READY

FORGE os 5

Stäubli CS9 Startup Guide

The documentation, best practices, and recommendations provided by READY Robotics do NOT constitute safety advice. Products sold through READY Robotics are not by themselves a fully integrated workcell. As required in ISO 10218-2, READY Robotics strongly recommends performing a complete risk assessment of the integrated workcell per ISO 12100. You may wish to use the methodology found in the ANSI/RIA TR R15.306 Task-based Risk Assessment Methodology.

CONTENTS

OVERVIEW

This guide helps you set up your Stäubli CS9 controller to work with Forge/OS 5.

You will follow these steps:

1. Set up Safety I/O hardware.
2. Connect the READY pendant.
3. Connect the robot controller to the IPC.
4. Power on your systems.
5. Get robot configuration files from Forge/OS.
6. Change robot settings and transfer the robot configuration files.
7. Add the robot in Forge/OS!

Note: *This guide assumes that you have installed the robot and CS9 controller following Stäubli instructions. Make sure the robot controller is in working order before moving on. We recommend backing up your robot controller.*

REFERENCES

Reference	Description, Link
[1]	Amphenol Connector Assembly Instructions, www.amphenol-sine.com/pdf/M23-Series-Assembly-Instructions.pdf

HARDWARE REQUIREMENTS

Image	Part Name	Description	Vendor	Part Number
	Industrial PC (IPC)	Hosts Forge/OS. ***Note:*** *Refer to the Forge/OS 5 User Manual for IPC requirements.*		
	READY pendant	The touch screen interface for Forge/OS.	READY Robotics	112563
	CS9 Robot Controller	Connects the robot arm to power and to other devices.	Staubli	
	Staubli Pendant	Configures the robot controller's Ethernet port, IP address, Subnet Mask, and other settings.	Staubli	
	17 Position Straight Plug Connector Kit, Threaded, E Type	Required to connect the READY pendant safety features to the Stäubli controller pendant port.	Amphenol	MA7CAE1700-S1-KIT
	Cat5e Shielded Ethernet Cables (x2)	▪ Connects the robot controller to a IPC. . ▪ Connects the READY pendant to a IPC.		

Image	Part Name	Description	Vendor	Part Number
	USB flash drive, 8GB or larger	Required to transfer robot files from Forge/OS to the robot.	READY Robotics	R-400030

SOFTWARE REQUIREMENTS

Controller	Minimum Software Version
CS9	s8.12.1

Tip: *To check what software version your controller is on, refer to the next section: Confirming Software Requirements.*

You also need the items in the table below:

Requirement	Part Number	Description	Supplier
Remote MCP Runtime License Option	D14327660	Required to connect the READY pendant to the robot controller and to control the robot.	Stäubli
Stäubli Robotics Suite (SRS) Software for Windows PC	-	Required to configure the Stäubli controller and transfer Forge/OS files to the controller.	

CONFIRMING SOFTWARE REQUIREMENTS

Follow these steps to check the software version on a CS9 robot controller.

1. Plug the Stäubli controller into a power source. Follow Stäubli instructions for powering the controller.
2. Turn the power switch on the controller clockwise to power the controller on. Wait for the controller to boot up.
3. On the Stäubli teach pendant, press the Home button in the upper-left corner.
4. Tap **ROBOT** on the touchsreen.

5 In the Robot menu, tap **Information**.

6 In the Information menu, search through the information pages until you find **System**.

7 Look at the entry to the right of **System**. If the entry doesn't start with "s8.12.1" or later, contact Stäubli to upgrade.

CHANGING THE STÄUBLI NETWORK SETTINGS

Follow these steps to configure the Stäubli controller to connect with Forge/OS. You will disconnect the Stäubli pendant at the end of this section.

1. Plug the Stäubli controller into a power source. Follow Stäubli instructions for powering the controller.
2. Turn the power switch on the controller clockwise to power the controller on. Wait for the controller to boot up.
3. On the Stäubli teach pendant, press the HOME button in the upper-left corner.
4. Tap **SETTINGS** on the touchscreen.

