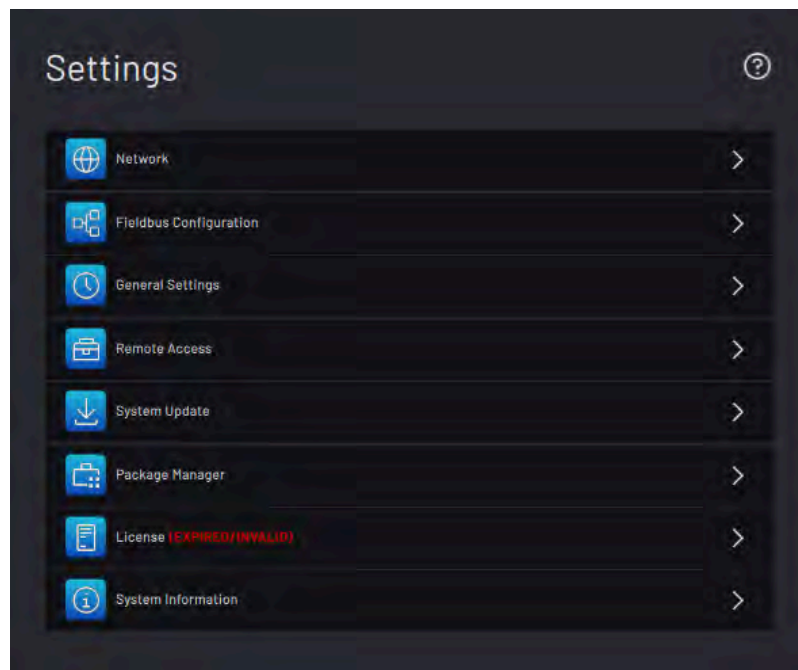
**Note:**

The READY pendant IP Address is preset to 172.16.255.253. The network interface that the pendant connects to should use IP Address 172.16.255.250 and Subnet mask 255.255.255.0.

3. Tap **Admin** and sign in. The default Admin password is "forgeadmin".



4. If Forge/OS is inactive, it opens the Settings app and prevents you from opening other apps. If you see the screen below, follow [Activating ForgeOS with a License Code \(on page 41\)](#) in Appendix A.



5. With Forge/OS active, move on to the next section.

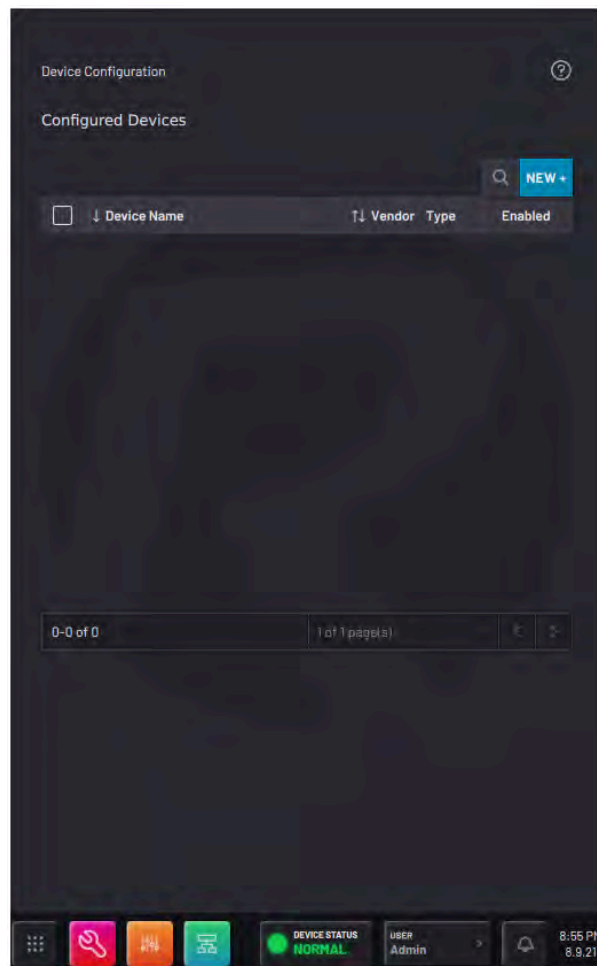
Chapter 8. Getting Robot Files from Forge/OS

In this section, you begin adding the robot in Forge/OS and you copy configuration files to a USB drive.

1. In the **Admin** role, open the **Device Configuration** app.



2. Tap **New +** to open the Device Library.



3. Find the **ABB industrial robot** option in the Device Library. You can use the **Filter by** dropdown to show only robots on the list.
4. Select **ABB industrial robot** and tap **NEXT** to continue with configuration.
5. Select the controller model, then select the robot model. You can fill in the other information later.

ABB Robot

Device Name IP Address

Description

Controller Model Robot Model

Force Sensor Device

Copy the Configuration Files

Insert a 2GB flash drive into the Forge/OS IPC to copy the configuration files needed to complete the setup of your robot

**NOTE: USB file system must be formatted in one of the following:
FAT16, FAT32, NTFS**

Insert USB storage device into Forge/OS IPC

6. Insert a USB flash drive into the IPC as instructed on the screen. Use an empty flash drive with at least 2GB of storage.

**Tip:**

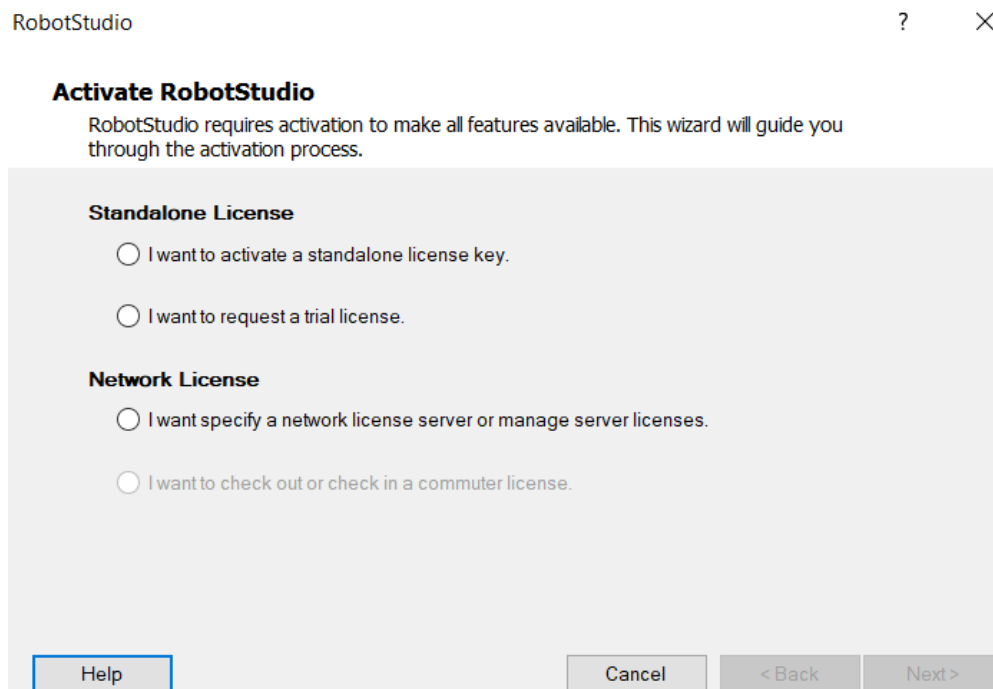
Do not connect the USB flash drive to the READY pendant.

7. Tap **Start Transfer** and wait for it to finish.
8. Remove the USB flash drive when prompted.

Chapter 9. Configuring the ABB Controller in RobotStudio

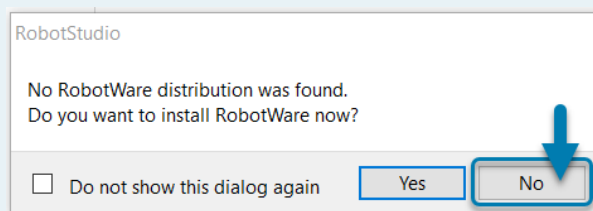
In this section, you configure the robot controller using RobotStudio and the robot files from ForgeOS.

1. On a workstation/laptop, go to the RobotStudio download page (<https://new.abb.com/products/robotics/robotstudio>) and install RobotStudio. Make sure you extract the contents of the zip folder before running the RobotStudio setup.
2. If you have not purchased a RobotStudio license, click **Cancel** in the "Activate RobotStudio" pop-up. You can perform these steps with the basic RobotStudio version.



Note:

You don't need to install RobotWare on RobotStudio for this setup. Click **No** if you see the below pop-up.



3. Use an Ethernet cable to connect your RobotStudio computer to the ABB controller service port: **X2**.



Note:

Refer to ABB documentation for more information on Ethernet routing. Depending on your setup, you may need to plug this cable into a different port.



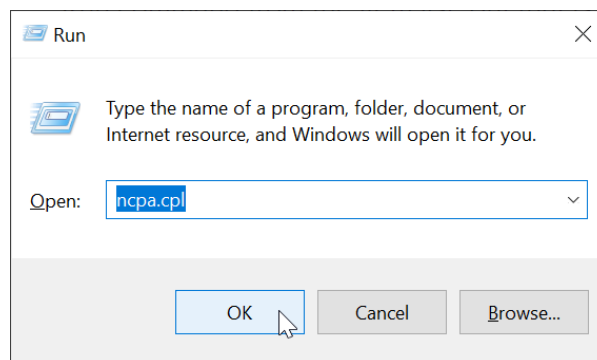
4. On your RobotStudio computer, configure the IP settings to connect with the ABB controller:



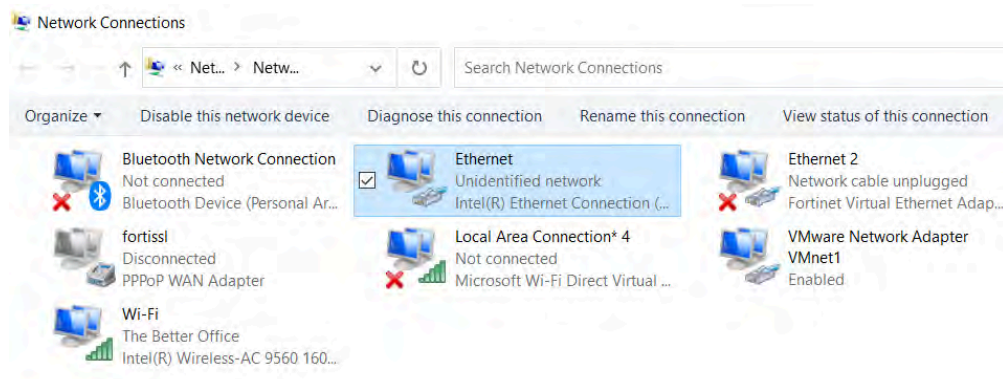
Note:

The below substeps assume that your RobotStudio computer is a Windows computer. If you are not using a Windows computer, follow your computer's procedure for configuring IP settings.

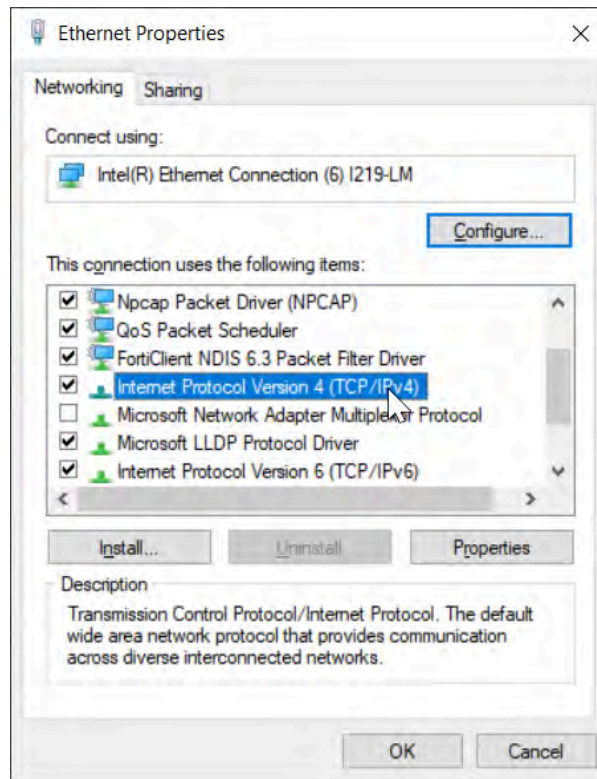
- a. Open the Run box by pressing **Windows key + R** on the keyboard or right-click the Start Menu button and select **Run**.
- b. In the Run pop-up, type "ncpa.cpl" (Network Connections panel) and click **OK**.



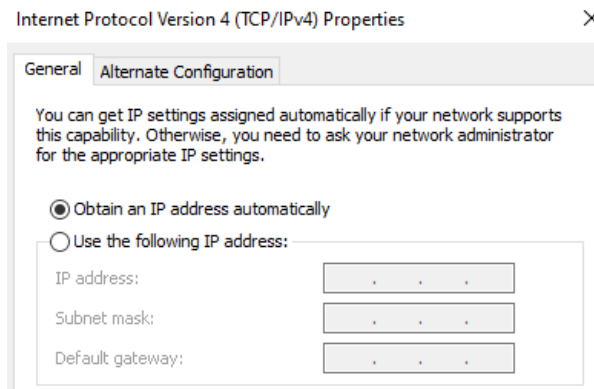
- c. On the **Network Connections** window, double-click the Ethernet connection that you are using on the computer. For computers with one Ethernet port, it's the **Ethernet** option.



- d. In the Ethernet Properties **Networking** tab, double-click **Internet Protocol Version 4 (TCP/IPv4)**.

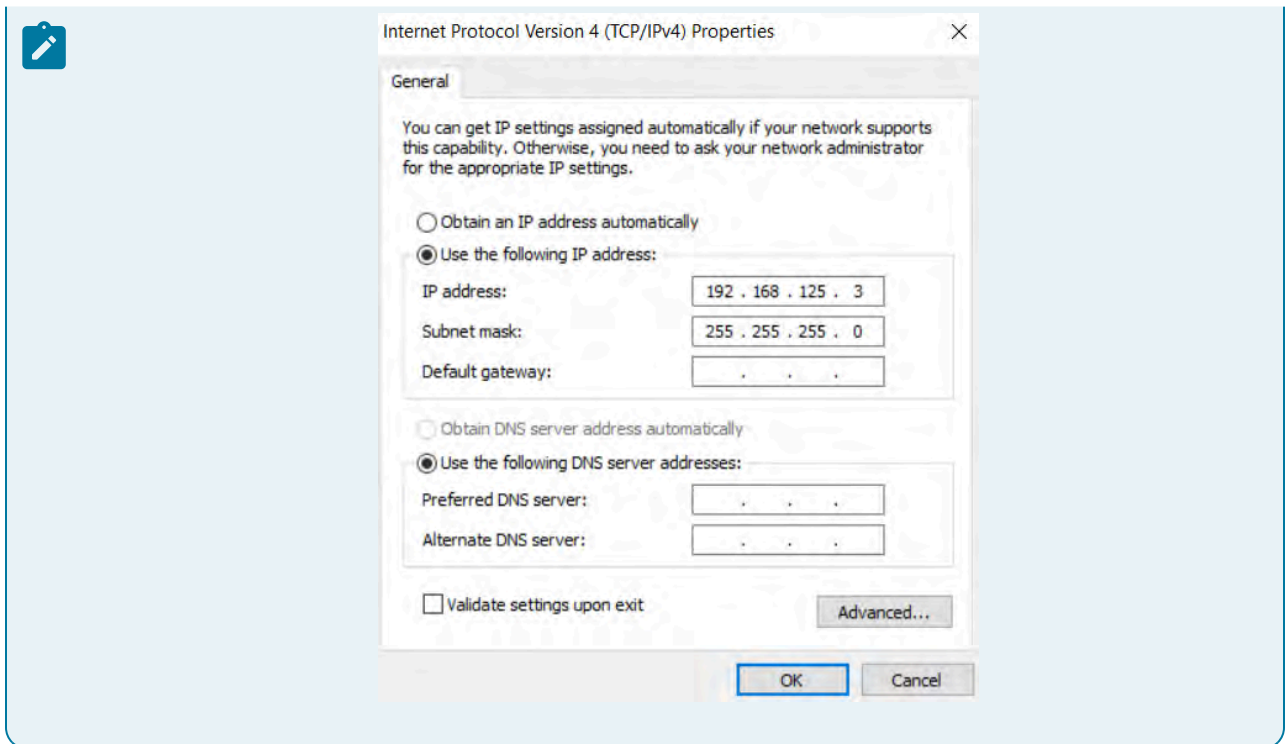


- e. In the IPv4 Properties pop-up **General** tab, select **Obtain an IP address automatically**. This allows the DHCP server to automatically assign your computer an IP address for communicating with the robot controller.



Note:

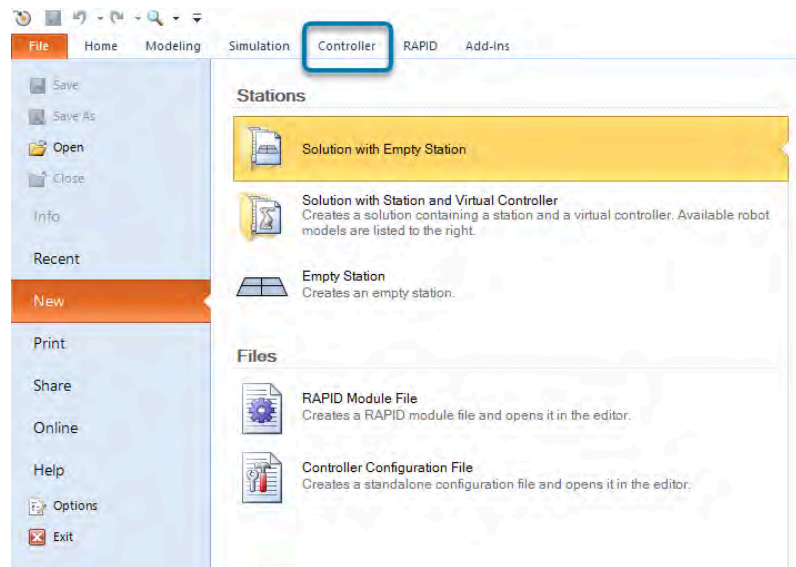
Selecting **Use the following IP address** instead is also valid, but make sure that the IP address that you are manually entering is compatible with the robot controller and doesn't interfere with other devices. For example, try setting the static IP address to **192.168.125.3** and the Subnet mask to **255.255.255.0**. If you get errors later on, come back to this screen to try different settings.



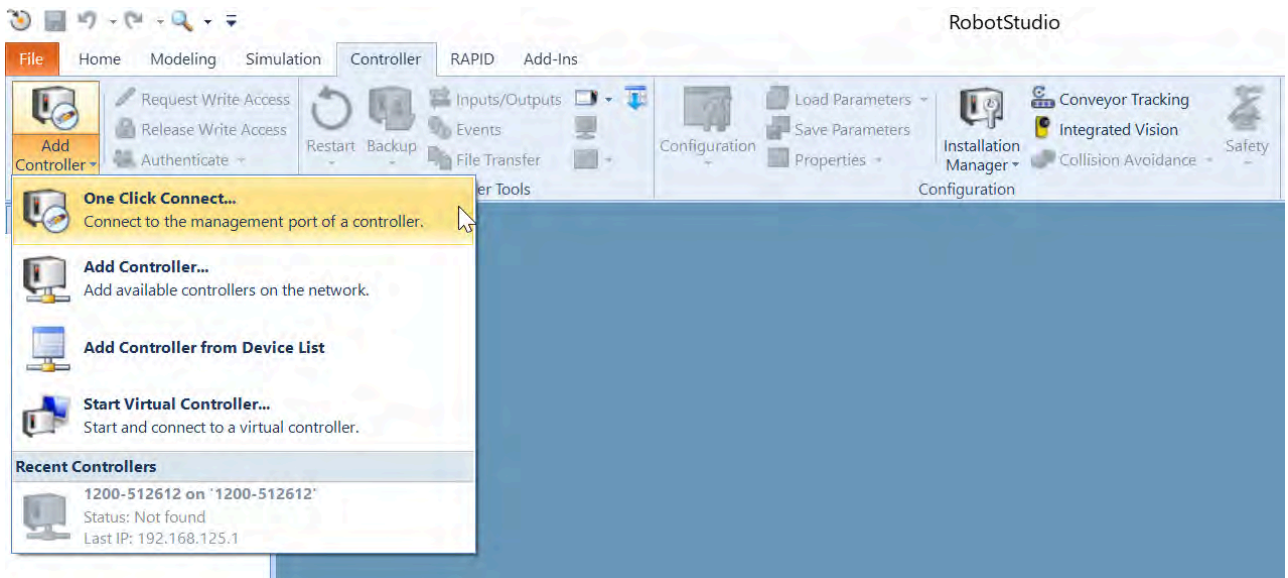
f. Click **OK** to save these settings.

5. Connect to the ABB controller in RobotStudio:

a. Select the **Controller** tab at the top of the screen.



b. Click the **Add Controller** dropdown and select **One Click Connect**.

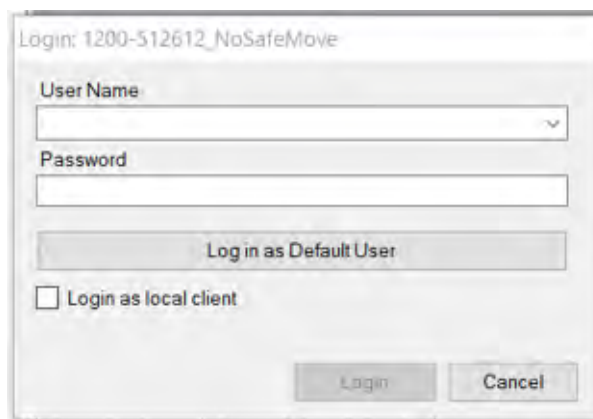


Tip:

If the controller doesn't connect, follow the instructions in the error pop-up for checking your Ethernet cable connection and your IP configuration settings.

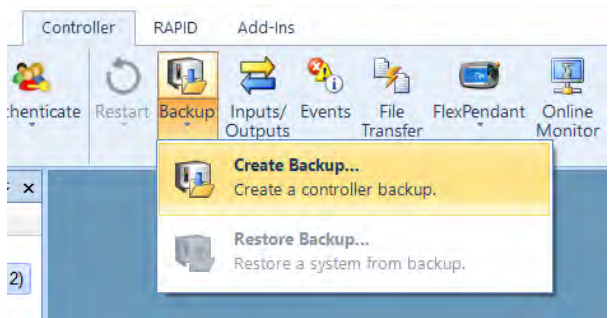


6. If you see the following pop-up, click **Log in as Default User**.

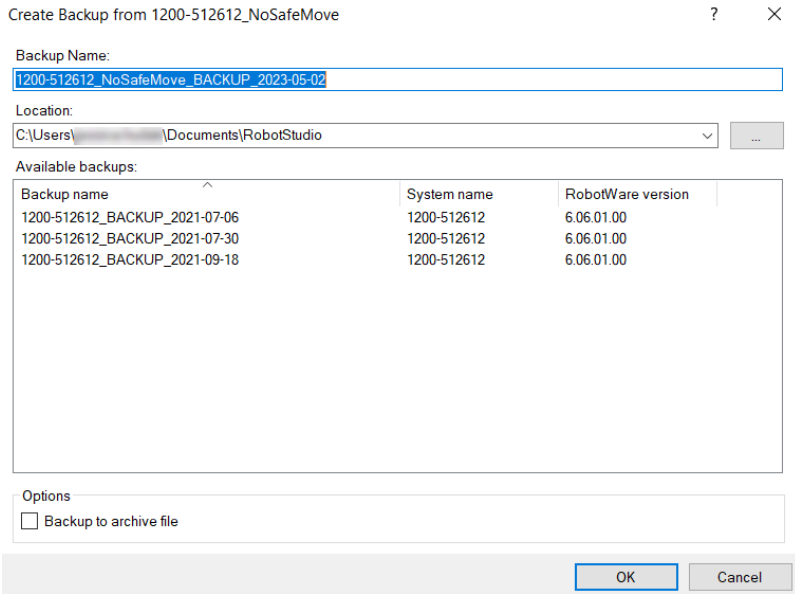


7. Backup the controller (skip this step if you already saved a backup):

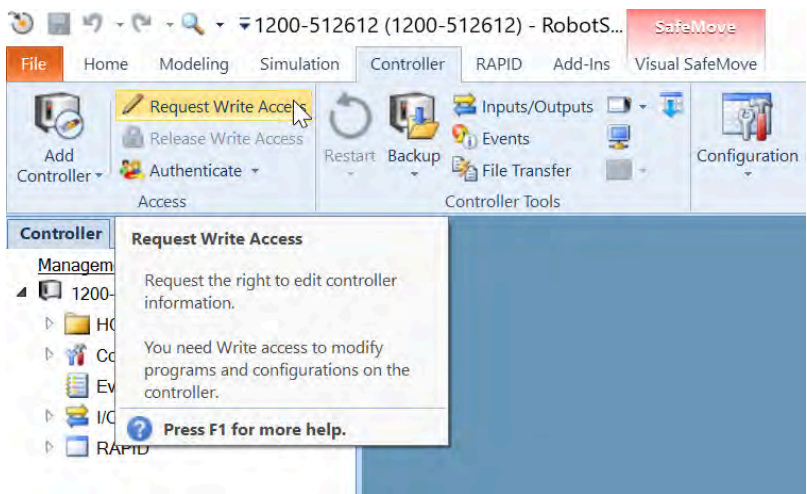
a. In the RobotStudio **Controller** tab, click **Backup** at the top of the screen, then select **Create Backup**.



b. Choose where to save your backup, then click **OK** to start the backup and wait for it to finish.