5 Tap **Network**.

6 On the front of the CS9 controller, check the Ethernet ports to see which one is available (**J204** or **J205**).

7 On the Stäubli pendant, select the Ethernet port you want to use and edit the IP address and subnet mask on the pop-up dialog box. Set the IP to **192.168.1.20** and set the Mask to **255.255.255.0**.

8 Turn off your CS9 controller and disconnect it from power. Follow your facility's lockout/tagout procedure before moving on.

9 Disconnect the Stäubli pendant from the controller. Set the pendant aside for now.

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	Destination
Brown	Enabling Switch Circuit 1	J103 - 7
Yellow	Enabling Switch Circuit 1	J103 - 8
Green	Enabling Switch Circuit 2	J103 - 12
Grey	Enabling Switch Circuit 2	J103 - 17
Pink	24V DC	External Power - 24V
Green/Brown	Emergency Stop Circuit 1	J103 - 3
White/Green	Emergency Stop Circuit 1	J103 - 4
Grey/Pink	Emergency Stop Circuit 2	J103 - 5
Red/Blue	Emergency Stop Circuit 2	J103 - 6
Black	0V DC	External Power - 0V
Violet	Key Switch Circuit 1	External Power - 24V
White/Pink	Key Switch Circuit 1	Safety Relay - B1
White	Key Switch Circuit 2	External Power - 24V
Blue	Key Switch Circuit 2	Safety Relay - B2
White/Blue	Not Connected	

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.

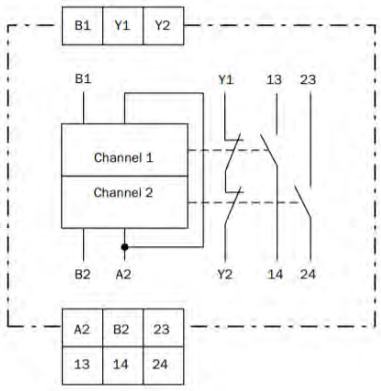
b Connect the pendant's power leads to a 24V DC, 2.5A source. Connect the Pink wire to +24V and the Black wire to 0V.

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.

d The enabling switch and emergency stop circuits connect to the Stäubli pendant port (J103) on the CS9 through the Amphenol M23 connector. Assemble the M23 connector using the destination table and these assembly instructions:www.amphenol-sine.com/pdf/M23-Series-Assembly-Instructions.pdf. The pin numbers of the Amphenol connector and the Staubli pendant port should match.

e Attach the M23 connector to port J103 on the CS9: align the male pins to the female holes and screw the connector's shell on clockwise.

2 Finish connecting the Key Switch circuit to J101 through a safety relay. This example uses a SICK UE10-2FG safety relay.



In this table, connect the two destinations that share a row:

Pendant Flying Leads	SICK Relay	CS9 Safe Input Block	24V External Power Supply
White/Pink	B1		
Blue	B2		
	13	J101 - 5	
	Y1	J101 - 5	
	14	J101 - 2	
	Y2	J101 - 3	
	A2		0V

3 If use a safety fence, connect the fence contact safety inputs on J100:

Function	Destination
Fence: Contact 11	J100 - 9
Fence: Contact 12	J100 - 11
Fence: Contact 21	J100 - 10
Fence: Contact 22	J100 - 12

4 If you do not install external safety fencing:

a Connect terminals J100-9 and J100-11 with a jumper wire.

b Connect terminals J100-10 and J100-12 with a jumper wire.

POWERING ON

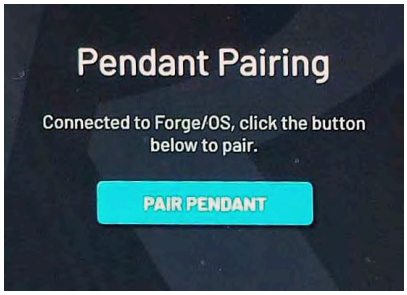
1. Reconnect the Stäubli controller to a power source and turn it on.
2. Plug your IPC's power cable into a power outlet.
3. Power on your IPC.
4. If there are issues, power off each device, disconnect from power supplies, and check your wiring.

SIGNING IN TO FORGE/OS

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

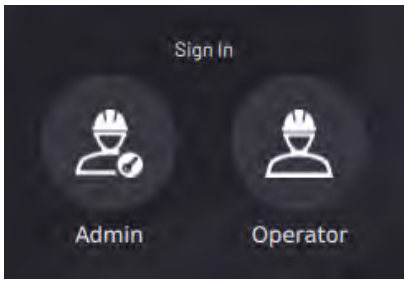
1. If you need to install Forge/OS 5 on your IPC, stop here and follow all the steps in Appendix A, then come back to these steps.

2. When you power on your READY pendant and IPC, the Pendant Pairing screen appears on the READY pendant. Tap the blue **PAIR PENDANT** button when it appears. It may take up to one minute to appear.

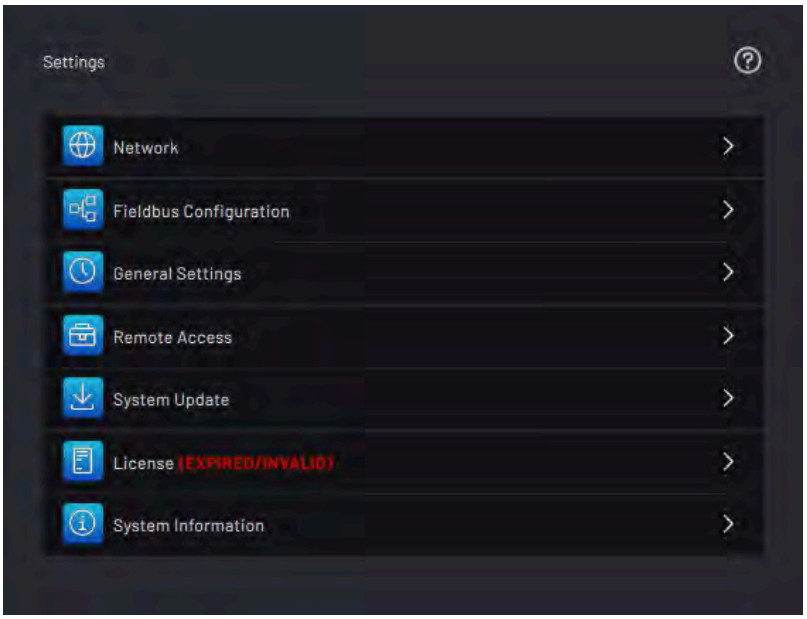


Note: *If the pendant fails to pair or the **PAIR PENDANT** button is unavailable for longer than two minutes, check the Ethernet connection to the **IPC**. If the pendant still doesn't pair, connect the pendant's Ethernet cable to another LAN port on the **IPC**. The **READY pendant** IP Address is preset to 172.16.255.253. The network interface that the pendant connects to should use an IP Address of 172.16.255.x 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 Forge/OS with a License Code in Appendix A.



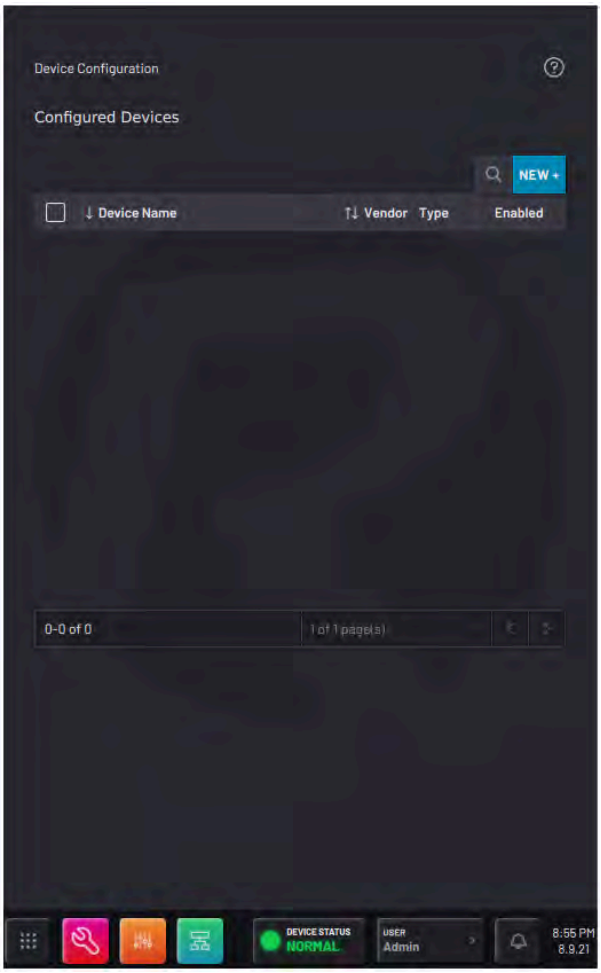
5 With Forge/OS active, move on to the next section.