8. With the mode switch on the ABB controller set to AUTO, click **Request Write Access**. This allows you to edit settings on the controller.



9. Reset the controller to its factory default settings:

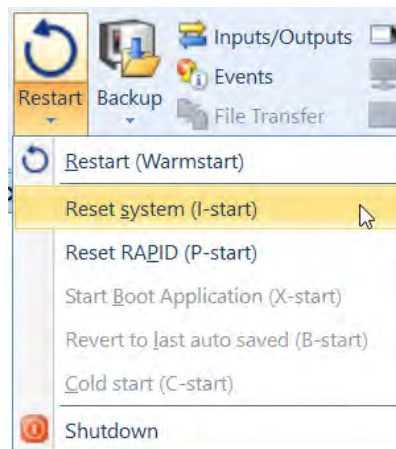
**Note:**

A factory reset (I-start) is recommended because it kills all currently-running programs and guarantees that there will be no conflicts during the ForgeOS file transfer. You could try skipping this factory reset step, but if you get errors later on in the setup process that prevent ForgeOS from communicating with the robot controller, come back to this step to do the factory reset. **Before performing the factory reset, take note of any settings that you have set in RobotStudio that you do not want to lose, and make sure that your backup files are stored in a safe place.** Later on in this guide are instructions for restoring the backup EIO.cfg file (if applicable).

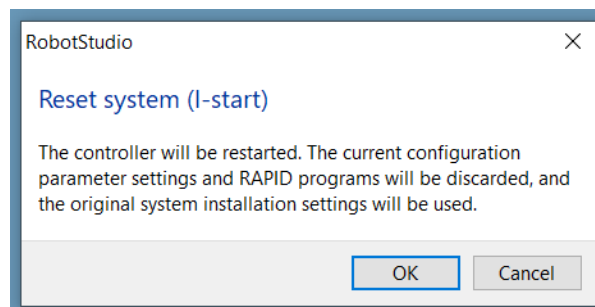
- a. In the **Controller** tab, click the **Restart** dropdown at the top of the screen, then select **Reset system (I-start)**.

**Note:**

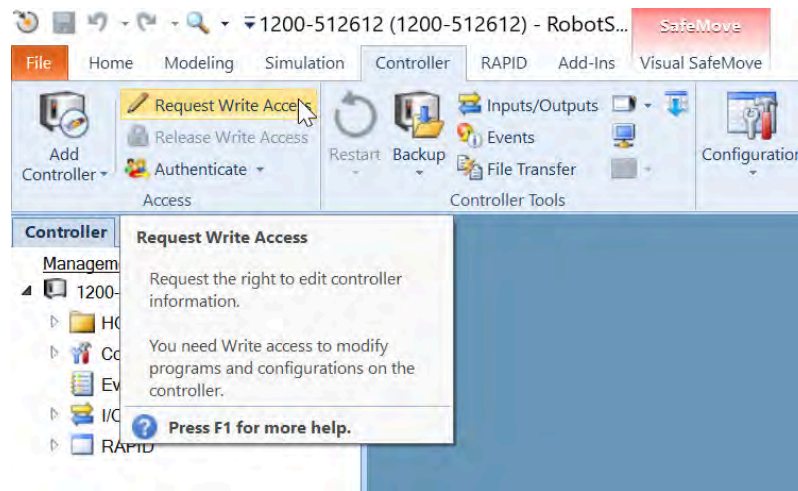
If the Restart menu is unavailable, try pressing the ABB controller's E-Stop to stop motion programs.



- b. Click **OK** to confirm the factory reset. Wait for the controller to restart and reconnect to RobotStudio.



c. Click **Request Write Access** to regain access.

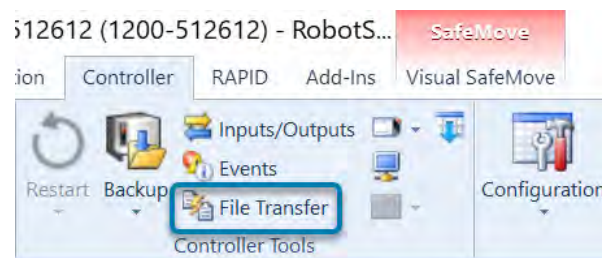


10. Connect the USB drive with the ForgeOS robot driver files to your RobotStudio computer.



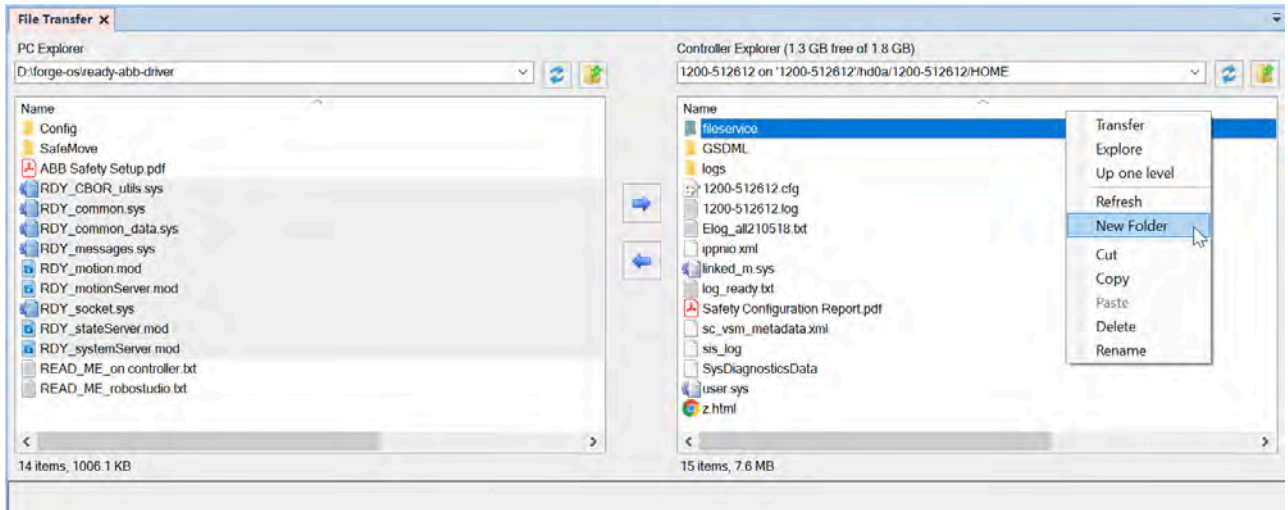
11. Follow these steps to copy the ForgeOS robot driver files onto the controller:

a. In the **Controller** tab, select the **File Transfer** button.

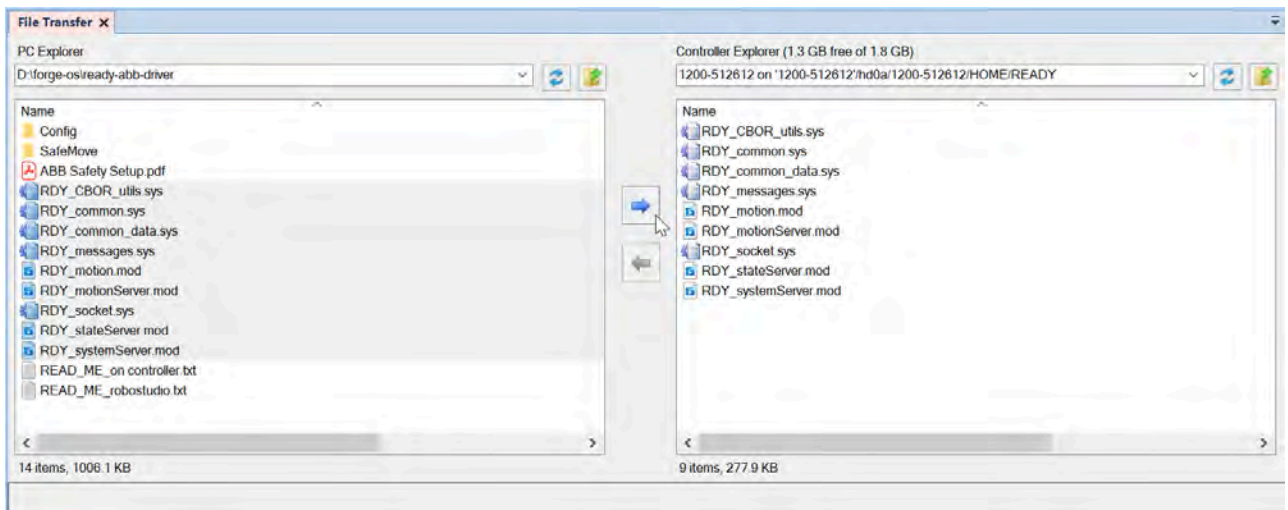


b. In the **PC Explorer**, find the ForgeOS robot driver files on the USB flash drive in **forge_os\ready-abb-driver**. Select all of the **.sys** and **.mod** files.

c. In the **Controller Explorer**, find the **HOME** directory. Create a new folder called "READY" by right-clicking and selecting **New Folder**.

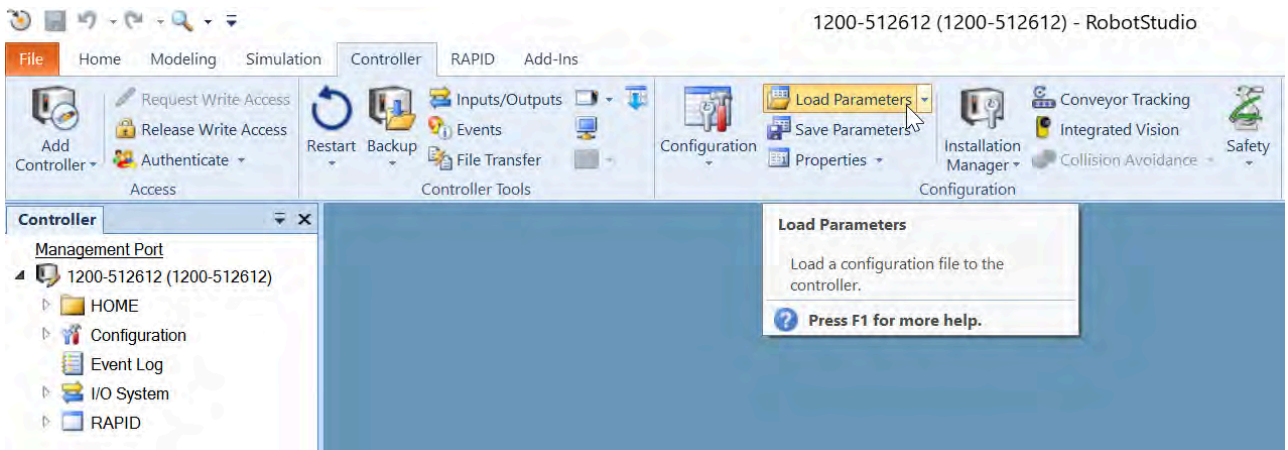


d. Open the new **READY** folder. Then click the arrow that's pointing to the right to transfer all of the driver files into that folder.



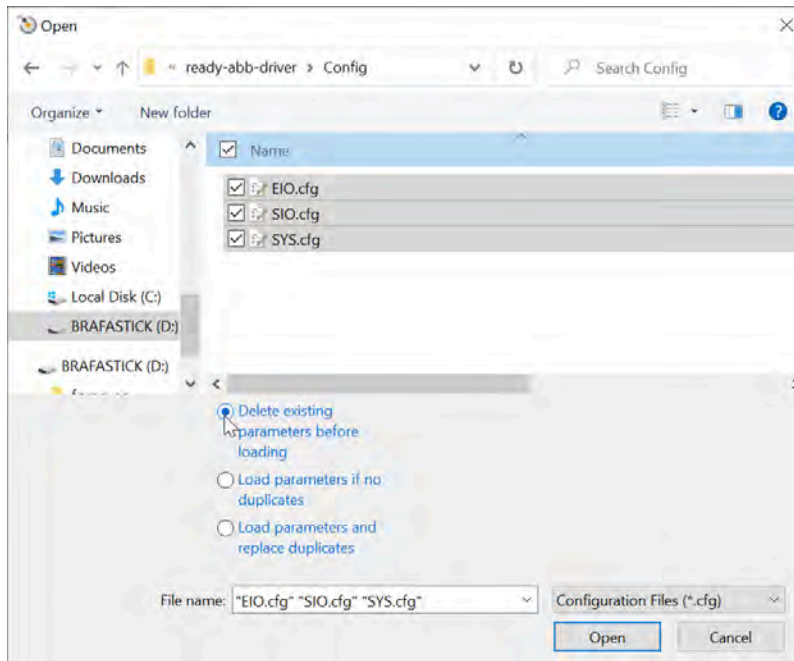
12. Follow these steps to copy the controller parameters onto the controller:

a. In the **Controller** tab, click **Load Parameters**.

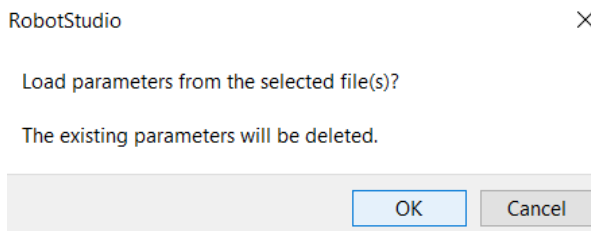


b. At the bottom of the Open window, select **Delete existing parameters before loading**.

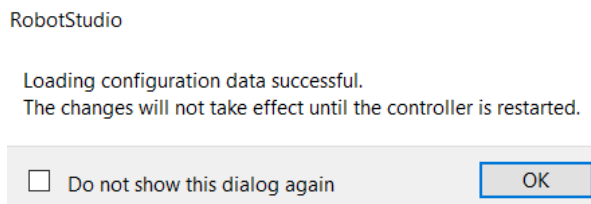
- c. Open the folder named **Config** in the USB drive. Select all of the **.cfg** files, and then click **Open** to load them.



- d. If RobotStudio warns you that existing parameters will be deleted, press **OK**.



- e. If RobotStudio asks you to restart the controller, press **OK** to clear the pop-up. However, to save time, wait to reboot until you do the next step.



13. Follow these steps to check that the controller network settings allow communication with ForgeOS:

- a. In the **Controller** tab, click the **Configuration** dropdown and select **Communication**.
- b. Of the Type options, select **IP Setting**.
- c. Make sure there is a network called **FORGE Network** on the ABB **WAN** interface. Double click over **FORGE Network** to bring up the instance editor.

Type	IP	Subnet	Interface	Label
Application protocol	192.168.127.1	255.255.255.0	N/A	Axis computer 1
Connected Services	192.168.126.1	255.255.255.0	LAN	FlexPendant Network
DNS Client	172.16.255.251	255.255.255.0	WAN	FORGE Network
Ethernet Port	192.168.125.1	255.255.255.0	LAN	Private Network
IP Route	192.168.15.6	255.255.255.0	LAN	PROFINET Network
IP Setting	172.16.255.251	255.255.255.0	WAN	Public Network

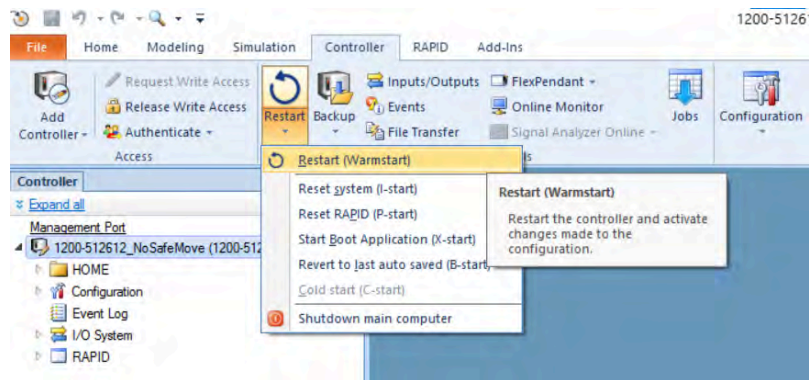


Note:

The IP address that you enter in this "FORGE Network" field will be the same IP address that you use later when you finish creating the robot device in Device Configuration.

d. Set the **IP Address** to **192.168.1.20** and set the **Subnet Mask** to **255.255.255.0**.

14. Restart the ABB controller by selecting **Restart (Warmstart)** in the Controller > Restart menu. Wait for the restart to finish. Keep the ABB controller set to AUTO mode.



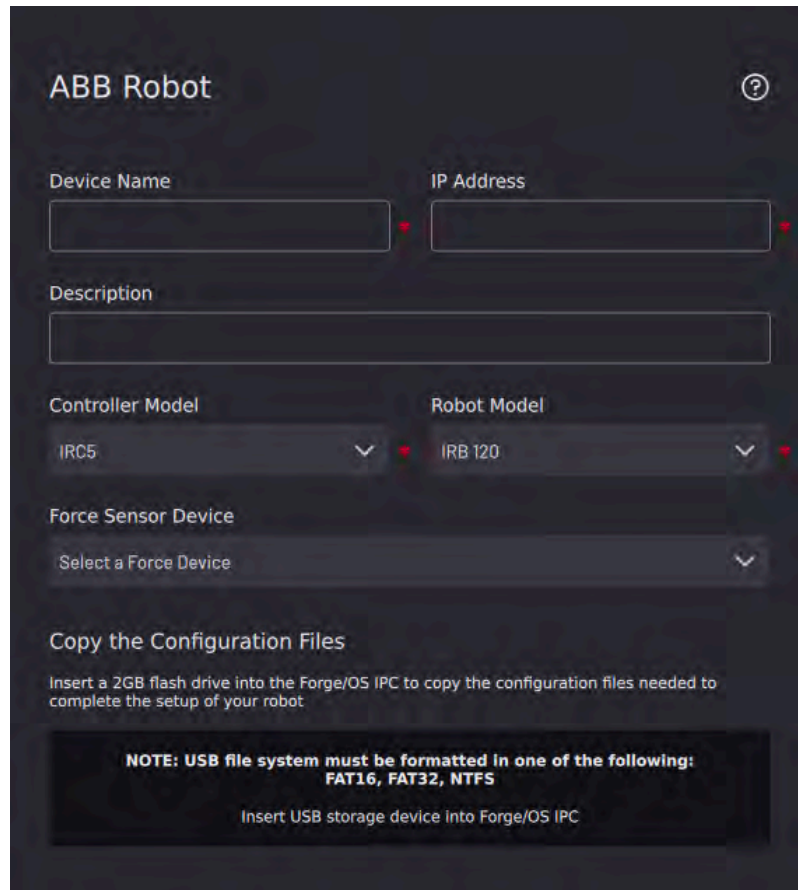
Note:

You can also use the power switch on the robot controller instead.

Chapter 10. Adding the Robot in Device Configuration

In these steps, you save the robot in the Device Configuration app and finish the setup.

1. In Forge/OS, finish entering your ABB device information:
 - a. Give your device a name.
 - b. For the IP Address, enter **192.168.1.20** or the IP address you assigned to the robot, if different.



The screenshot shows the 'ABB Robot' configuration screen. It features several input fields and dropdown menus. The 'Device Name' and 'IP Address' fields are empty. The 'Description' field is also empty. The 'Controller Model' dropdown is set to 'IRC5' and the 'Robot Model' dropdown is set to 'IRB 120'. The 'Force Sensor Device' dropdown is set to 'Select a Force Device'. Below these fields, there is a section titled 'Copy the Configuration Files' with instructions: 'Insert a 2GB flash drive into the Forge/OS IPC to copy the configuration files needed to complete the setup of your robot'. A note states: 'NOTE: USB file system must be formatted in one of the following: FAT16, FAT32, NTFS'. At the bottom, there is a button labeled 'Insert USB storage device into Forge/OS IPC'.

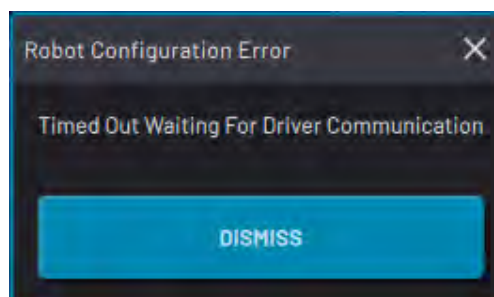
2. In Forge/OS, confirm your device settings and tap **SAVE**. Forge/OS attempts to connect with the robot controller for up to 20 seconds.



Note:

When you first connect to a robot, it's normal to see some robot errors and/or warnings on the READY pendant. Ignore these for now. You will clear them after you finish adding the robot to Forge/OS.

- a. If the robot controller fails to connect, you see this pop-up.



Click **DISMISS**, do the following, then try to tap **SAVE** again:

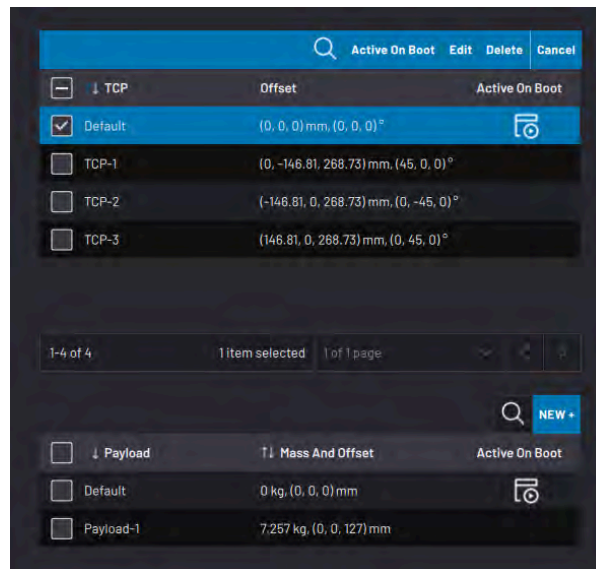
- Check the Ethernet connection between the robot controller and IPC.
- Check the network settings on the robot controller.
- Check if the robot controller is on and in the correct operating mode (in auto or remote mode).
- Select the correct robot controller and robot models in Device Configuration.

3. When the robot connects, you can add Tool Center Points (TCPs) or Payloads for the robot. You can come back to this later by editing the device's configuration. Tap **SAVE** to continue.

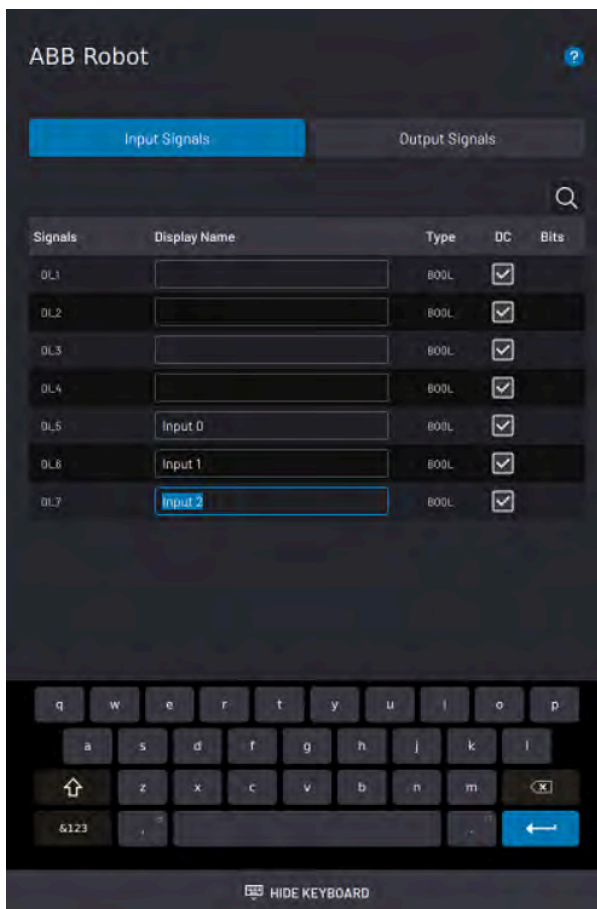


Note:

The default TCP is at the robot's tool flange. The default Payload is zero.