GETTING SETUP FILES FOR YOUR ROBOT

In this section, you add the robot in Forge/OS and copy configuration files to the robot controller.

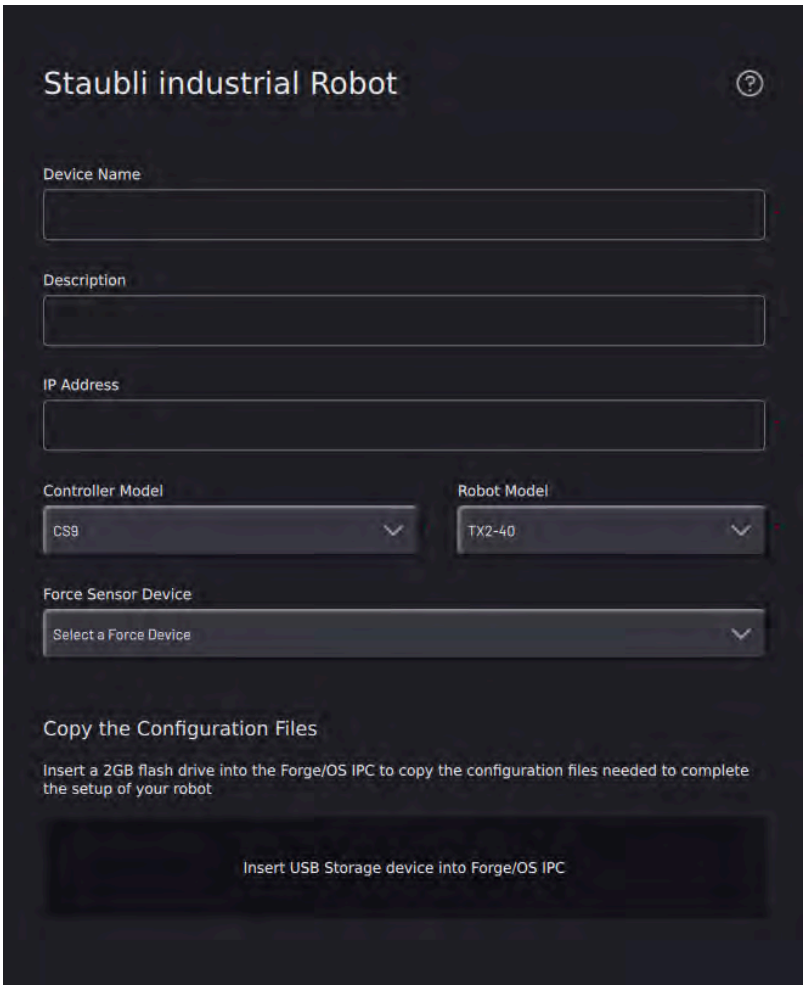
1 In the **Admin** role, open the **Device Configuration** app.

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



3 Use the **Filter by** dropdown to show robot options. Select the **Stäubli industrial robot** option and tap **NEXT** to continue with configuration.

4 Select the robot controller model, then select the robot model. You can fill in the other information later.



5 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****.*

6 Tap **Start Transfer** and wait for it to finish.

7 Remove the USB flash drive when prompted.

COPYING FILES TO THE ROBOT

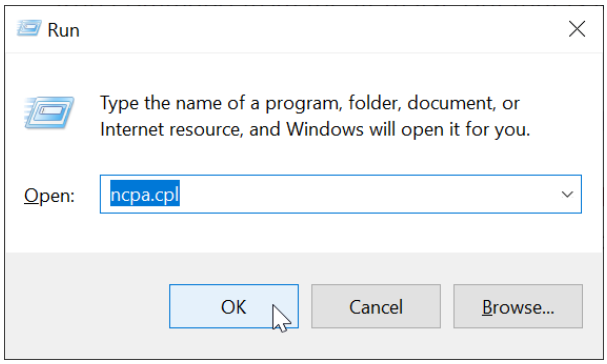
In this section, you will set up the robot controller and copy configuration files to the robot with Stäubli Robotic Suite.