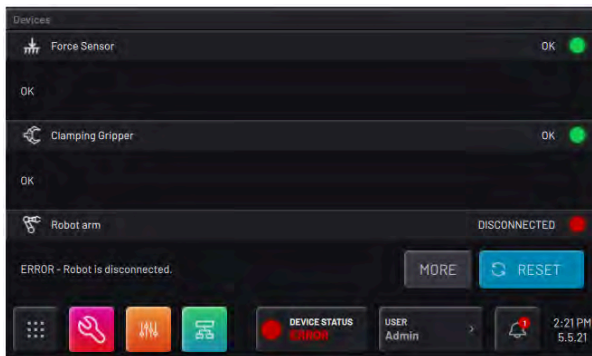
4. View a list of the reserved default ForgeOS signals. Later, you can add your own signals from scratch by following [Appendix B \(on page 46\)](#) or restore a backup of a previous IO configuration by following [Appendix C \(on page 60\)](#), but press **SAVE** for now to continue.



5. If you pressed the E-Stop on the ABB controller earlier before rebooting, make sure to release it.

6. Follow these steps to clear robot errors:

- a. Tap the **Device Status** button on the Toolbar to expand the Device Status Panel. The robot is listed with two buttons: **MORE** and **RESET**.



- b. Tap **RESET** to try to recover from the errors. If you can't **RESET** an error, tap **MORE** to get more details and instructions.

Congrats! Now that your device is connected in ForgeOS, here are four options of how to proceed:

- Begin using your robot device as is (without custom IO signals) to program Task Canvas tasks.
- Follow [Appendix B \(on page 46\)](#) to wire IO devices to the ABB robot controller and add new IO signals in ForgeOS from scratch.

- Follow [Appendix C \(on page 60\)](#) to restore a backup of a previous IO configuration (instead of re-entering this data from scratch in RobotStudio).
- Follow [Appendix D \(on page 63\)](#) to update the robot driver files on the robot controller when a new ForgeOS version is released.

Chapter 11. Appendix A: Setting Up Forge/OS

Installing ForgeOS

Follow these steps to install ForgeOS and sign in to the Admin role. Installation takes about 30 minutes, depending on the resources of the IPC.

1. To install ForgeOS, follow these substeps. You need a ForgeOS installation USB flash drive. Contact your READY Robotics distributor for an installation USB drive.



Important:

Installing ForgeOS will erase all data on the target hard drive.

- a. Connect a monitor, keyboard, and mouse to the IPC where you want to install ForgeOS.



- b. Plug the ForgeOS installation USB flash drive into the IPC.



Tip:

If you need more USB ports, use a USB 3.0 hub.

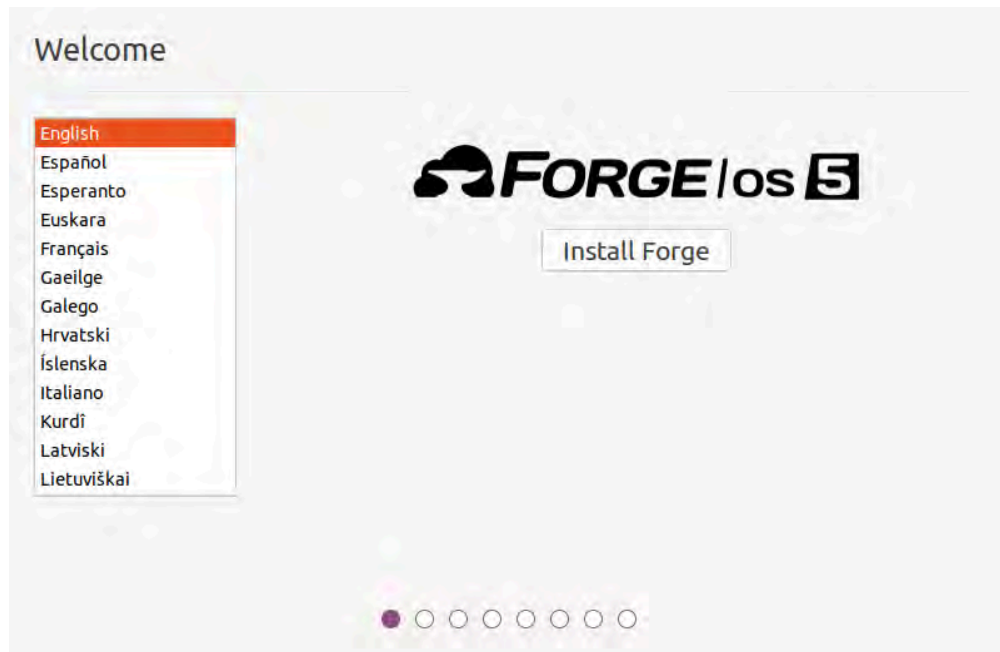
- c. Restart the IPC. While the IPC is powering on, press the keyboard hotkey that takes you to the Boot Menu.



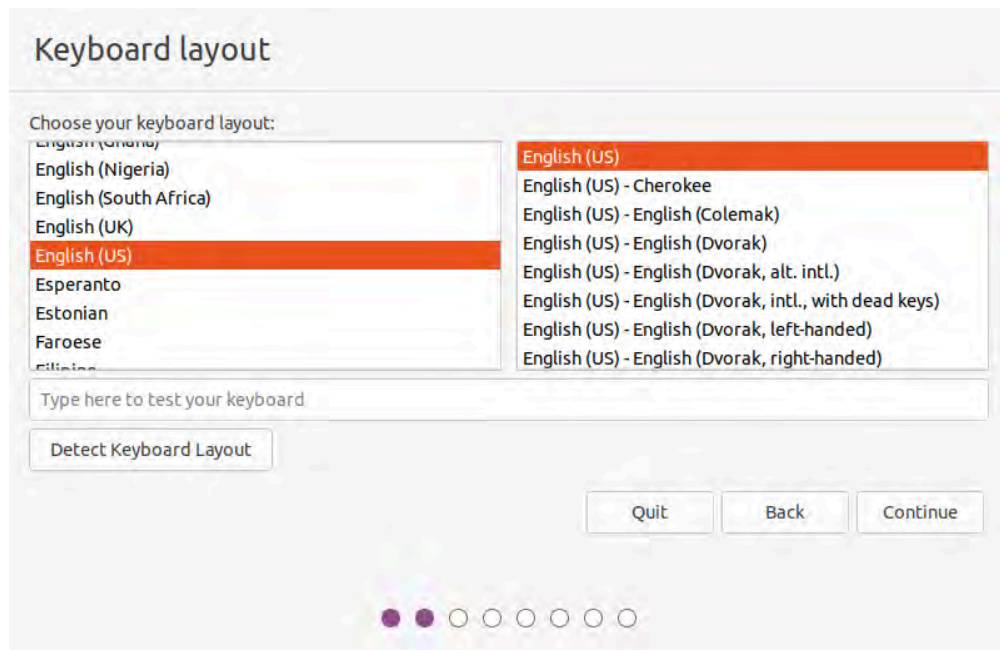
Tip:

The key that opens the Boot Menu depends on the IPC model. The most common keys that do this are ESC, F10, F11, or F12. Refer to your computer's documentation for boot options.

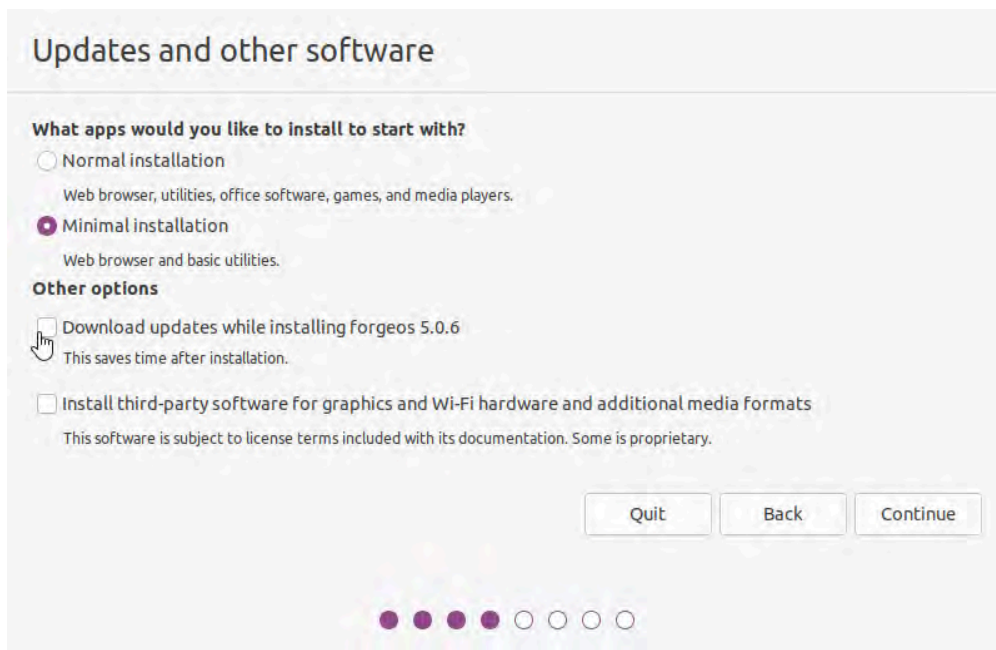
- d. From the boot options, select **Install ForgeOS** to boot from the installation USB flash drive.
- e. The installer may take several minutes to load. Wait until the installation wizard opens.
- f. Select your language. Then click **Install Forge**.




g. Choose a keyboard layout. Then click **Continue**.

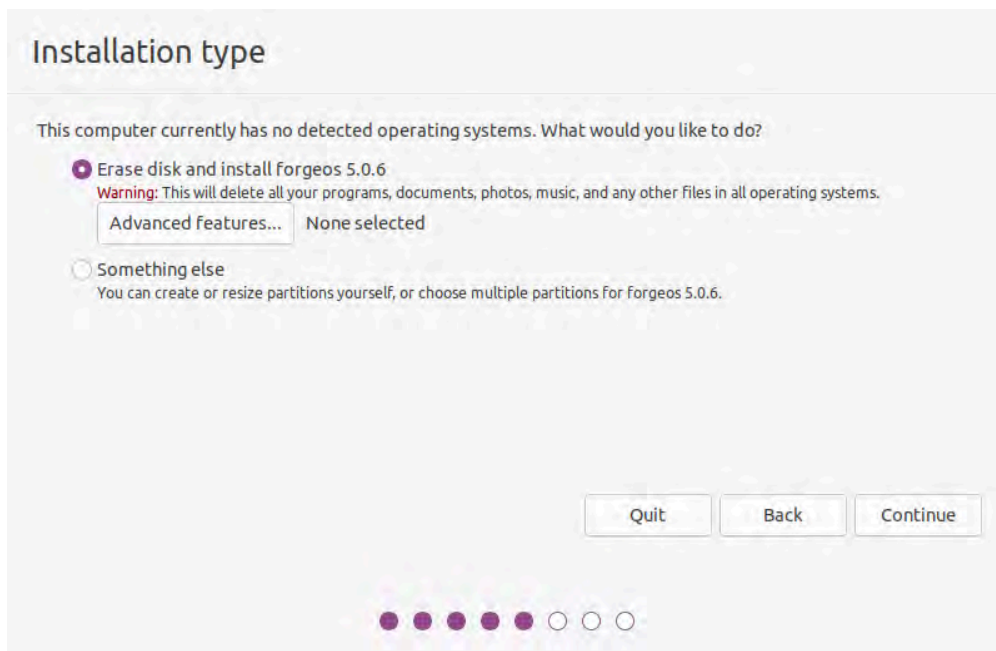


h. Select **Minimal installation**. Uncheck **Download updates while installing forgeos**. Then click **Continue**.

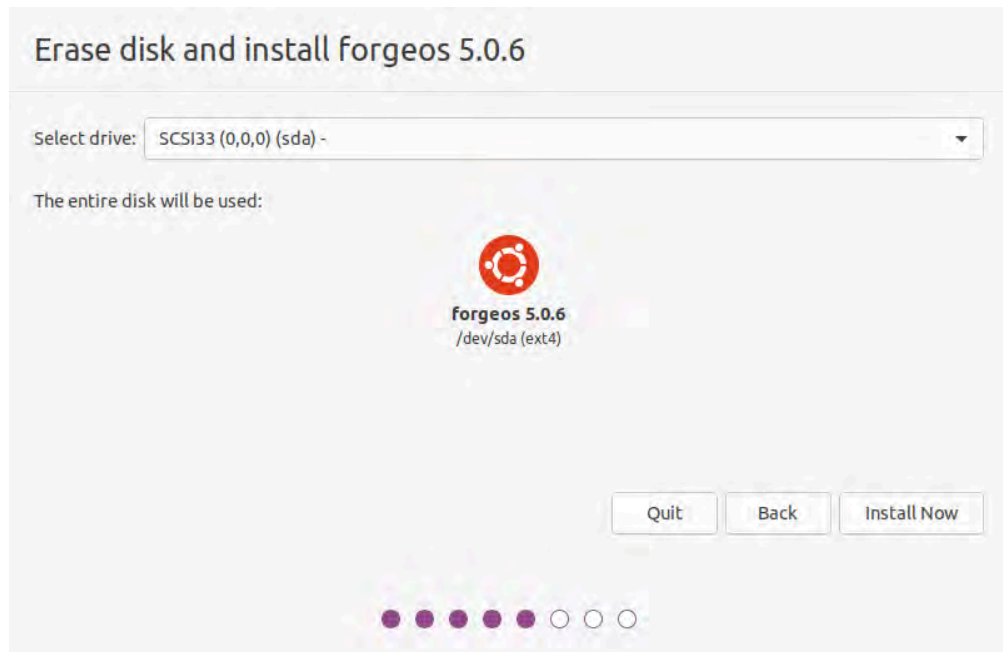


i. Select **Erase disk and install forgeos**. Then click **Continue**.

 **Note:**
 If ForgeOS is already installed, the installation wizard will show additional options. The goal is to erase the entire disk for a brand new installation.

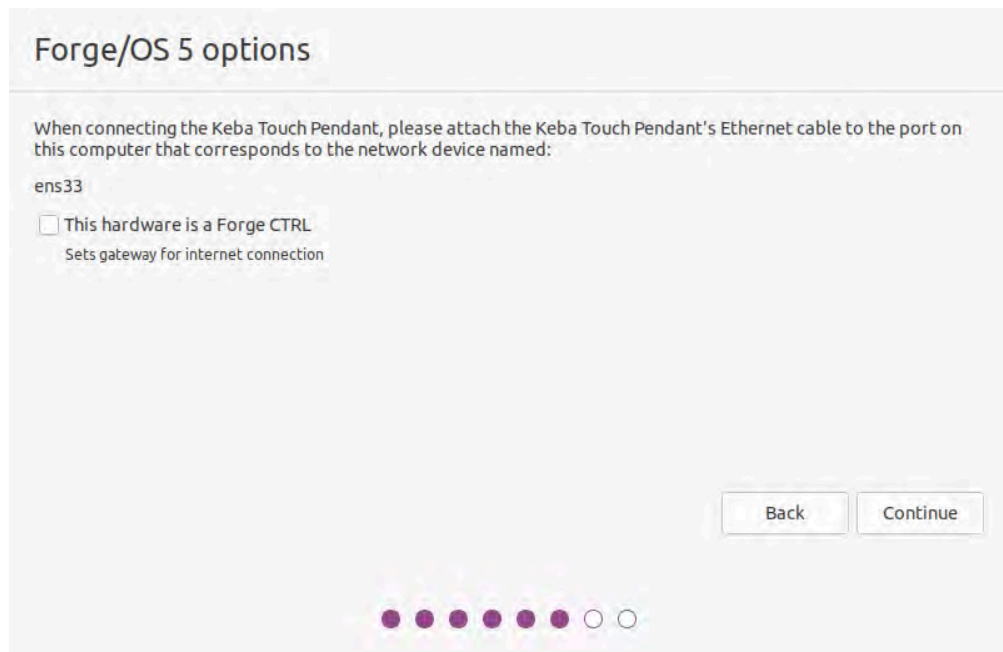


j. Select the IPC hard drive for ForgeOS and click **Install Now**.

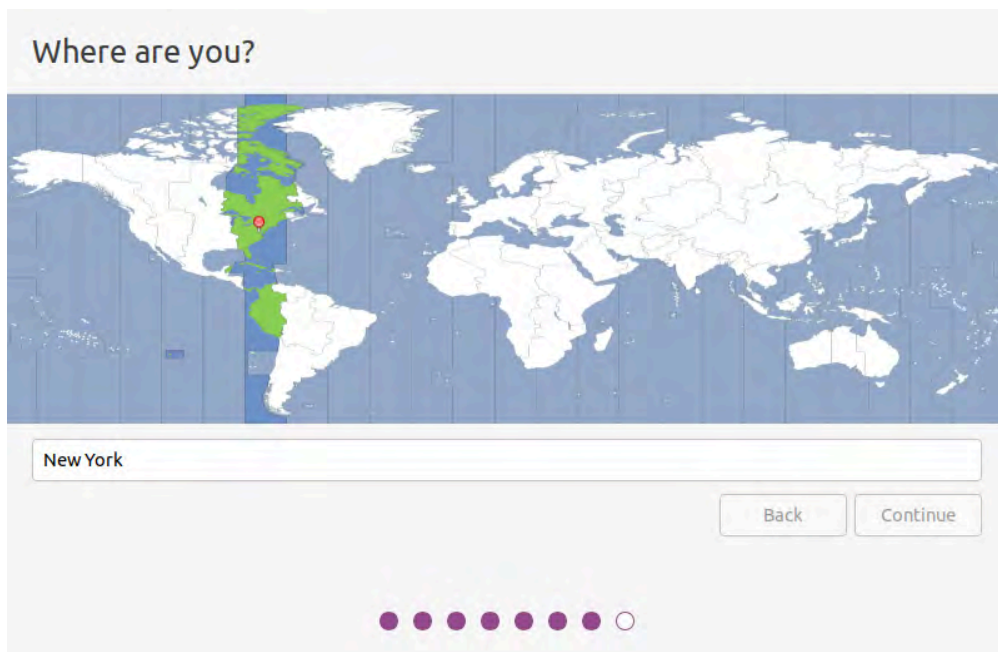


k. Confirm that you want to erase the entire disk by clicking **Continue**.


l. Make a note of the pendant instructions. If you're using a Forge/Ctrl, select the checkbox next to **This hardware is a Forge CTRL**.

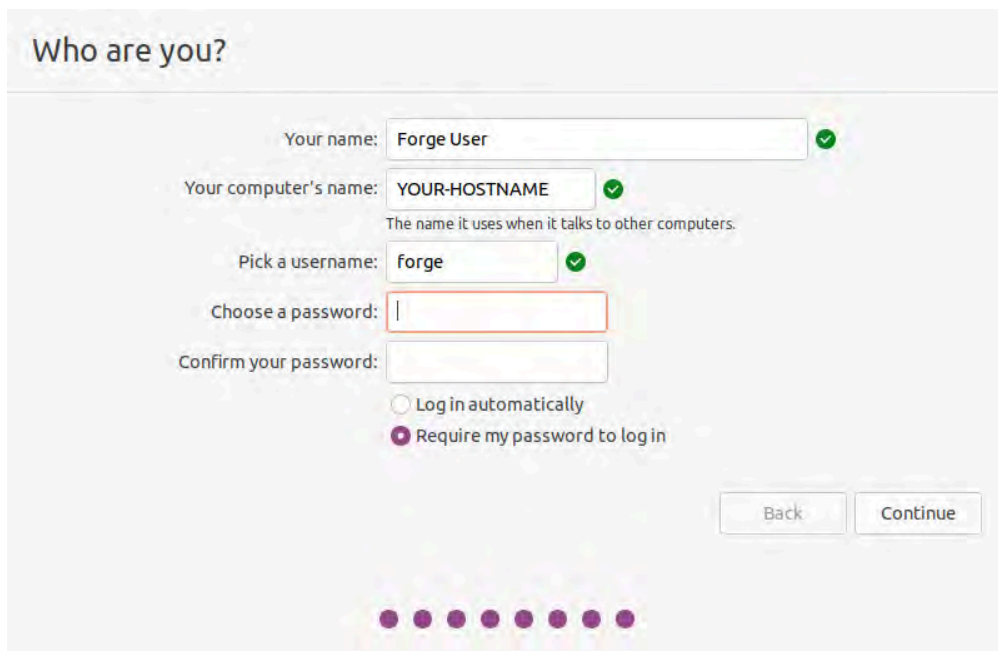


m. Choose your timezone. Then click **Continue**.



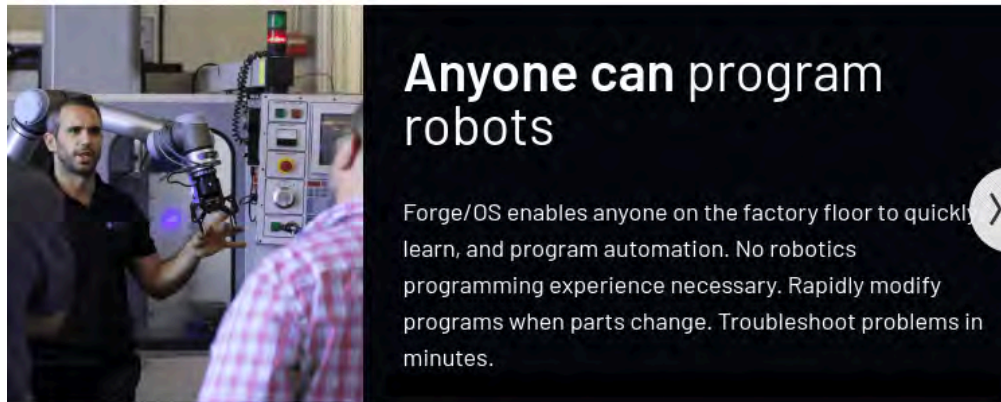
- n. Choose your IPC's host name. The host name identifies the IPC on the network. Pick a username and password. Then click **Continue**.

 **Note:**
 The username and password that you create here are for accessing the IPC desktop. They are NOT for signing into ForgeOS on the READY pendant.



- o. Wait for the installer to copy and install ForgeOS.

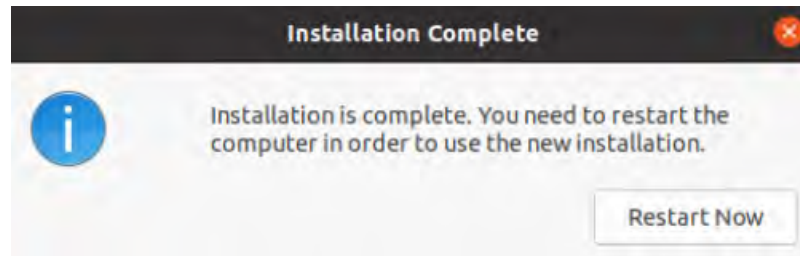
Welcome to Forge/OS 5



▶ Copying files...

Skip

p. Once the installation completes, click **Restart Now**.

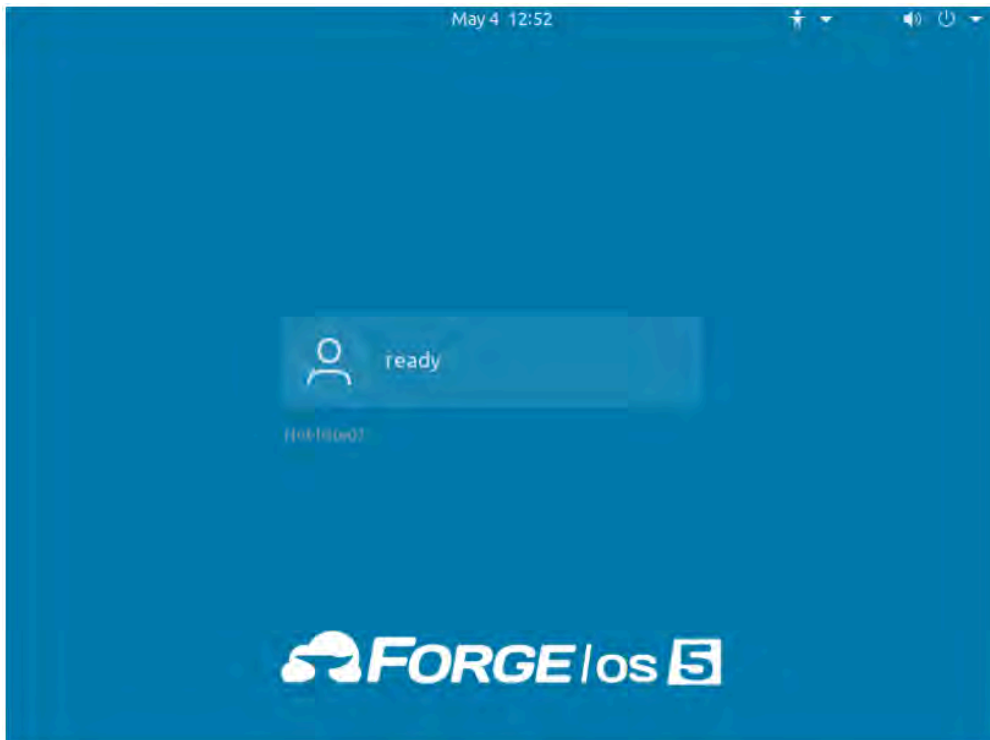


q. When prompted, remove the installation flash drive. Then reboot.

```
Please remove the installation medium, then reboot.
```

r. Wait for ForgeOS to finish booting.

- s. When you see the login screen with the ForgeOS 5 logo, ForgeOS is ready to run on the READY pendant! You don't need to sign in to the desktop. Disconnect the monitor, keyboard, and mouse that you used to install ForgeOS.



2. The READY pendant automatically finds and pairs with the IPC. The three LEDs on the screen help you track the status:
- **Pendant Network Connection:** This condition is satisfied when the READY pendant has a valid network connection (i.e., the Ethernet cable is plugged in).
 - **ForgeOS IPC Detected:** This condition is satisfied when the READY pendant detects a Forge/OS IPC on the network.
 - **ForgeOS IPC Paired:** This condition is satisfied when the READY pendant successfully pairs with the IPC. If pairing fails, it is automatically retried indefinitely.

When a condition is not satisfied, the LED is red. When a condition is in progress of becoming satisfied, a spinner around a READY logo appears to the right of the text. When a condition becomes satisfied, the LED turns green.



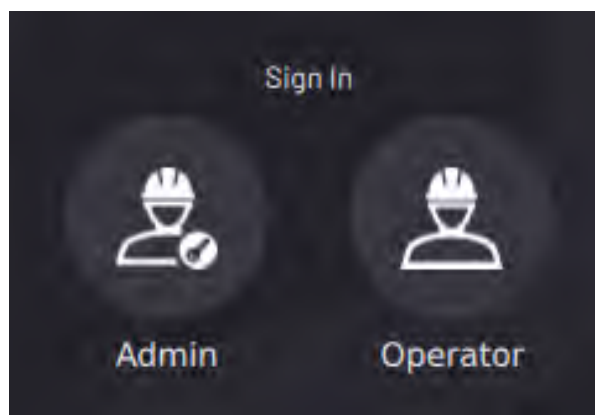
The UI shows the real-time state of each step. For example, if the pendant loses its network connection during pairing, all steps become undone. If the READY pendant spends more than 60 seconds on any step, troubleshooting text displays. Common things to check are if the READY pendant network cable is plugged in, if the IPC is powered on, if the READY pendant and IPC are connected to the same network, and if there's only one READY pendant and one IPC on that network.



Note:

The READY pendant IP Address is preset to 172.16.255.253. The network interface that the pendant connects to should use IP Address 172.16.255.250 and Subnet mask 255.255.255.0.

3. Tap **Admin** and sign in. The default Admin password is "forgeadmin".



Note:

After installation, you have limited access to ForgeOS until you activate it with a license code. See [Activating ForgeOS with a License Code \(on page 41\)](#).

Activating ForgeOS with a License Code

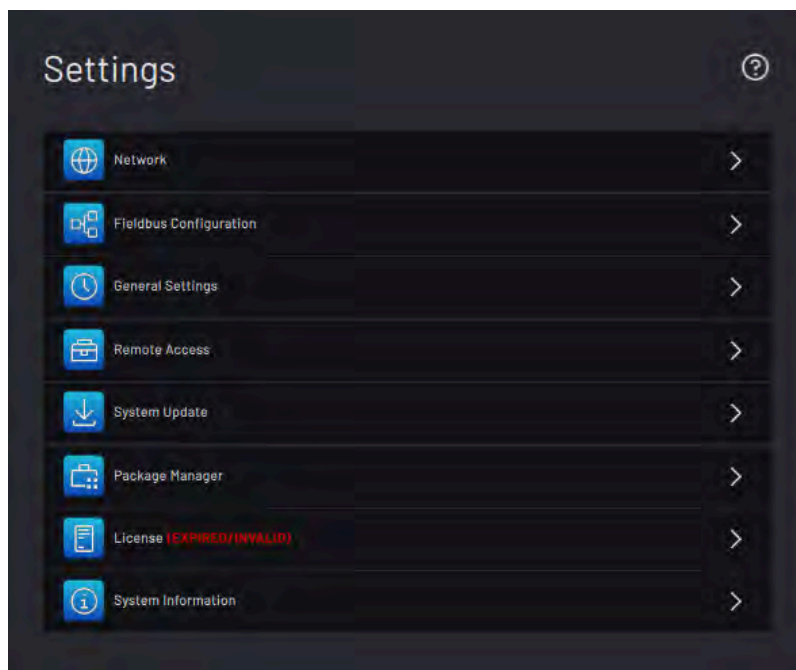
There are two methods to activate ForgeOS: **Online license activation** and **offline license activation**.

The table below lists the requirements for each method.

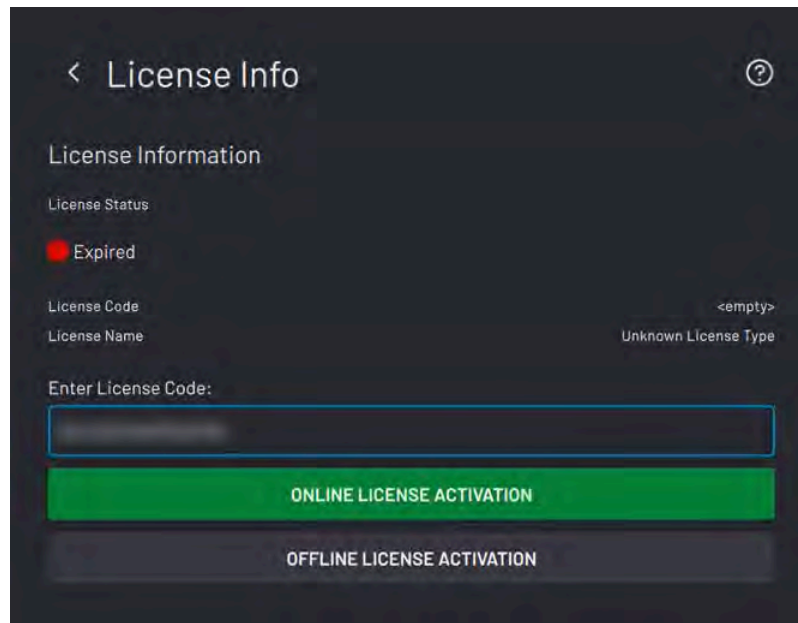
Online License Activation	Offline License Activation
<ul style="list-style-type: none"> • An internet-connected ForgeOS • A valid ForgeOS license code 	<ul style="list-style-type: none"> • A 2GB or larger USB flash drive • An internet-connected PC • A valid ForgeOS license code

i **Tip:**
Connect a USB keyboard to the port on the bottom of the READY pendant to type in any text field in ForgeOS.

1. On the Settings app main screen, tap **License**.



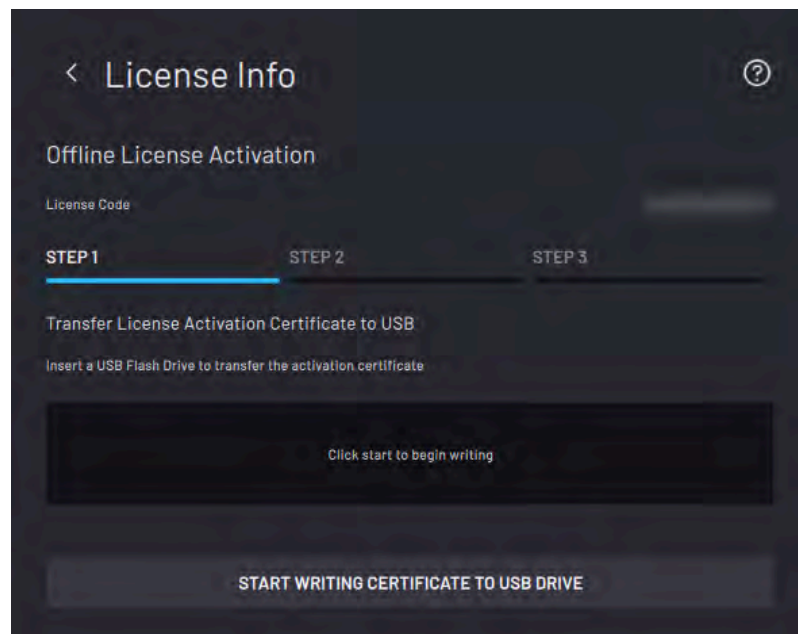
2. Type in your license code.
3. Choose **ONLINE LICENSE ACTIVATION** if ForgeOS is connected to the internet. If not, choose **OFFLINE LICENSE ACTIVATION**.



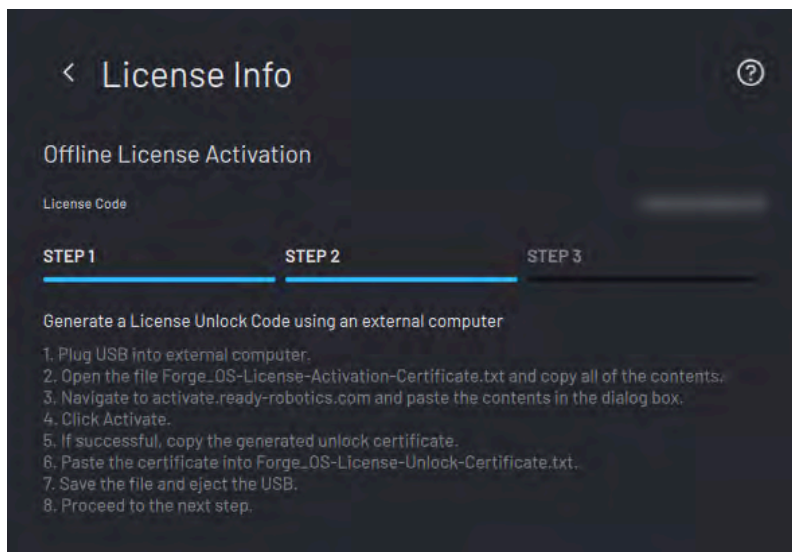
4. If you chose online license activation, you're done!

5. If you chose offline license activation, follow these substeps:

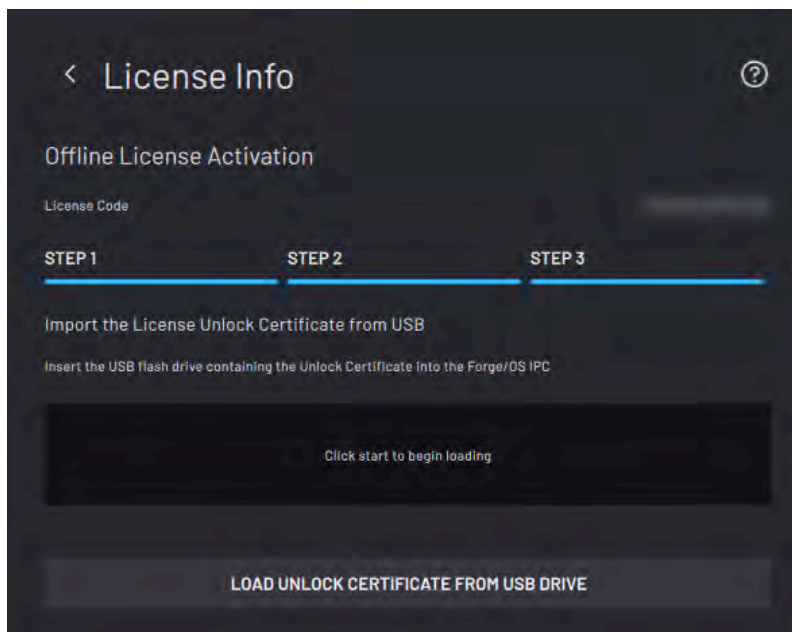
- a. Insert the USB flash drive into your IPC. Tap **START WRITING CERTIFICATE TO USB DRIVE**.



- b. When the files finish transferring, tap **NEXT**. Follow the instructions on the screen to convert the Activation Certificate to an Unlock Certificate using an internet-connected PC.



- c. Insert the USB flash drive back into your IPC. Tap **UNLOAD UNLOCK CERTIFICATE FROM USB DRIVE**.



- d. Wait for the file to finish transferring. When the file transfer is complete, remove the USB flash drive and tap **SAVE**.
- e. ForgeOS returns to the licensing home screen and shows an active license. If the license status isn't active, restart these license activation steps. Double-check your license code.

Choosing Preferences

These steps help you choose system preferences, including language, units, time, and network settings.

1. To change preferences for the first time, go to General Settings:

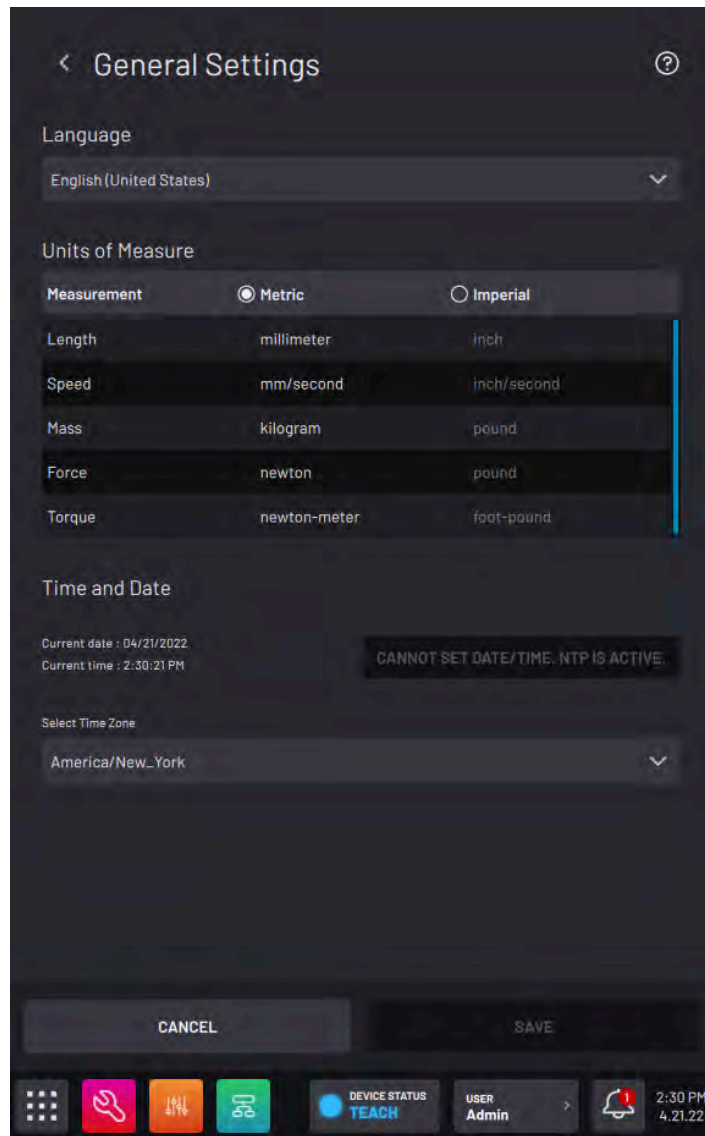
a. On the Settings app main screen, tap **General Settings**.

b. Change the Units of Measure, Time and Date settings, or the Admin login password.



Note:

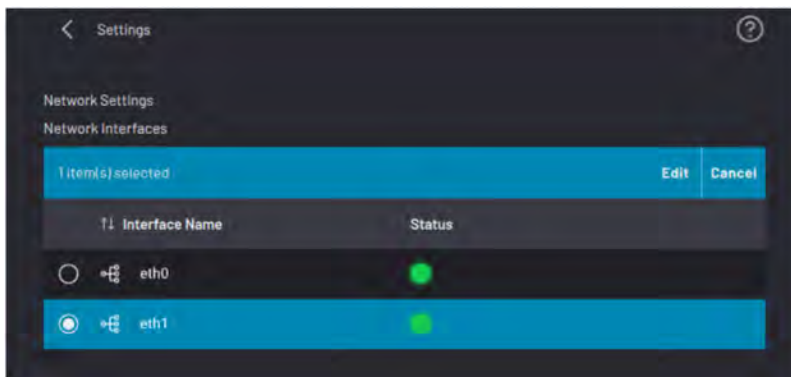
If you later forget your password, contact READY Robotics to reset it.



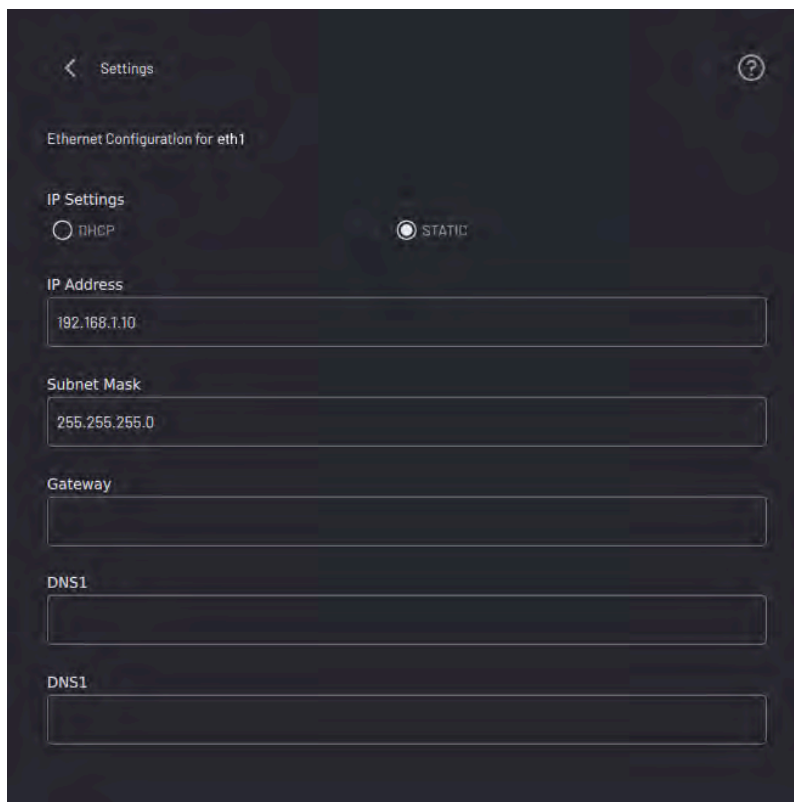
c. Tap **SAVE** to save changes and exit the General Settings menu.

2. Check the Network settings in Forge/OS and set them as you want.

- a. On the Settings main screen, tap **Network**.
- b. The table below lists the available network interfaces on your IPC. By default, the first interface is for the READY pendant. You can't edit the pendant's interface in Forge/OS. Select another interface and tap **Edit** to see the network settings.



- c. Change the network interface to match the settings in the image below. Connect robots and other devices to this interface through an Ethernet switch.



- d. Tap **SAVE**.

Chapter 12. Appendix B: Configuring ABB IO From Scratch

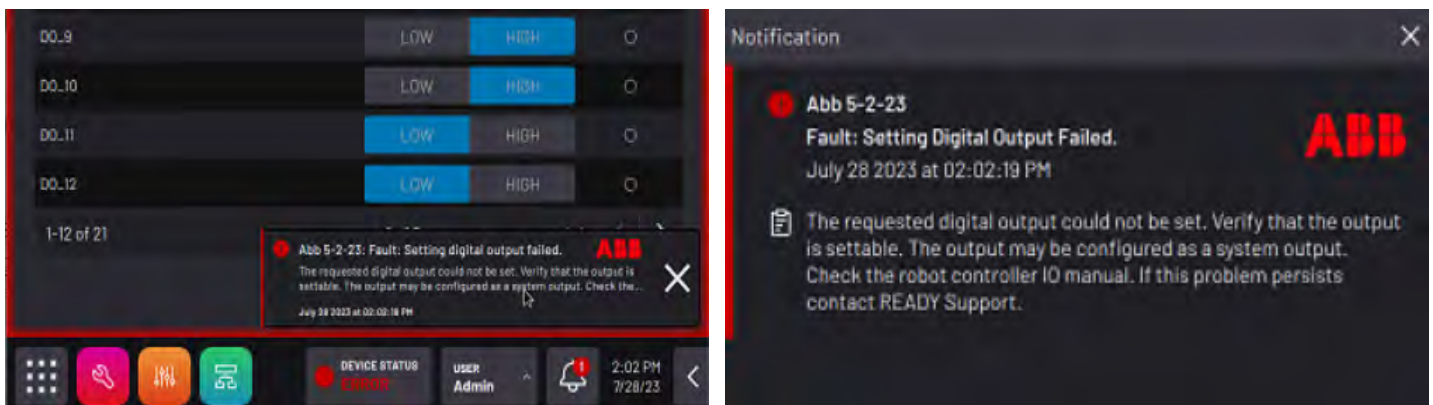
Overview

When you add an ABB robot device in ForgeOS, four digital inputs (DI_1-DI_4)* and 18 outputs (DO_1-DO_17 and AO_1)* automatically appear in the Device Configuration IO table. These simulated signals are reserved for internal ForgeOS use. ForgeOS uses these signals to recover from errors, check if robot motion is possible, and start and stop motion programs.

Suppose you select the **DC** checkbox next to all of these reserved signals so that they all appear in the Device Control app. If you for instance try to change the state of DO_15* with the LOW/HIGH buttons in Device Control (or with a Set block in Task Canvas), you will get a "**Setting Digital Output Failed**" error. In this case, this error is because ForgeOS is using that signal to read if the robot is in PROGRAM Mode or RUN Mode.

Note:

*The number and order of existing reserved IO signals are subject to change.



The order that signals appear in ForgeOS depends on the order that RobotStudio provides them. To view this order, open the **EIO.cfg** file that you downloaded from Device Configuration when you were adding your robot device.

Tip:

If you are using a Windows computer, open this file with the following steps:

1. Open File Explorer.
2. Go to your USB drive's **forge-os > ready-abb-driver > Config** folders.
3. Double-click "EIO.cfg".

The reserved signal "fos_sig_auto_mode" is the 15th digital output signal listed. This translates to DO_15 in ForgeOS.

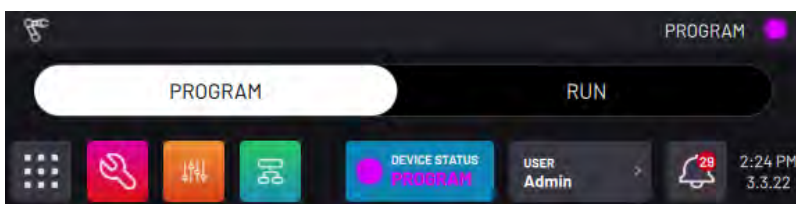
```

1200-512612_NoSafeMove (1200-512612)  EIO.cfg x
83  -Name "fos_sigMotionTaskExecuting" -SignalType "DO"
84
85  -Name "fos_sigMotionServerTaskExecuting" -SignalType "DO"
86
87  -Name "fos_sigStateServerTaskExecuting" -SignalType "DO"
88
89  -Name "fos_sigSystemServerTaskExecuting" -SignalType "DO"
90
91  -Name "fos_sig_estop_ack" -SignalType "DO" -Device "DN_Internal_Device"\
92  -DeviceMap "0" -Size 1
93
94  -Name "fos_sig_event_clear" -SignalType "DO" -Device "DN_Internal_Device"\
95  -DeviceMap "1" -Size 1
96
97  -Name "fos_sig_prog_pointer" -SignalType "DO" -Device "DN_Internal_Device"\
98  -DeviceMap "2" -Size 1
99
100 -Name "fos_sig_mtn_start" -SignalType "DO" -Device "DN_Internal_Device"\
101 -DeviceMap "3" -Size 1
102
103 -Name "fos_sig_auto_mode" -SignalType "DO" -Device "DN_Internal_Device"\
104 -DeviceMap "4" -Size 1
...

```

Even though you could not directly change the state of DO_15, you can indirectly change it from the Device Status Panel.

- When the robot is in **PROGRAM** Mode, DO_15 is **LOW**.
- When the robot is in **RUN** Mode, DO_15 is **HIGH**.



Because all the other existing signals are similarly already used by ForgeOS, you must create new signals if you want to wire IO devices to the robot controller and then read and/or control them in ForgeOS. The new signals that this guide will walk you through adding will appear at the bottom of your new EIO.cfg file in the order that you added them in RobotStudio. New bottom entries here will translate to new bottom entries in the ForgeOS Device Configuration IO table. From there, you will be able to rename the new signals and use them for your IO devices!

i Tip:

View an EIO.cfg file that includes the controller's latest data with the following steps:

1. In RobotStudio, connect your computer to the controller.
2. In the top menu, click **Save Parameters**.
3. Select a folder to save the new configuration files to.
4. After saving, go to that folder.
5. Double-click "EIO.cfg".

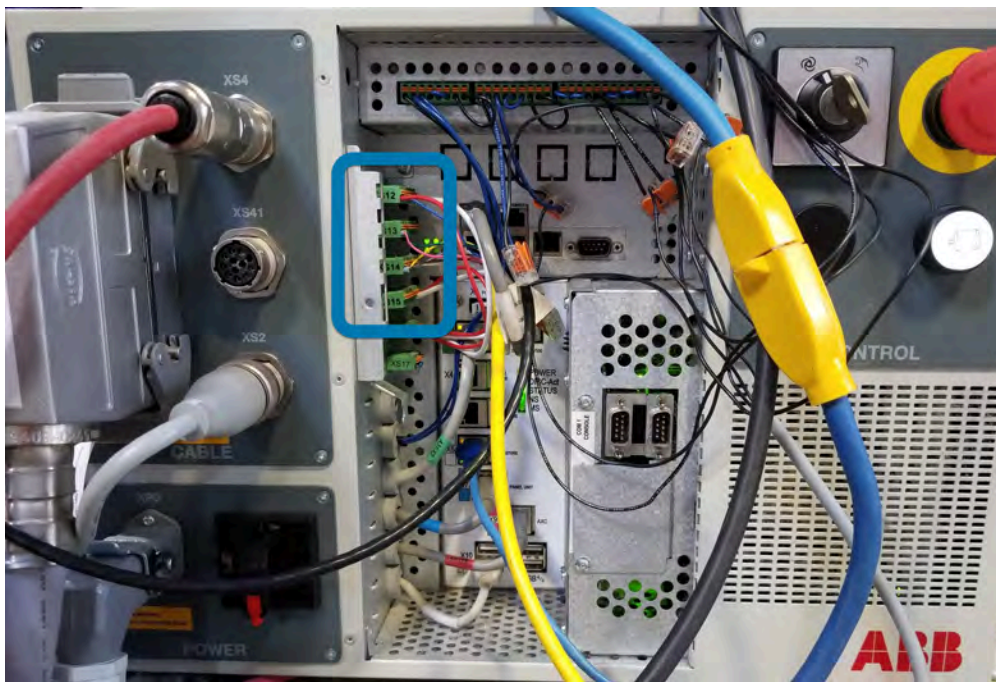
```

1200-512612_NoSafeMove (1200-512612)  EIO.cfg x
112 -Name "FENCE_CLOSED" -SignalType "DI" -Access "All" -Default 1
113
114 -Name "THREE_POS_ENABLED" -SignalType "DI" -Access "All" -Default 1
115
116 -Name "StopMotion" -SignalType "DO" -Access "ReadOnly"
117
118 -Name "FOS_E_STOP" -SignalType "DO" -Access "ReadOnly"
119
120 -Name "Test_DI_1" -SignalType "DI" -Device "d652" -DeviceMap "1" \
121 -Access "All"
122
123 -Name "Test_DI_8" -SignalType "DI" -Device "d652" -DeviceMap "8" \
124 -Access "All"
125
126 -Name "Test_DI_9" -SignalType "DI" -Device "d652" -DeviceMap "9" \
127 -Access "All"
128
129 -Name "Test_DO_0" -SignalType "DO" -Device "d652" -DeviceMap "0" \
130 -Access "All"
131
132 -Name "Test_DO_1" -SignalType "DO" -Device "d652" -DeviceMap "1" \
133 -Access "All"

```

Wiring Your Inputs and Outputs

On the IRC5 Compact controller, terminal blocks **XS12**, **XS13**, **XS14**, and **XS15** are accessible from the front.

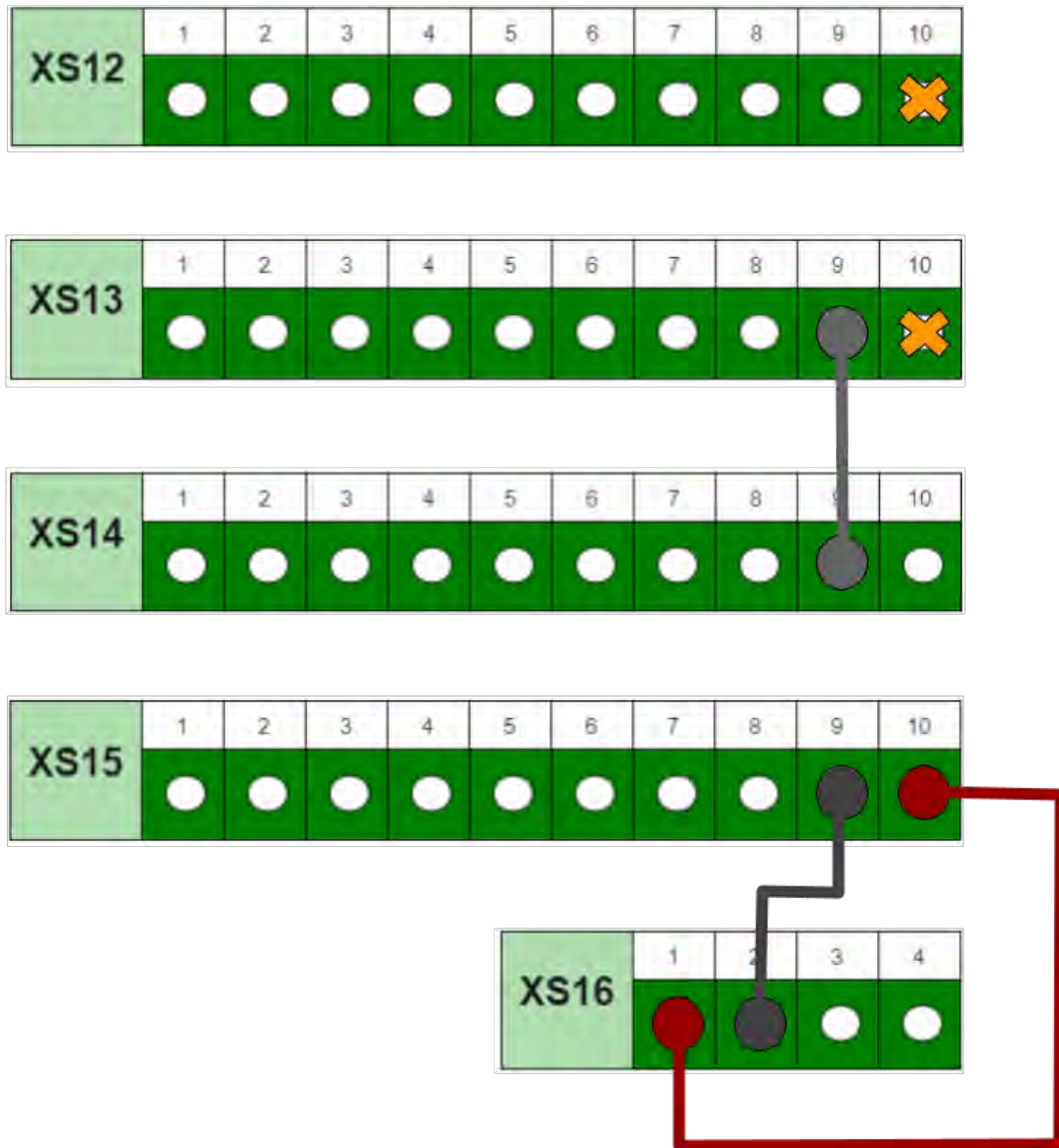


The pins on each of these terminal blocks are labeled **1-10**. Refer to the following table for pin assignments and internal connections.

Block	Pins 1-8	Pin 9	Pin 10
XS12	Digital Input	0V (Internally connected to XS13 - Pin 9)	NC
XS13	Digital Input	0V	NC
XS14	Digital Output	0V (Internally connected to XS15 - Pin 9)	24V (Internally connected to XS15 - Pin 10)
XS15	Digital Output	0V	24V

Refer to the following table and schematic for an example of connecting these terminal blocks to 0V and 24V. For more information, refer to ABB documentation.

Pin	Destination	Function
XS16 - Pin 1	XS15 - Pin 10	24V
XS16 - Pin 2	XS15 - Pin 9	0V
XS14 - Pin 9	XS13 - Pin 9	0V



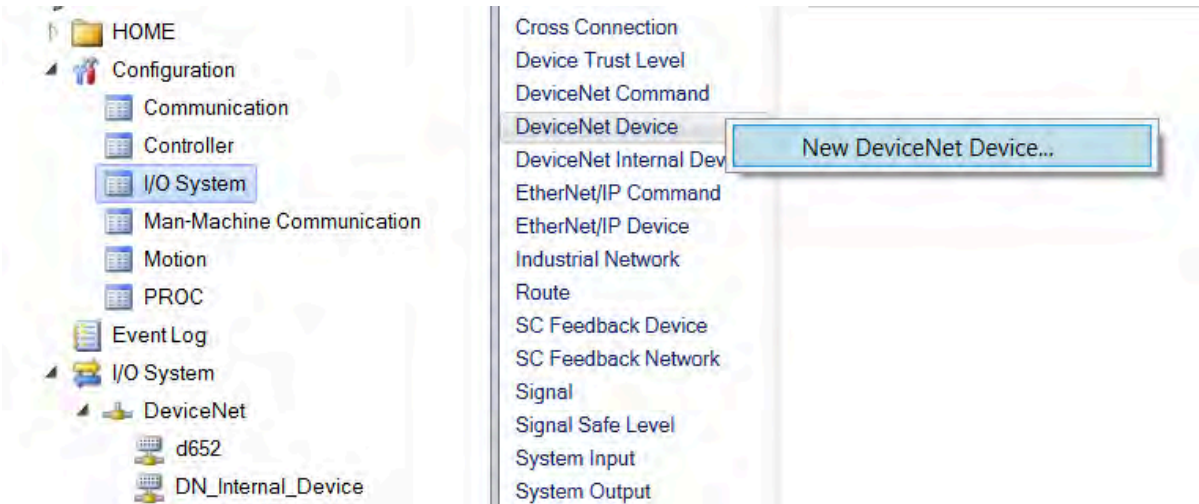
XS12, XS13, XS14, and XS15 are internally connected with the IO unit (**DSQC 652**). It's standard for this IO unit to come with the IRC5 Compact controller. Because DSQC 652 is mounted inside, XS12, XS13, XS14, and XS15 are designed for connecting to it. You do not need to open the controller to wire anything directly to DSQC 652.

Adding the DSQC 652 Device in RobotStudio

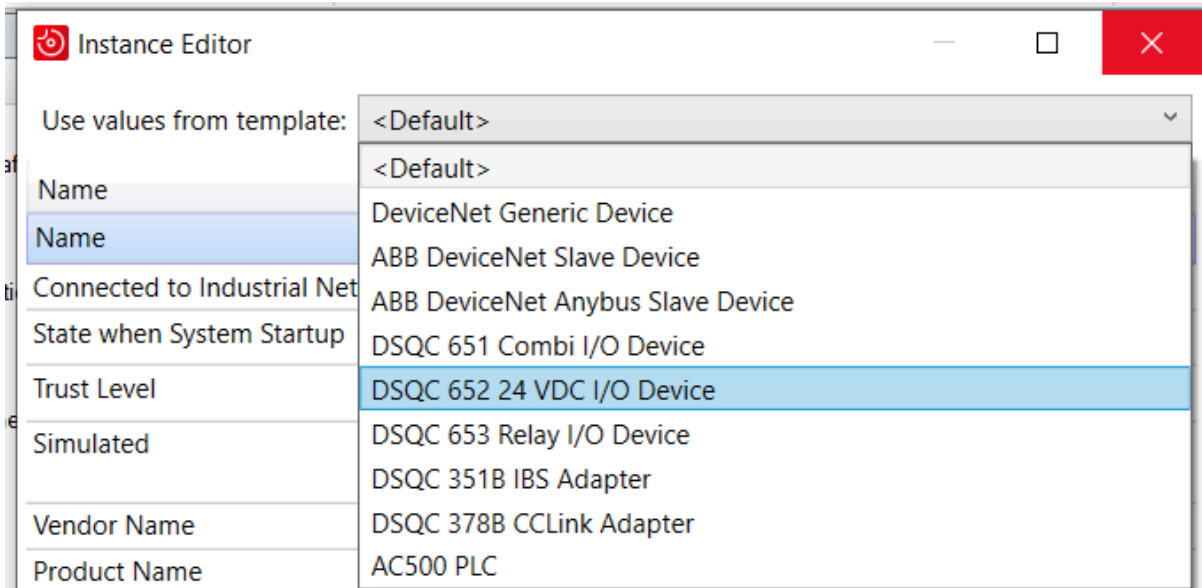
Now it's time to create a DSQC 652 device in RobotStudio to later map signals to.

Once you connect a computer with RobotStudio to the controller, follow these steps:

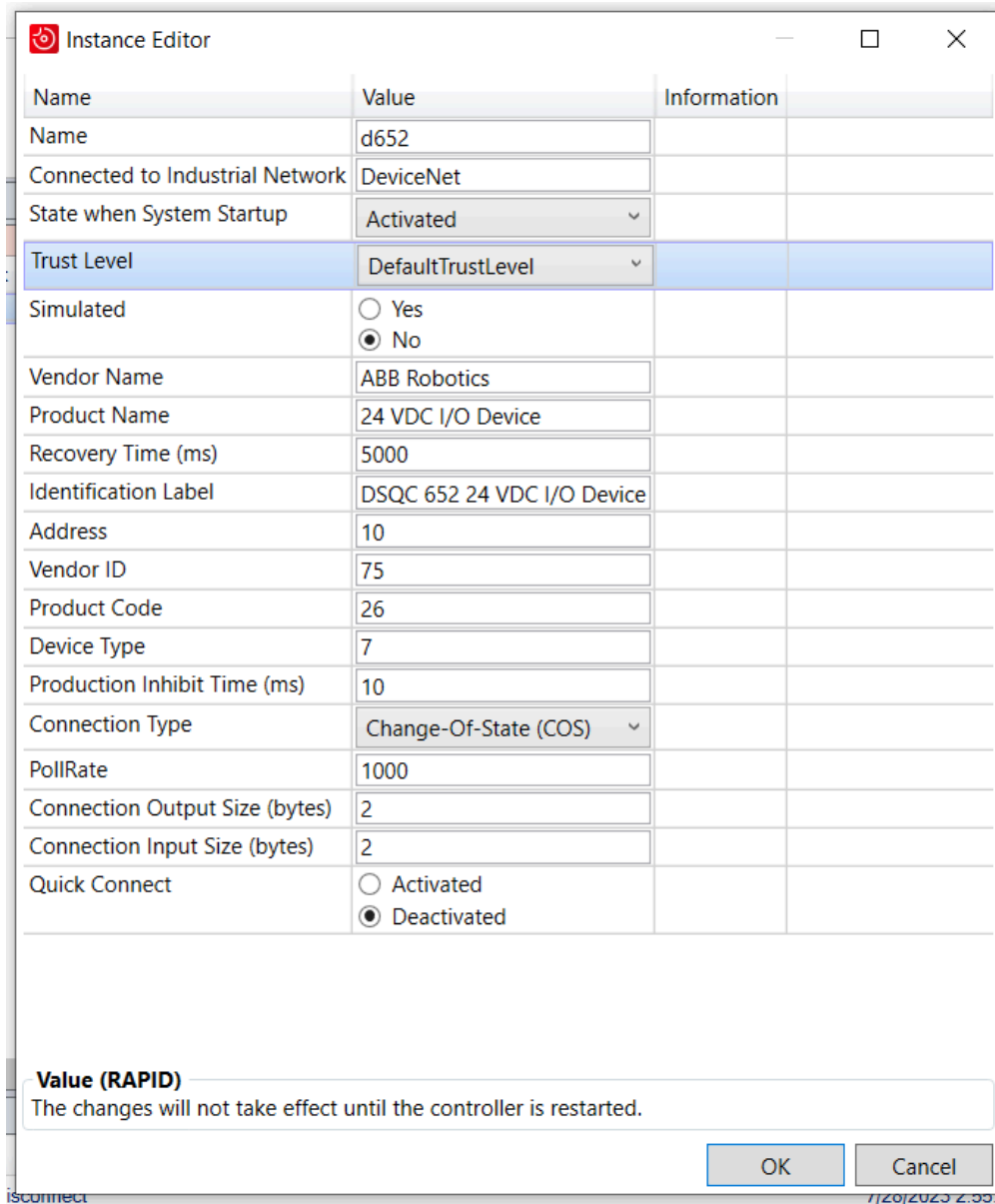
1. Select **Request Write Access**
2. In the **Configuration - I/O System** menu, right-click **DeviceNet Device**. Select **New DeviceNet Device**.



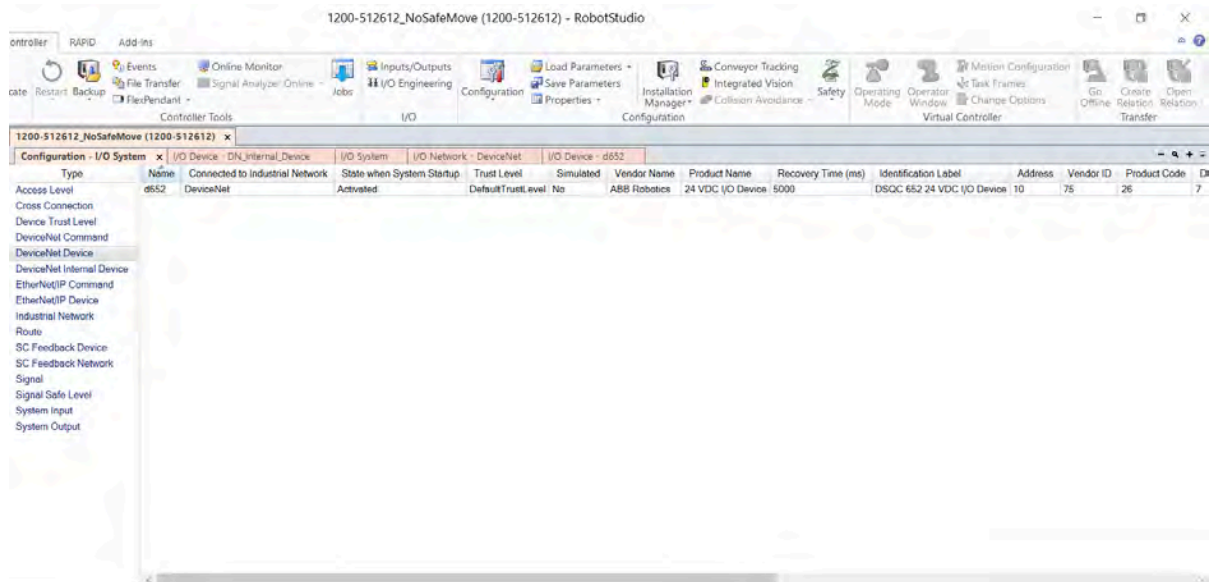
3. Select the **DSQC 652 VDC I/O Device** template.



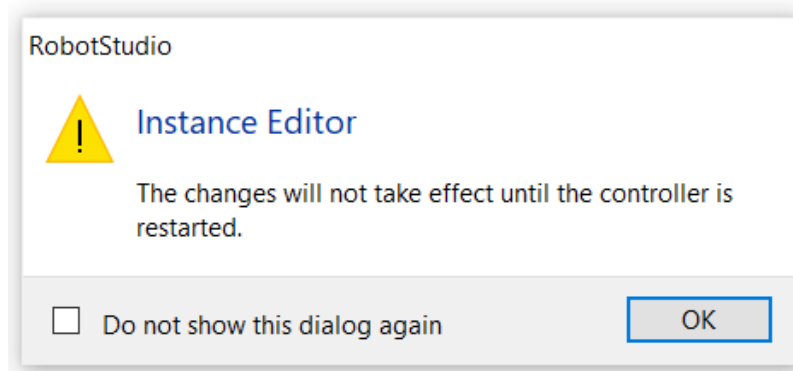
4. Change the **Address** from 63 to **10**. The rest of the fields should match the following image.



5. Click **OK** to save. Your new device will appear in the table.



6. A pop-up appears to warn you that you need to reboot the controller to apply the change. Click **OK** to clear the message, but to save time, wait to reboot until you add signals in the next section.

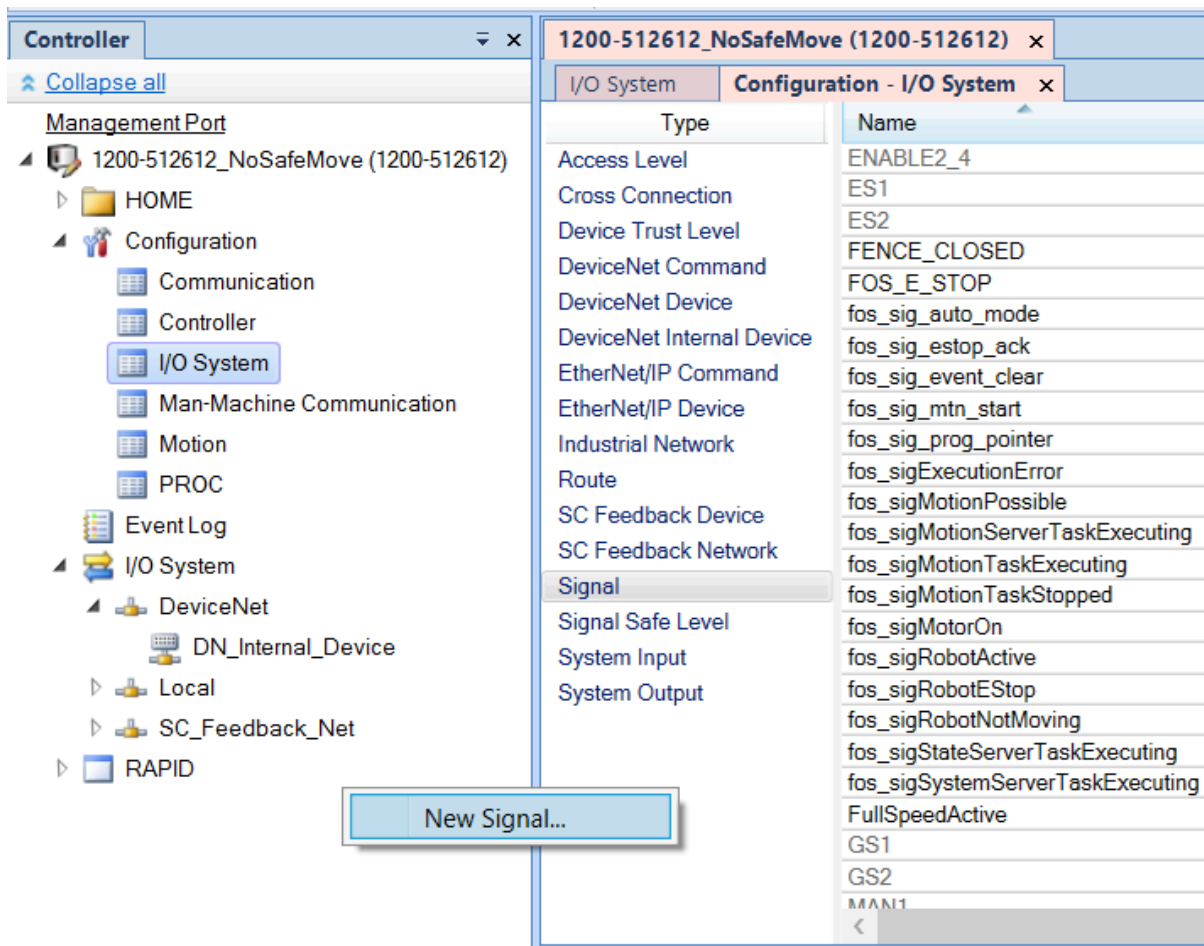


Adding Signals in RobotStudio

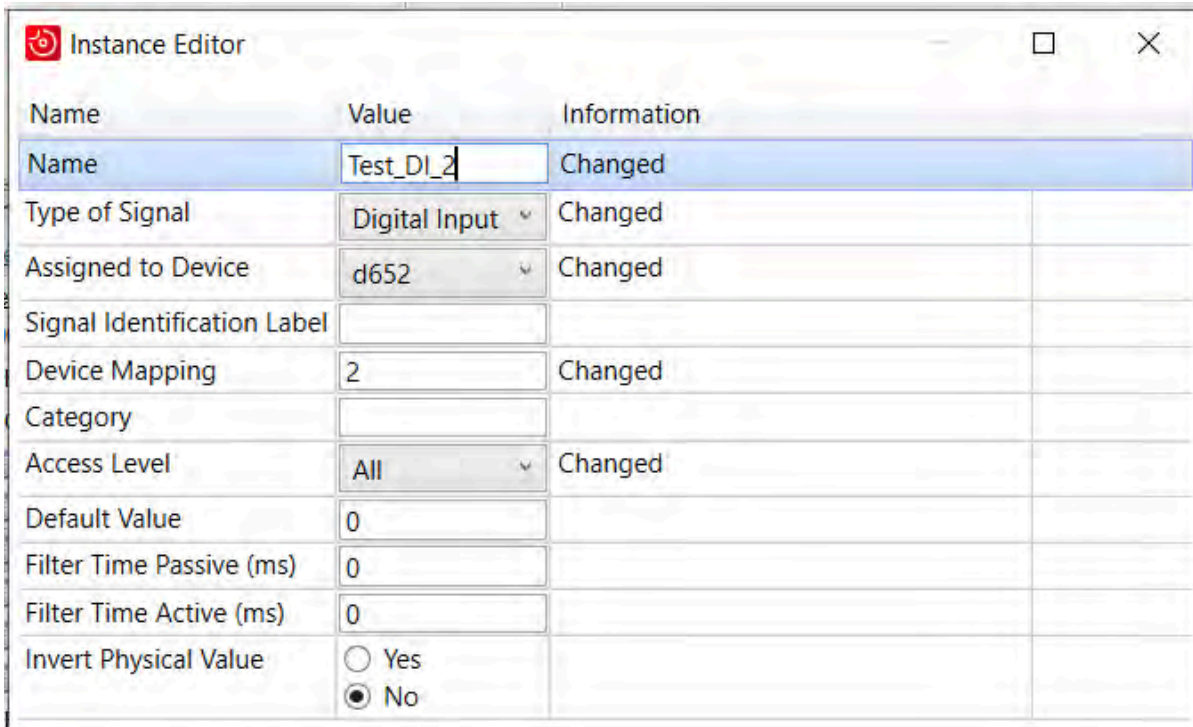
Now it's time to create signals that map to the DSQC 652 device that you created.

Follow these steps:

1. Select **Request Write Access**.
2. In the **Configuration - I/O System** menu, right-click **Signal**. Select **New Signal**.



3. In the Instance Editor, follow these substeps for adjusting signal parameters:

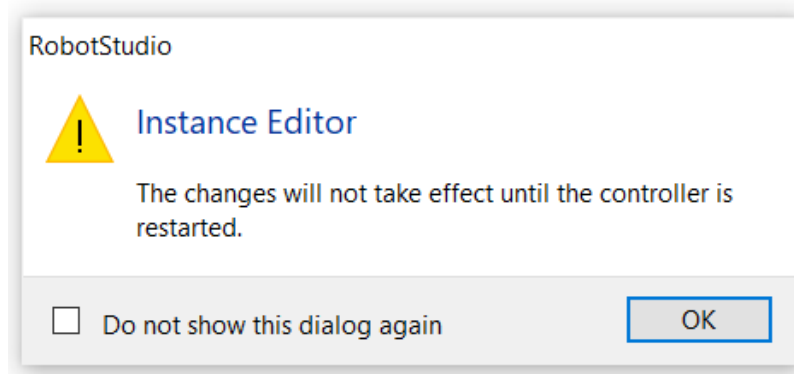


- a. Type in a **Name** for your signal. This name will help you identify this signal in RobotStudio. The name will not directly carry over to ForgeOS, but you can later type this name again in ForgeOS as the signal's "Display Name" for a similar result.
- b. Select a **Type of Signal** (such as "Digital Input" or "Digital Output").
- c. In the **Assigned to Device** dropdown, select the DSQC 652 device that you created in the previous section.
- d. In the **Device Mapping** field, enter a value that corresponds to the pin that you wired the input or output to. The count for these mapping values begin at 0 (whereas the count for the values that are printed on the terminal blocks begin at 1). For example, suppose you want to wire two lights, two buttons, and a switch. You can wire and map these devices as follows:

Name	Terminal Block	Pin No.	Device Mapping Value
Test_DI_1	XS12	2	1
Test_DI_8	XS13	1	8
Test_DI_9	XS13	2	9
Test_DO_0	XS14	1	0
Test_DO_1	XS14	2	1

- e. Set the **Access Level** to **All**. This will allow you to read and/or control the signal in ForgeOS.
- f. Click **OK** to save. Your new signal will appear in the **Configuration - I/O System** signal table.

4. Reboot the controller to apply the change. This will allow the signals to appear in ForgeOS in the next section.



Note:

If the “Restart” menu is unavailable, press the READY Pendant E-Stop or the ABB controller E-Stop. This will stop all programs. Now you will be able to Warm-Restart. (You can also just use the power switch on the controller.)



Tip:

After rebooting, go to the left side panel in the RobotStudio **Controller** menu. If you double-click **I/O System** (i.e., the option that is its own menu dropdown, not the option under "Configuration"), you can view signal statuses. Signals with a gray “0” to the left of its name are LOW. Signals with a yellow “1” to the left of its name are HIGH. You can use this screen later to help with signal identification and troubleshooting.

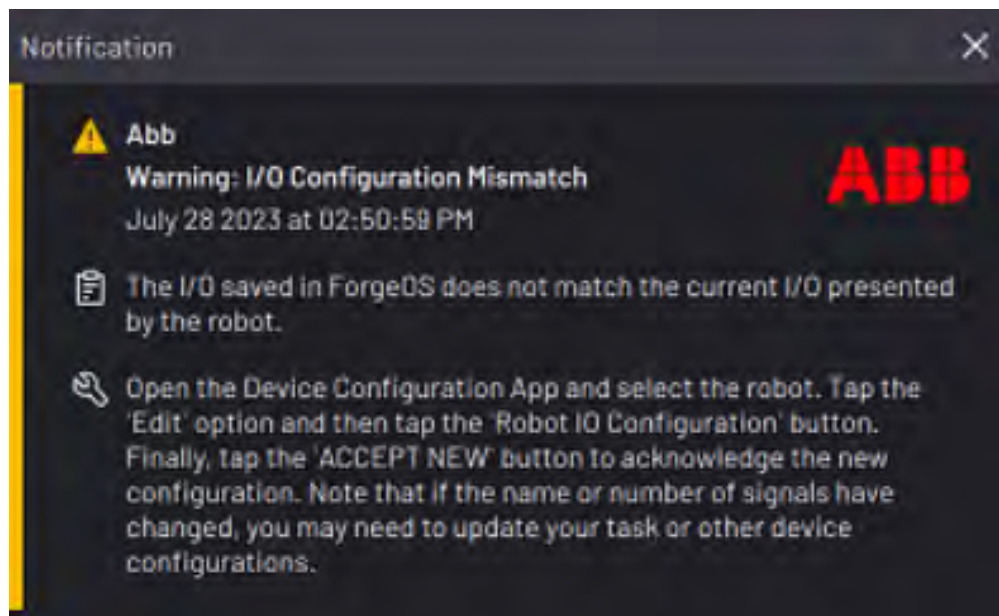
1200-512612_NoSafeMove (1200-512612) x									
Configuration - I/O System		I/O Device - DN_Internal_Device			I/O System		I/O Network - DeviceNet		
Name	Type	Value	Min Value	Max Value	Simulated	Network	Device	Device Mapping	
0 Test_DI_1	DI	0	0	1	No	DeviceNet	d652	1	
0 Test_DI_8	DI	0	0	1	No	DeviceNet	d652	8	
0 Test_DI_9	DI	0	0	1	No	DeviceNet	d652	9	
0 Test_DO_0	DO	0	0	1	No	DeviceNet	d652	0	
0 Test_DO_1	DO	0	0	1	No	DeviceNet	d652	1	

5. If the ABB pendant alerts you to naming or device mapping conflicts, follow its instructions to resolve those conflicts.

Using the Signals in ForgeOS

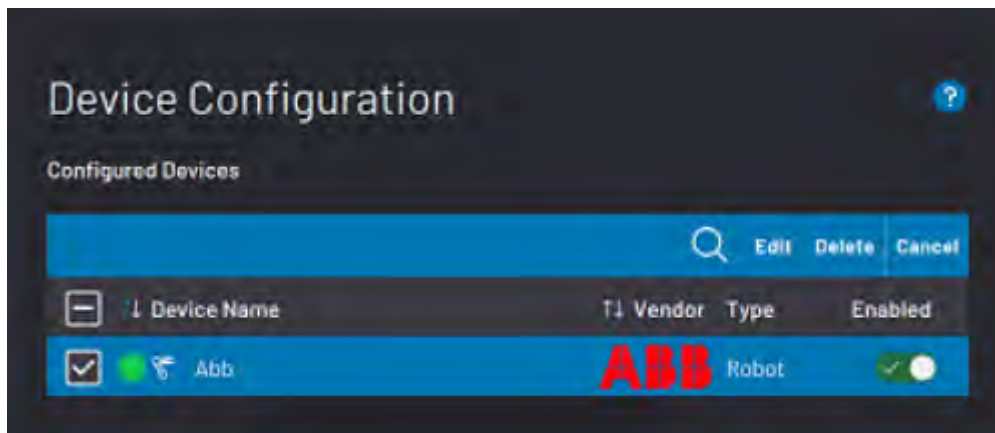
The ABB pendant now displays a message that says, "An update has been ordered. An update of program configuration is done." **Acknowledge** that message to clear it.

The READY pendant displays an “I/O Configuration Mismatch” warning. This section covers how to clear this warning and use the new IO signals that you created.



1. In Device Configuration, complete these substeps:

a. Select your robot device and tap **Edit**.



b. Tap **ROBOT IO CONFIGURATION** to edit the robot's IO configuration.

ABB Robot

Device Name: Abb

IP Address: 172.16.255.251

Description:

Controller Model: IRC5

Robot Model: IRB 1200-7-0.7

Force Sensor Device: Select a Force Device

TCP AND PAYLOAD CONFIGURATION

ROBOT IO CONFIGURATION

c. Tap **ACCEPT NEW** to accept the new IO configuration.

I/O Configuration Update

The I/O configuration has changed. Would you like to accept the new I/O configuration?

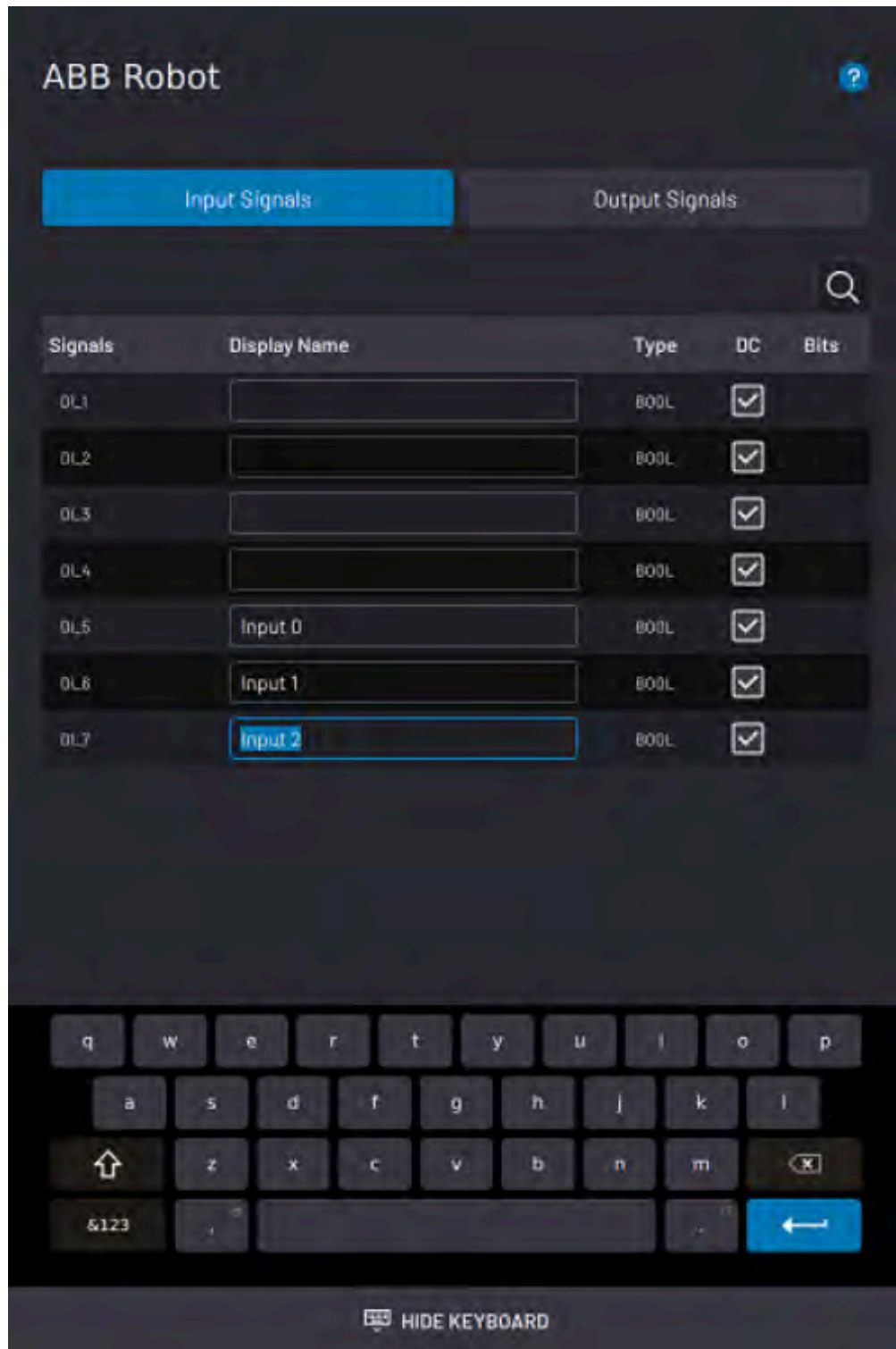
USE PREVIOUS

ACCEPT NEW

d. Verify that your new signals appear at the bottom of the table.

e. Type in a **Display Name**. This will make it easier for you to identify your signals.

f. Select the **DC** checkbox for the signals to appear in the Device Control app.

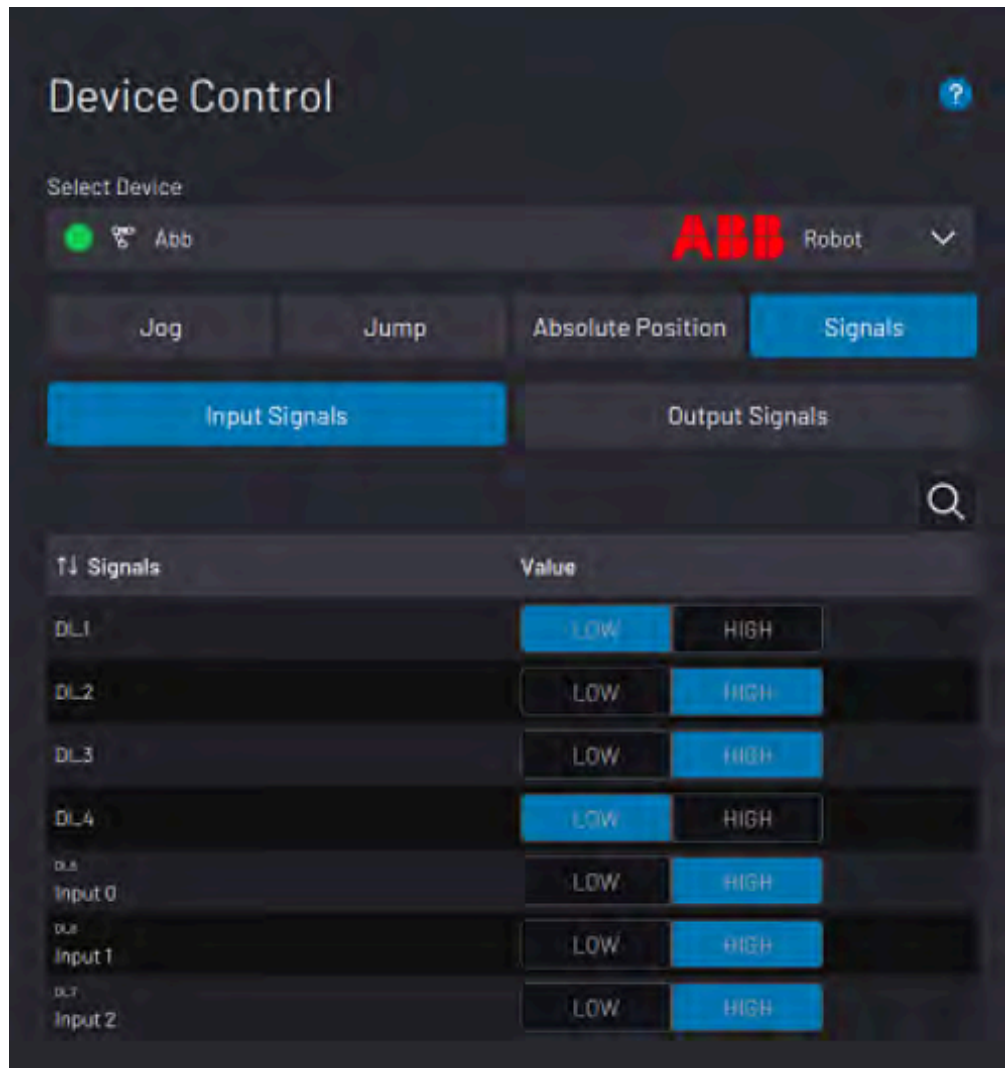


g. **SAVE** your changes.

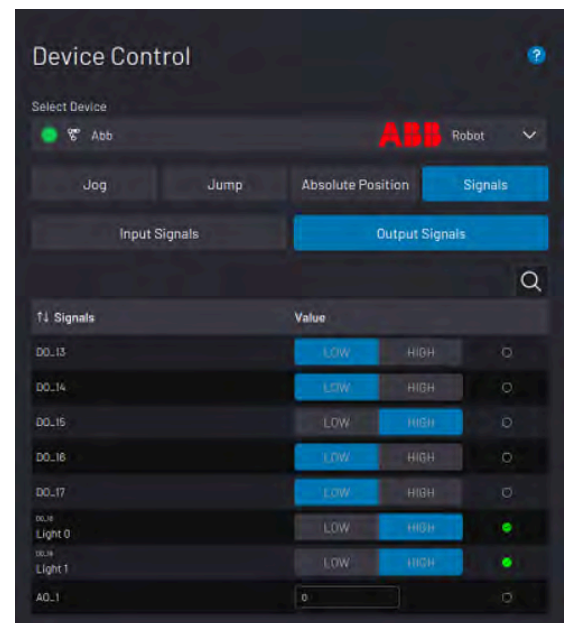
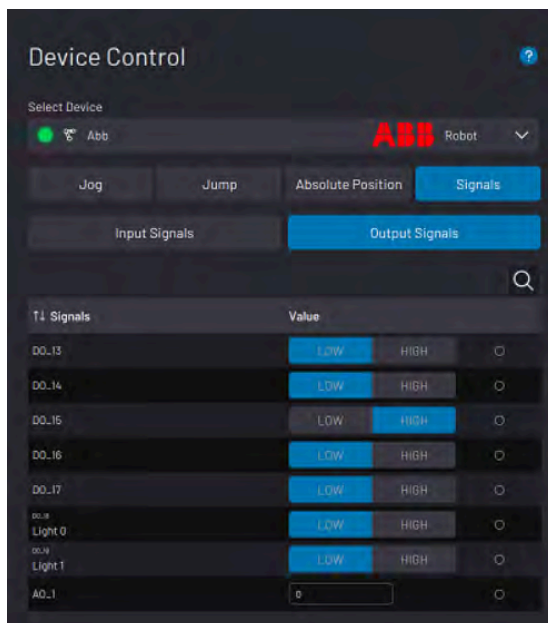
2. In Device Controls, complete these substeps:

a. Go to the robot's **Signals** tab.

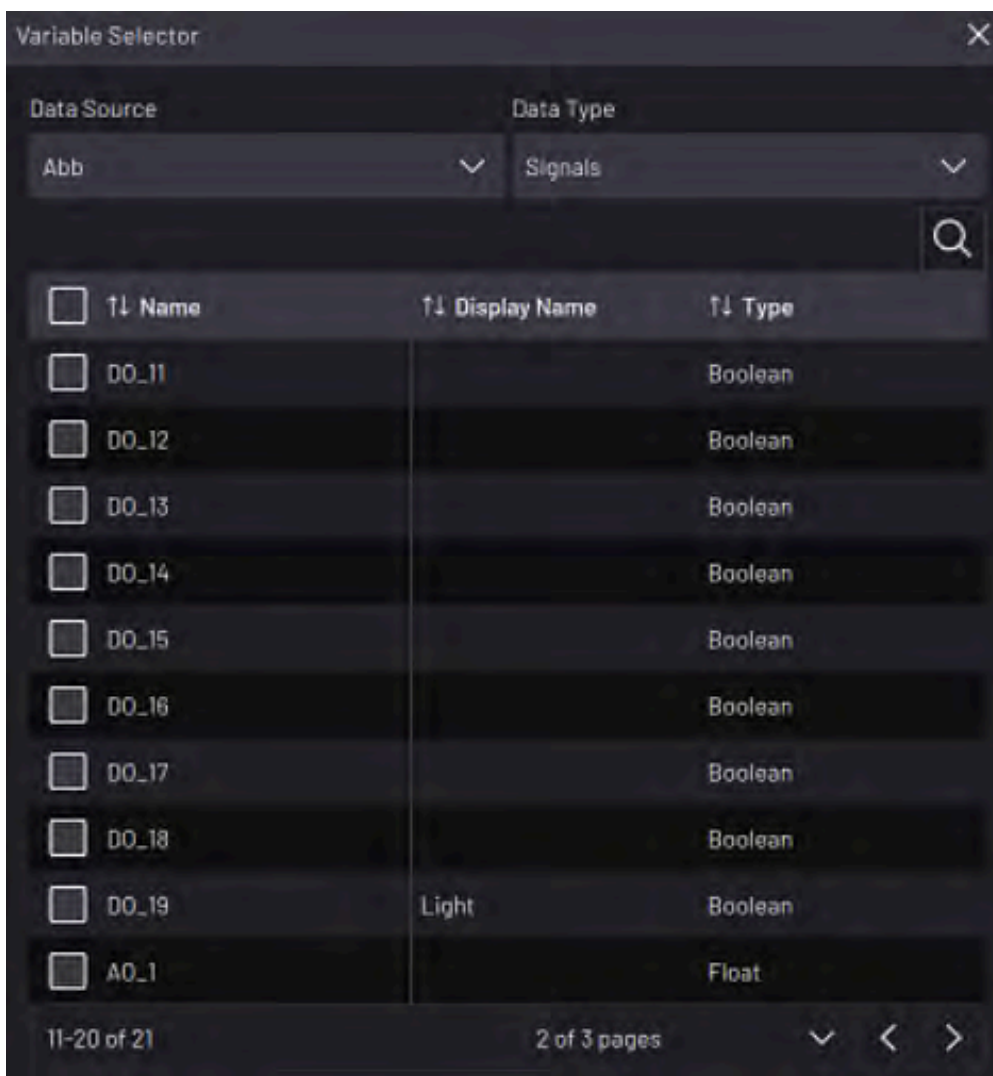
b. Verify that the read-only input state fields change as you control your device.



c. Verify that the writeable output state buttons control your device.



3. In Task Canvas, open the robot's block glossary. Use the new signals in **Set** and **Check** blocks.



Note:

Use a similar variable selector in Rule Engine to set and/or check your new IO signals in the background of Task Canvas tasks.

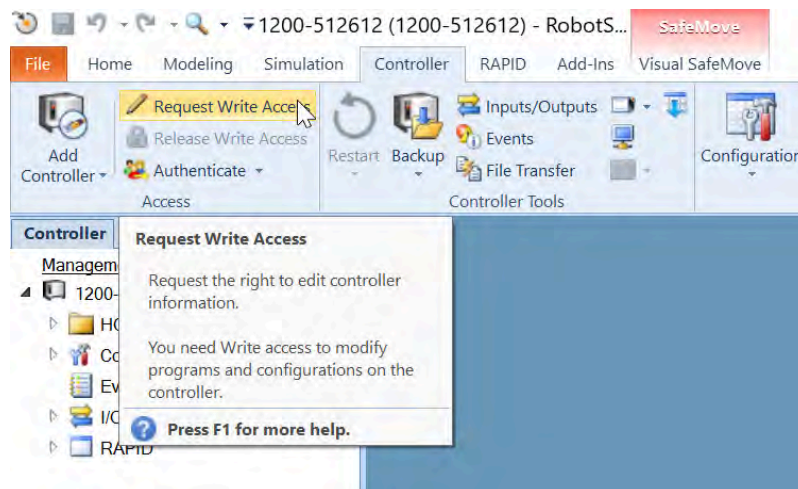
Chapter 13. Appendix C: Restoring an EIO.cfg File During Initial Forge Setup

If you had already set up IO on your ABB controller BEFORE setting up ForgeOS, follow this section to restore your IO configuration.

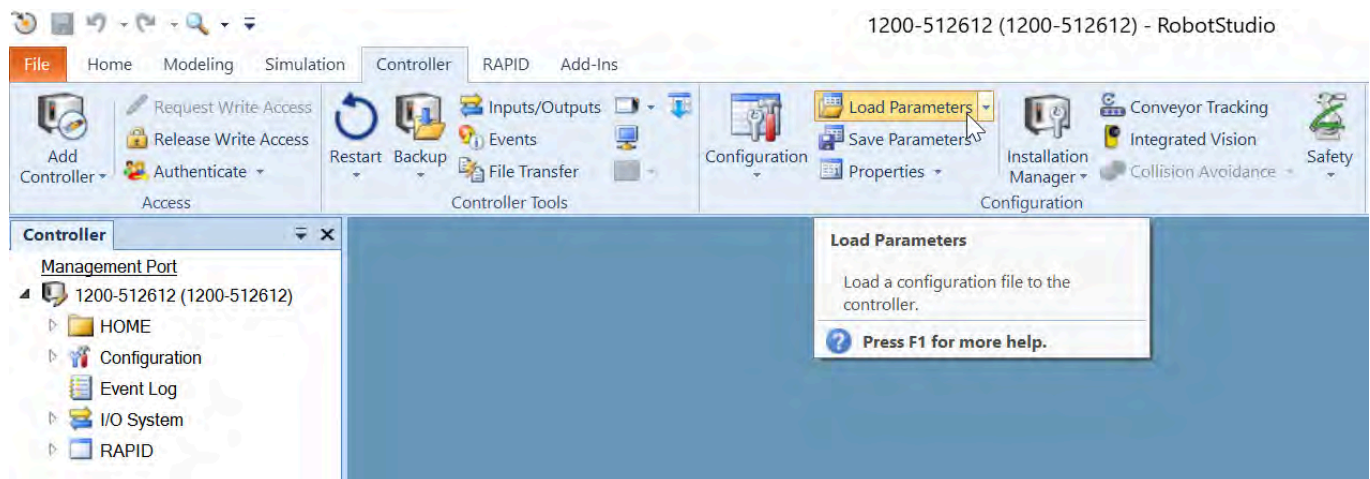
Note:

This section assumes that you have done a factory reset, loaded the ForgeOS robot driver files, and kept your RobotStudio computer connected to the controller.

1. In the **Controller** tab, click **Request Write Access**. This allows you to edit settings on the controller.



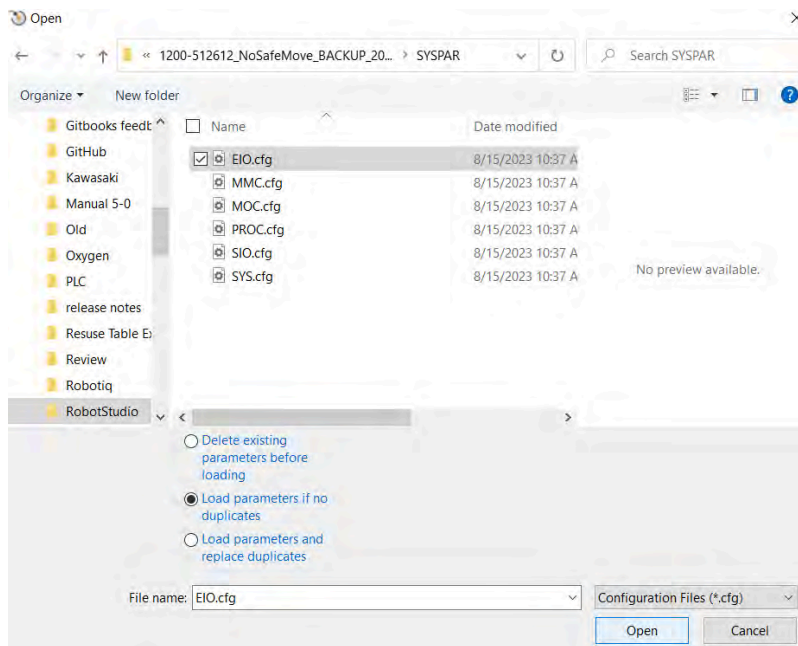
2. Click **Load Parameters**.



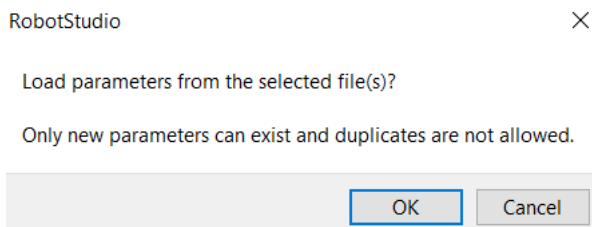
3. In the Open window, select the **EIO.cfg** file from the **SYSPAR** folder in your backup folder. Select **Load parameters if no duplicates**, then click **Open**.

Note:

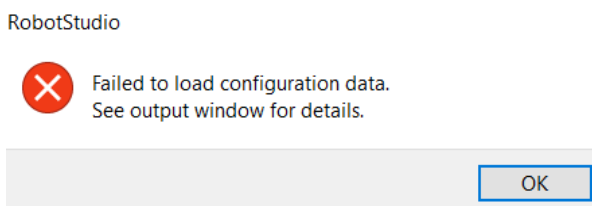
This setting will only load your IO signals beneath the already-loaded ForgeOS signals if there are no overlap conflicts.



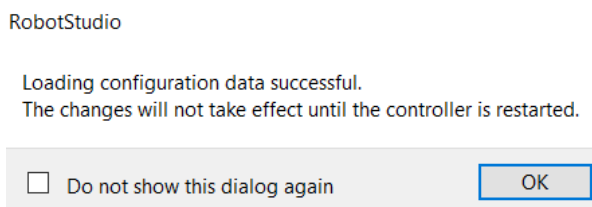
4. If RobotStudio warns you that the parameters will only be loaded if there are no overlap conflicts, click **OK**.



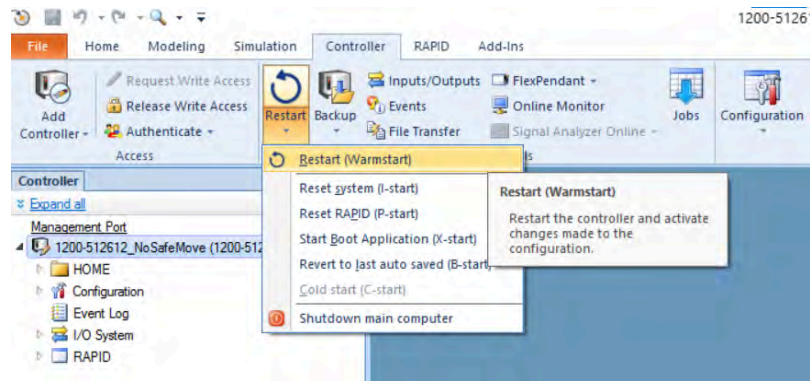
5. If you get an error, look at the output window for more information. Copy the backup EIO.cfg file (to make sure that you have an unmodified version in case anything goes wrong), then make edits to resolve the conflicts. When all the conflicts are resolved, repeat the above steps. Alternatively, if the only duplicates are exact duplicates of entries in the default ForgeOS EIO.cfg file, then you could instead try the "Load and replace duplicates" option. The goal is to have your custom signals appear below the default Forge signals for easier identification in ForgeOS.



6. If your backup EIO.cfg file loaded without an error, you will see the below pop-up. Press **OK** to clear the pop-up.



7. Restart the ABB controller by selecting **Restart (Warmstart)** in the Controller > Restart menu. Wait for the restart to finish. Keep the ABB controller set to AUTO mode.



Note:

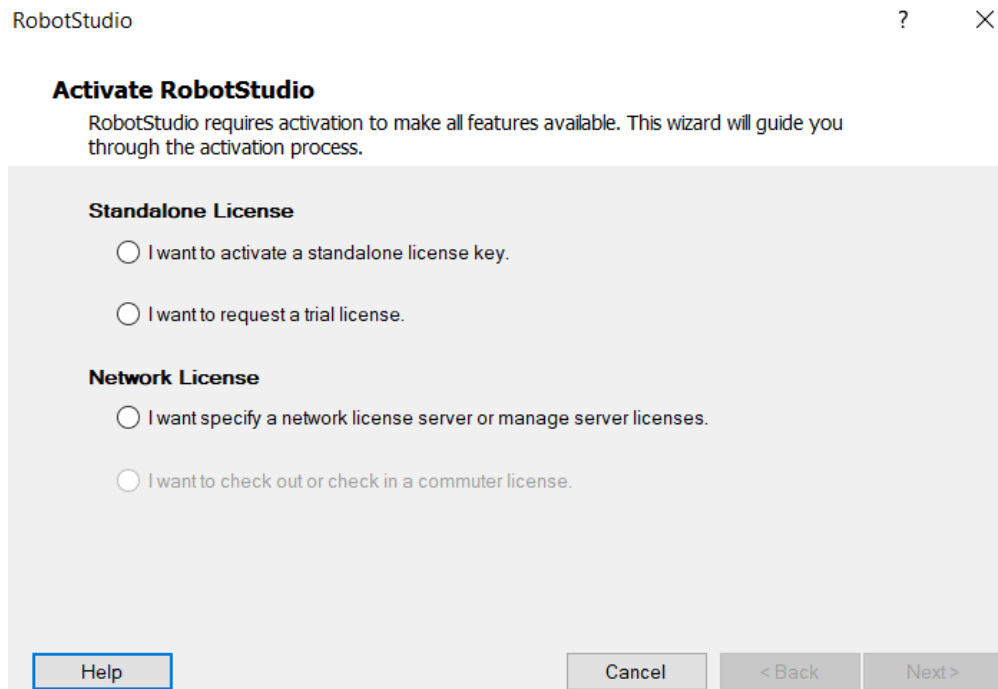
If the Restart menu is unavailable, try pressing the READY pendant E-Stop or the ABB controller E-Stop to stop motion programs. This will allow you to be able to warm-restart from RobotStudio. Then, after the controller finishes booting back up, release the E-Stop and press **RESET** to clear any errors on the READY pendant. (You can also use the power switch on the robot controller instead.)

8. Follow the instructions in [Using the Signals in ForgeOS \(on page 54\)](#) in Appendix B to use the signals in ForgeOS.

Chapter 14. Appendix D: Updating Robot Driver Files After a ForgeOS Update

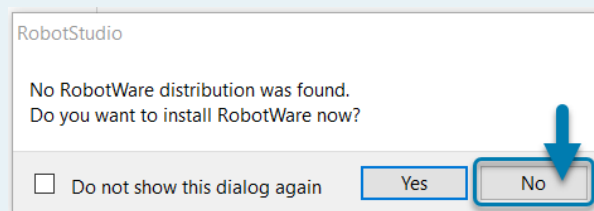
Updating ForgeOS requires not only updating the READY pendant itself, but also updating the robot driver files on the robot controller. Follow this section each time you update ForgeOS.

1. Open RobotStudio on your workstation/laptop.
2. If you have not purchased a RobotStudio license, click **Cancel** in the "Activate RobotStudio" pop-up. You can perform these steps with the basic RobotStudio version.



Note:

You don't need to install RobotWare on RobotStudio for this setup. Click **No** if you see the below pop-up.



3. Use an Ethernet cable to connect your RobotStudio computer to the ABB controller service port: **X2**.



Note:

Refer to ABB documentation for more information on Ethernet routing. Depending on your setup, you may need to plug this cable into a different port.



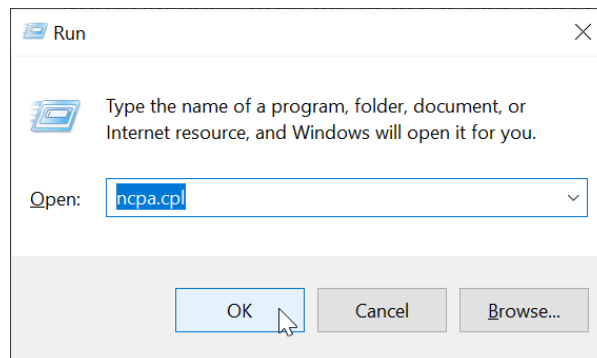
4. On your RobotStudio computer, configure the IP settings to connect with the ABB controller:



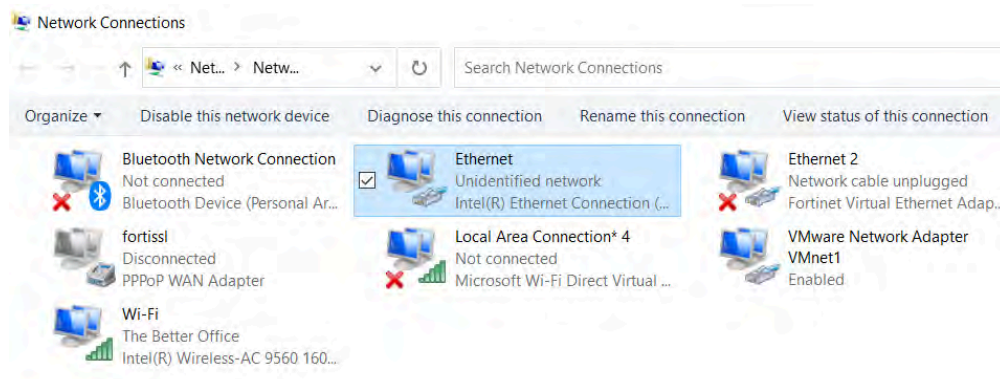
Note:

The below substeps assume that your RobotStudio computer is a Windows computer. If you are not using a Windows computer, follow your computer's procedure for configuring IP settings.

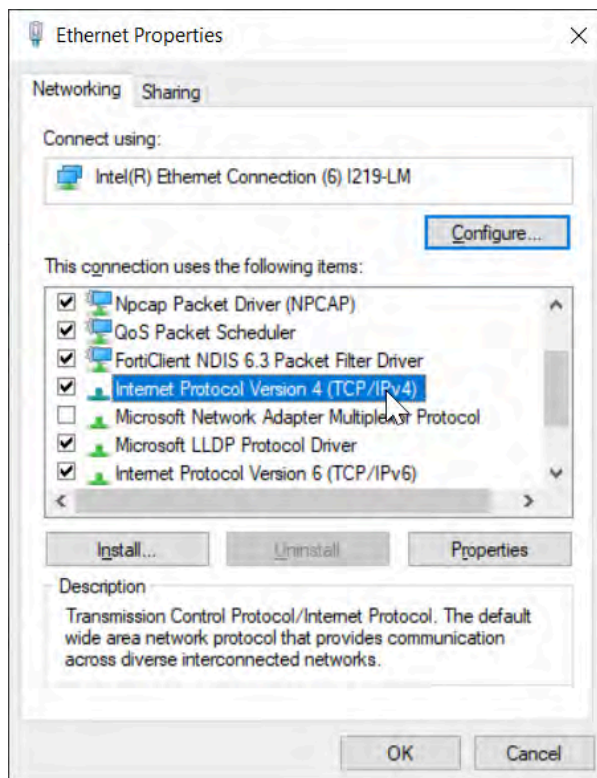
- a. Open the Run box by pressing **Windows key + R** on the keyboard or right-click the Start Menu button and select **Run**.
- b. In the Run pop-up, type "ncpa.cpl" (Network Connections panel) and click **OK**.



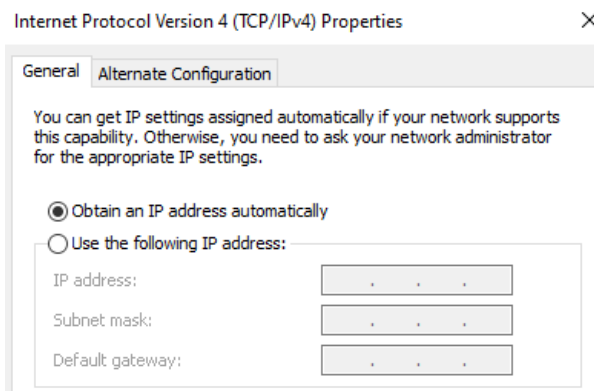
c. On the **Network Connections** window, double-click the Ethernet connection that you are using on the computer. For computers with one Ethernet port, it's the **Ethernet** option.




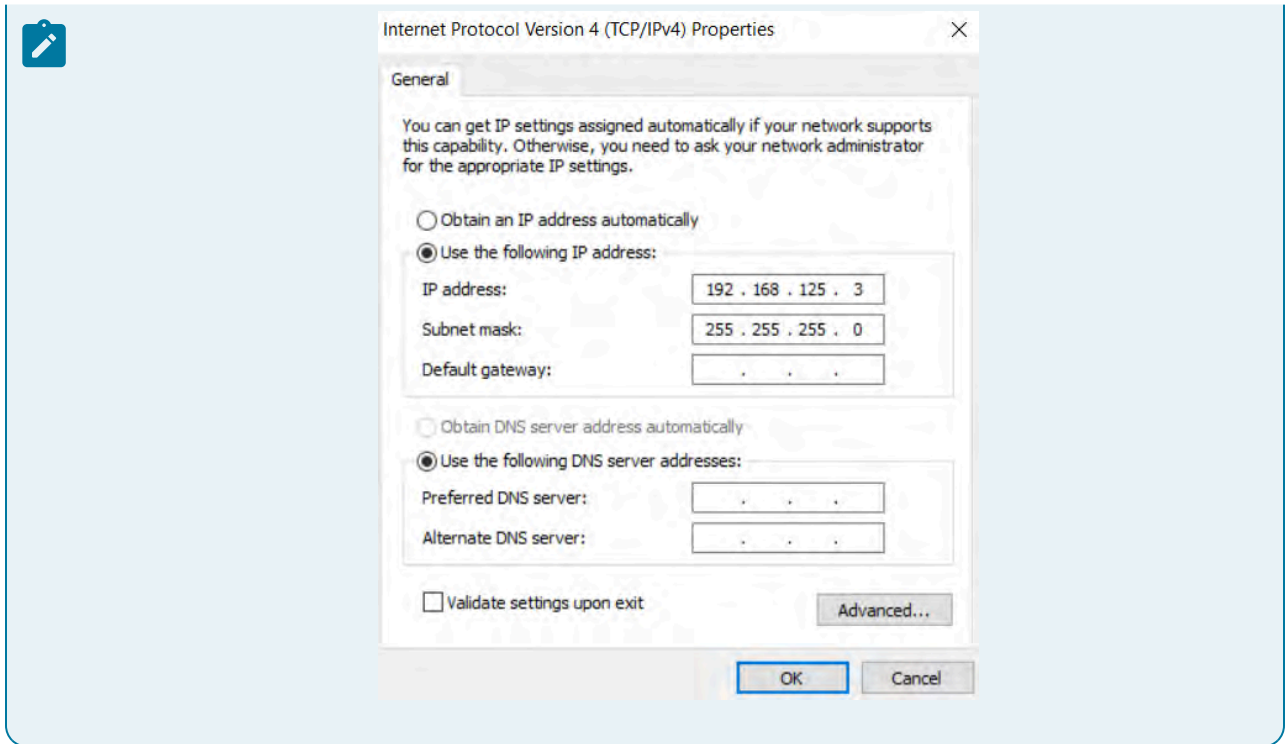
d. In the Ethernet Properties **Networking** tab, double-click **Internet Protocol Version 4 (TCP/IPv4)**.



- e. In the IPv4 Properties pop-up **General** tab, select **Obtain an IP address automatically**. This allows the DHCP server to automatically assign your computer an IP address for communicating with the robot controller.



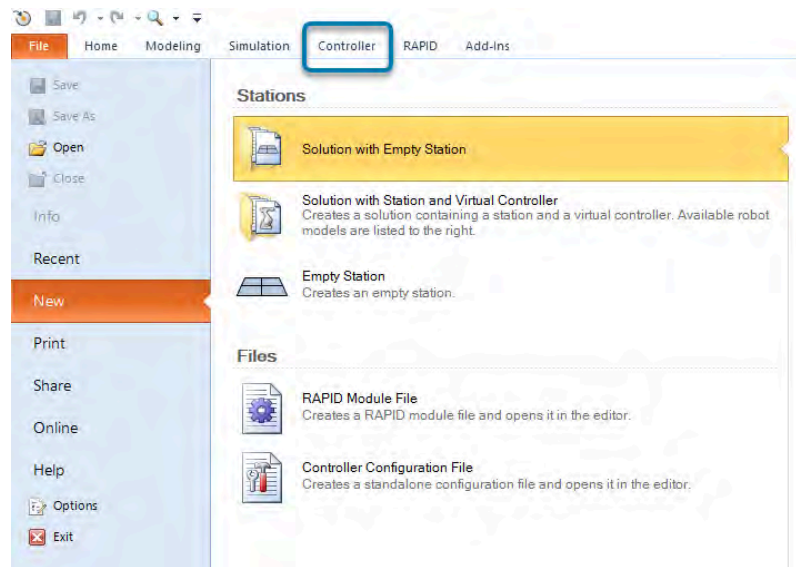
 **Note:** Selecting **Use the following IP address** instead is also valid, but make sure that the IP address that you are manually entering is compatible with the robot controller and doesn't interfere with other devices. For example, try setting the static IP address to **192.168.125.3** and the Subnet mask to **255.255.255.0**. If you get errors later on, come back to this screen to try different settings.



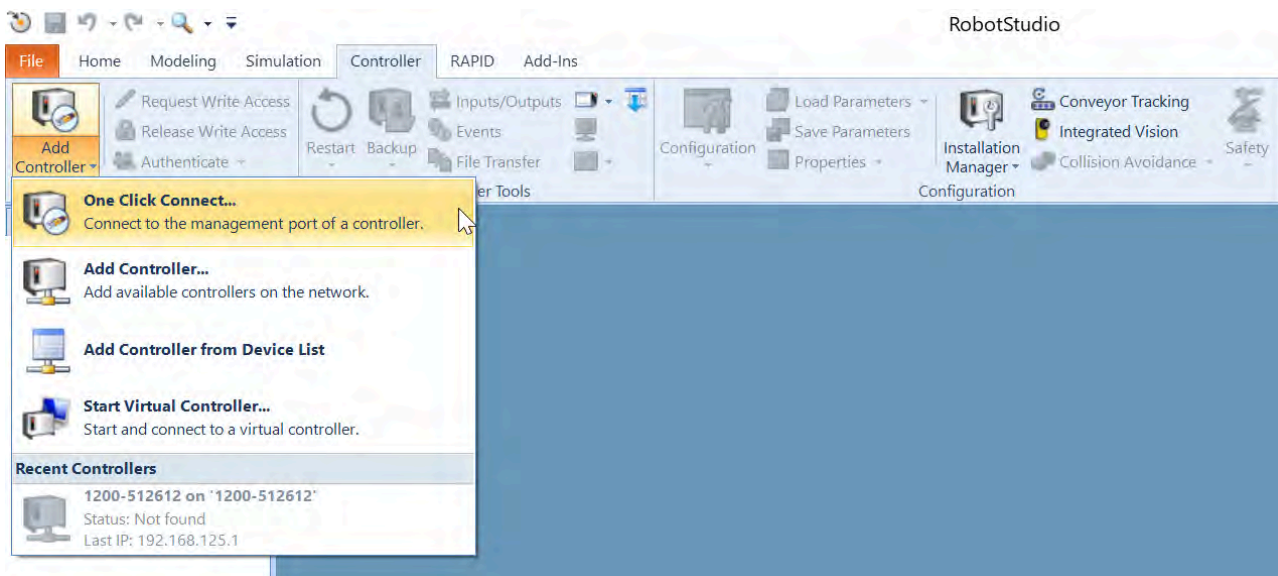
f. Click **OK** to save these settings.

5. Connect to the ABB controller in RobotStudio:

a. Select the **Controller** tab at the top of the screen.

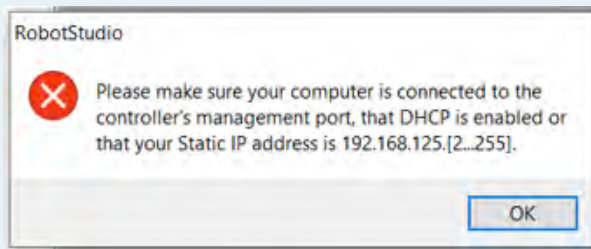


b. Click the **Add Controller** dropdown and select **One Click Connect**.

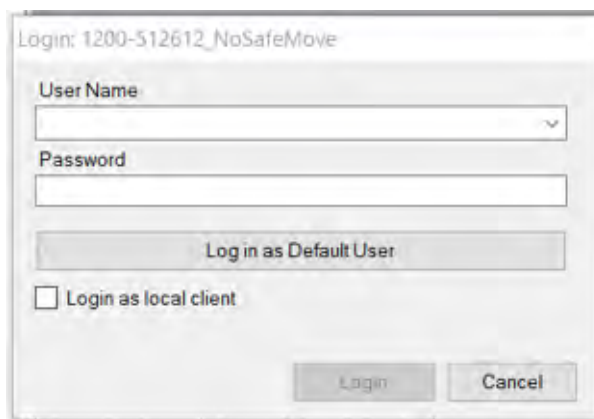


Tip:

If the controller doesn't connect, follow the instructions in the error pop-up for checking your Ethernet cable connection and your IP configuration settings.

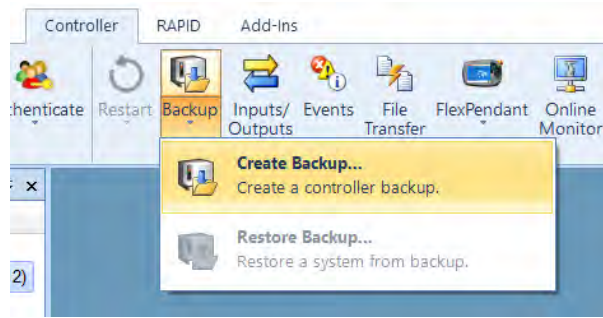


6. If you see the following pop-up, click **Log in as Default User**.

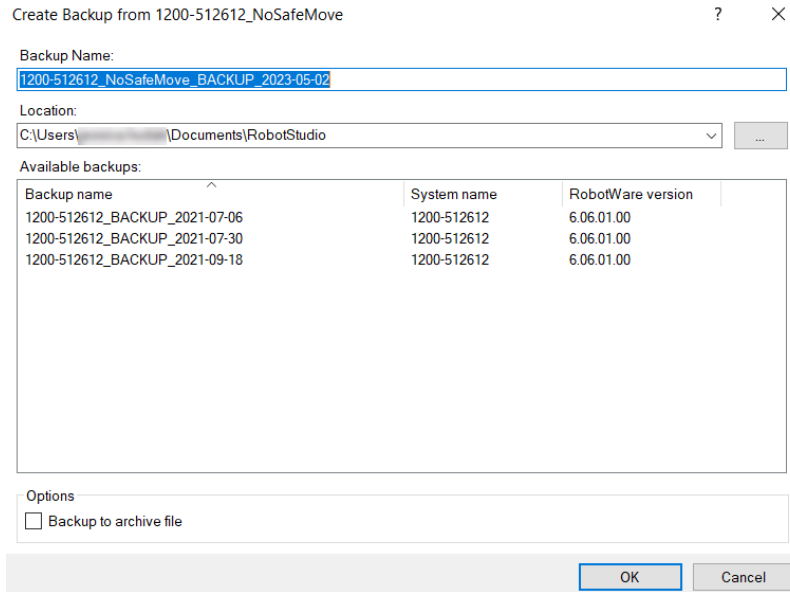


7. Backup the controller (skip this step if you already saved a backup):

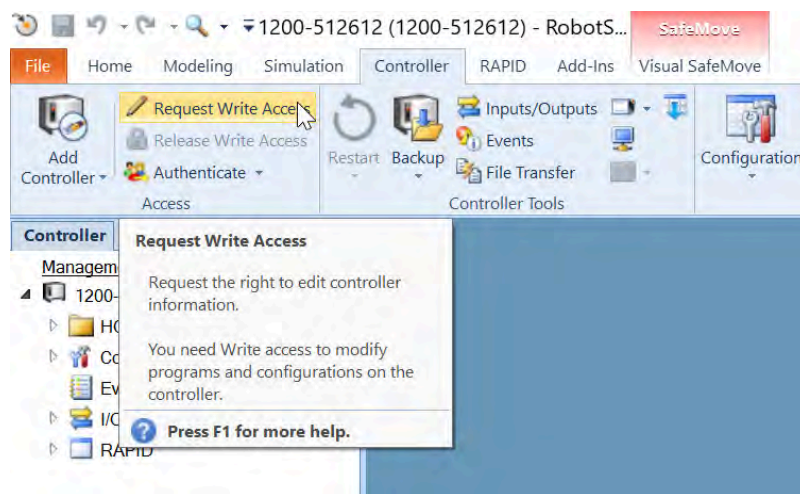
- a. In the RobotStudio **Controller** tab, click **Backup** at the top of the screen, then select **Create Backup**.



- b. Choose where to save your backup, then click **OK** to start the backup and wait for it to finish.



8. With the mode switch on the ABB controller set to AUTO, click **Request Write Access**. This allows you to edit settings on the controller.



9. Reset the controller to its factory default settings:



Note:

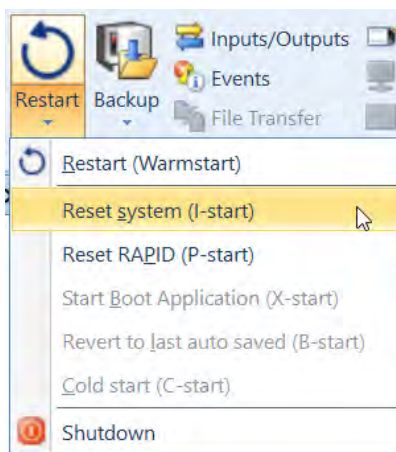
A factory reset (I-start) is recommended because it kills all currently-running programs and guarantees that there will be no conflicts during the ForgeOS file transfer. You could try skipping this factory reset step, but if you get errors later on in the setup process that prevent ForgeOS from communicating with the robot controller, come back to this step to do the factory reset. **Before performing the factory reset, take note of any settings that you have set in RobotStudio that you do not want to lose, and make sure that your backup files are stored in a safe place.** If you've set up custom IO signals, also take note of any signal "Display Names" in Device Configuration and take note of how your custom signals are referenced in other apps. Later on in this guide are instructions for restoring the backup EIO.cfg file (if applicable).

- a. In the **Controller** tab, click the **Restart** dropdown at the top of the screen, then select **Reset system (I-start)**.

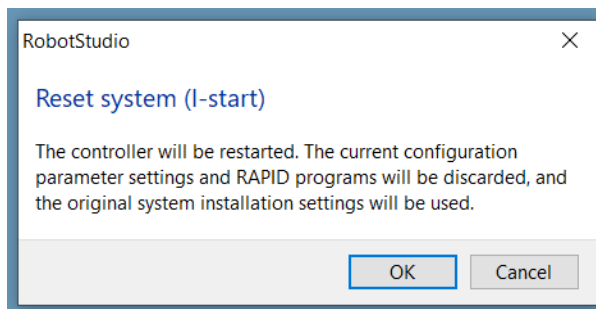


Note:

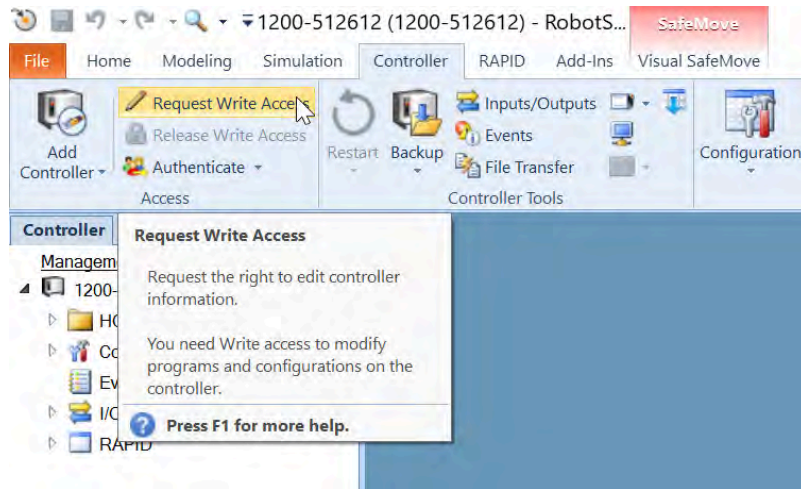
If the Restart menu is unavailable, try pressing the ABB controller's E-Stop to stop motion programs.



- b. Click **OK** to confirm the factory reset. Wait for the controller to restart and reconnect to RobotStudio.



c. Click **Request Write Access** to regain access.

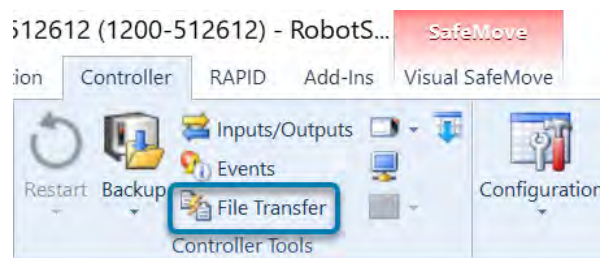


10. Connect the USB drive with the ForgeOS robot driver files to your RobotStudio computer.



11. Follow these steps to copy the ForgeOS robot driver files onto the controller:

a. In the **Controller** tab, select the **File Transfer** button.



b. In the **PC Explorer**, find the ForgeOS robot driver files on the USB flash drive in **forge_os\ready-abb-driver**. Select all of the **.sys** and **.mod** files.

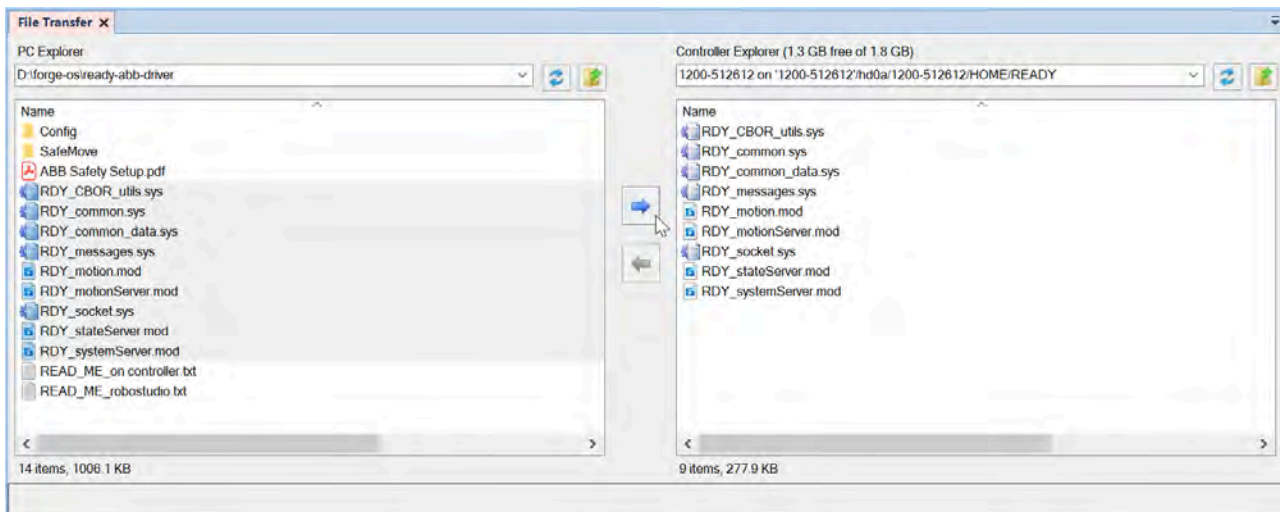
c. In the **Controller Explorer**, find the **HOME** directory. Open the folder called "READY" that you created when initially setting up ForgeOS.

d. Click the arrow that's pointing to the right to transfer all of the driver files into that folder.



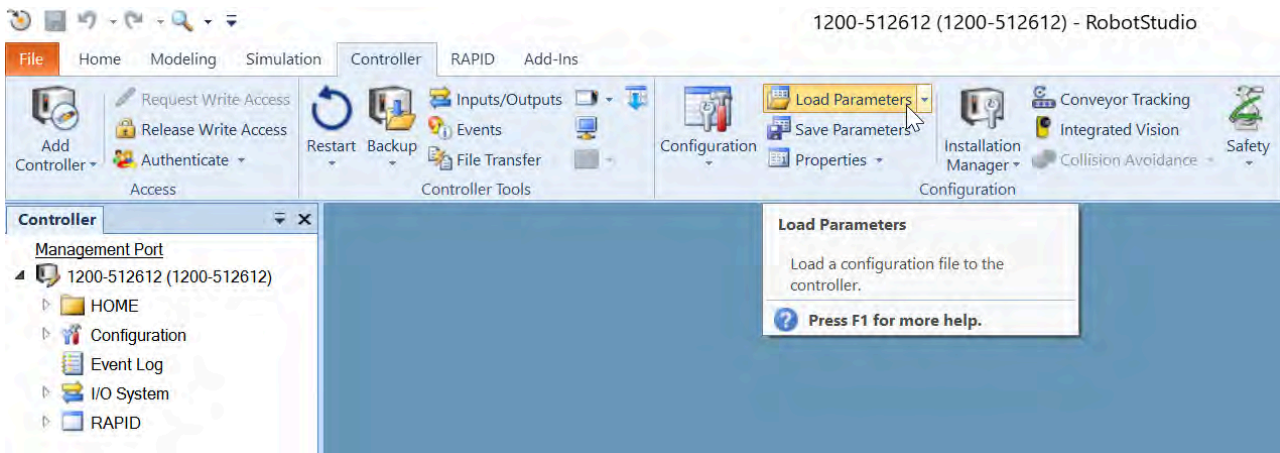
Note:

If you don't delete the existing files in the "READY" folder before the file transfer process, click **Yes** in the pop-up that asks you if you want to overwrite these existing files.



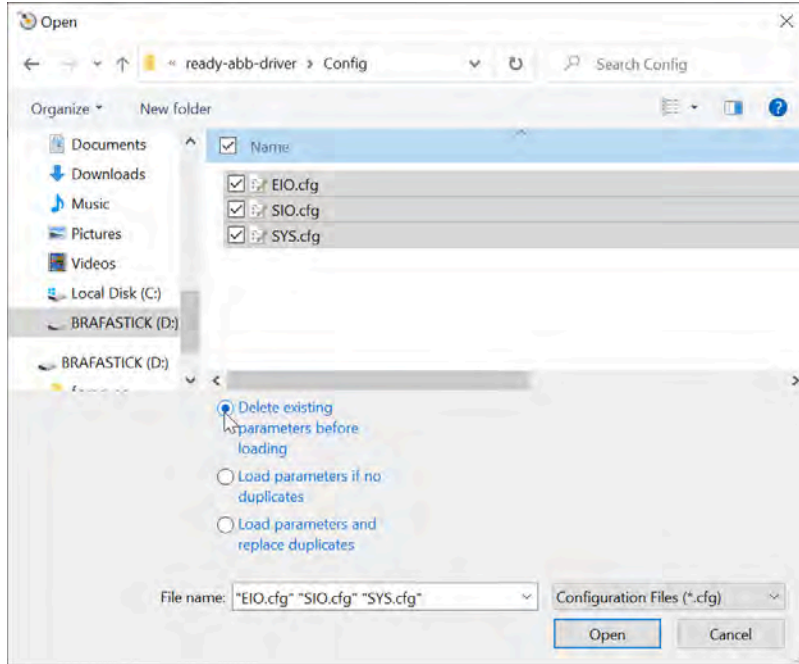
12. Follow these steps to copy the controller parameters onto the controller:

a. In the **Controller** tab, click **Load Parameters**.

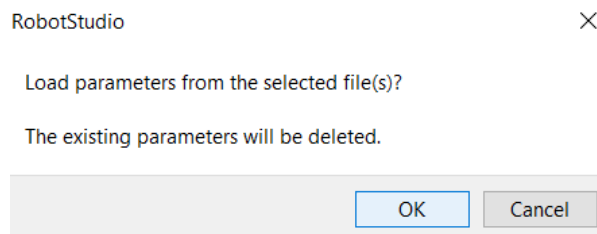


b. At the bottom of the Open window, select **Delete existing parameters before loading**.

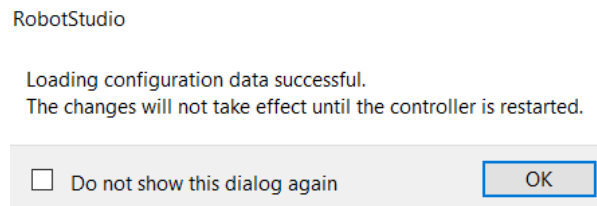
c. Open the folder named **Config** in the USB drive. Select all of the **.cfg** files, and then click **Open** to load them.



d. If RobotStudio warns you that existing parameters will be deleted, press **OK**.



e. If RobotStudio asks you to restart the controller, press **OK** to clear the pop-up. However, to save time, wait to reboot until you do the next step.



13. (Optional) If you have a previous IO configuration that you wish to restore from a backup, follow these substeps.



Note:

These substeps assume that the backup EIO.cfg file already consists of the default ForgeOS signals followed by your custom signals (from previously either following Appendix B or Appendix C).

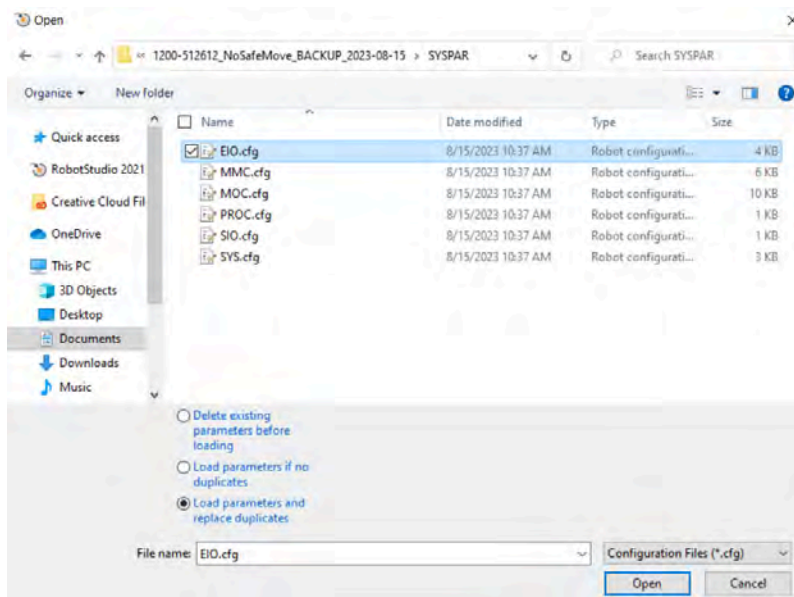
a. Click **Load Parameters**.

b. In the Open window, select the **EIO.cfg** file from the **SYSPAR** folder in your backup folder. Select **Load parameters and replace duplicates** then **Open** to load your new signals.

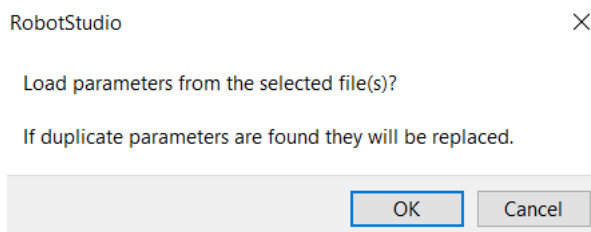


Note:

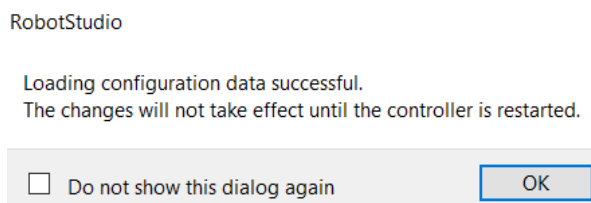
This option will reload your new signals to the bottom of the EIO.cfg file (below the default ForgeOS signals). Because your backup file already includes the default ForgeOS signals, these signals are considered "duplicates" to the ForgeOS signals that you loaded in the previous step.



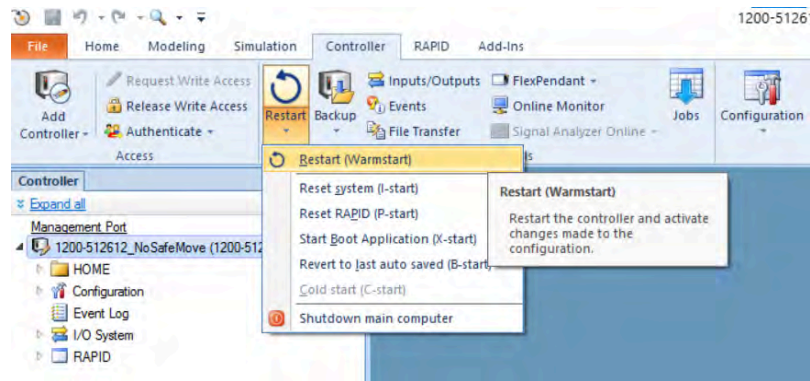
c. If RobotStudio warns you that duplicate parameters will be replaced, press **OK**.



d. If RobotStudio asks you to restart the controller, press **OK**.



14. Restart the ABB controller by selecting **Restart (Warmstart)** in the Controller > Restart menu. Wait for the restart to finish. Keep the ABB controller set to AUTO mode.



Note:

If the Restart menu is unavailable, try pressing the READY pendant E-Stop or the ABB controller E-Stop to stop motion programs. This will allow you to be able to warm-restart from RobotStudio. Then, after the controller finishes booting back up, release the E-Stop and press **RESET** to clear any errors on the READY pendant. (You can also use the power switch on the robot controller instead.)



Note:

If you restored a previous IO configuration from a backup file, follow the instructions in [Using the Signals in ForgeOS \(on page 54\)](#) in Appendix B to resolve the ForgeOS IO configuration mismatch warning. Check if you need to re-add the Display Names of your signals, then check if the signals correctly re-populated to Task Canvas tasks and Rule Engine rules.

Chapter 15. Contacting READY

Visit [READY.academy](https://ready.academy) for *FREE* hands-on courses to help you deploy a robotic system.

Visit our [Support](#) site for robot startup guides, FAQs, and more.

If you encounter a problem and need to talk to someone, reach out to us.

- Email READY Robotics: support@ready-robotics.com
- Call READY Robotics: +1-833-732-3977