1. Use a Cat5e STP Ethernet cable to connect your Windows computer to the Ethernet port you chose earlier on the CS9 controller (port **J204** or **J205**).

2. On your Windows computer, configure the IP settings to connect with the Stäubli controller.

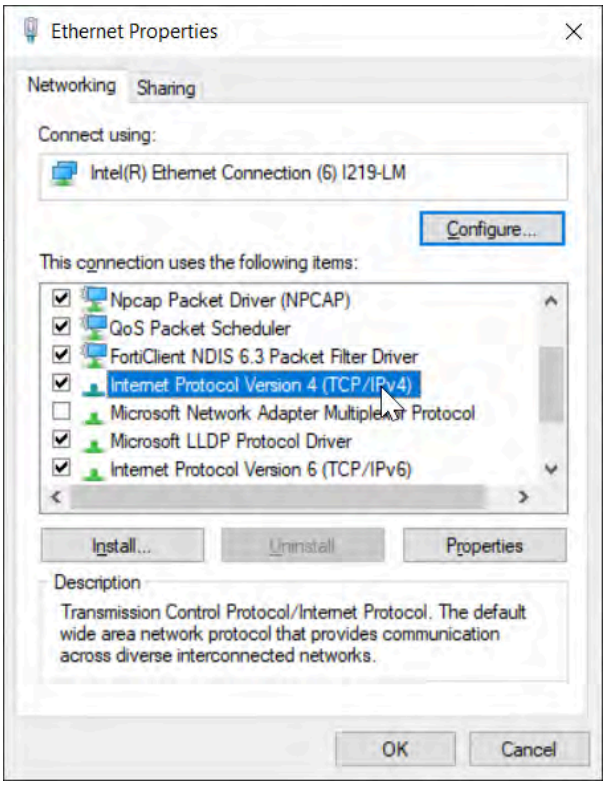
   a. On your Windows computer, open the Run box. To open Run, press **Windows key + R** on the keyboard or right-click the Start Menu button and select **Run**.

   b. In the Run pop-up, type "ncpa.cpl" (Network Connections panel) and click **OK**.

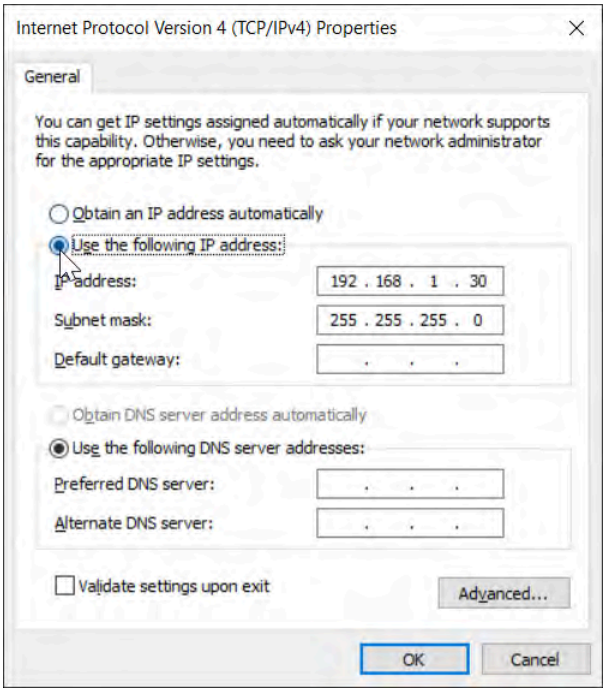


   c. On the **Network Connections** window, double-click the Ethernet connection you are using on the computer. For computers with one Ethernet port, it's the **Ethernet** option.

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



e In the IPv4 Properties pop-up **General** tab, select **Use the following IP address**. Set the IP address to **192.168.1.30** and set the Subnet mask to **255.255.255.0**.

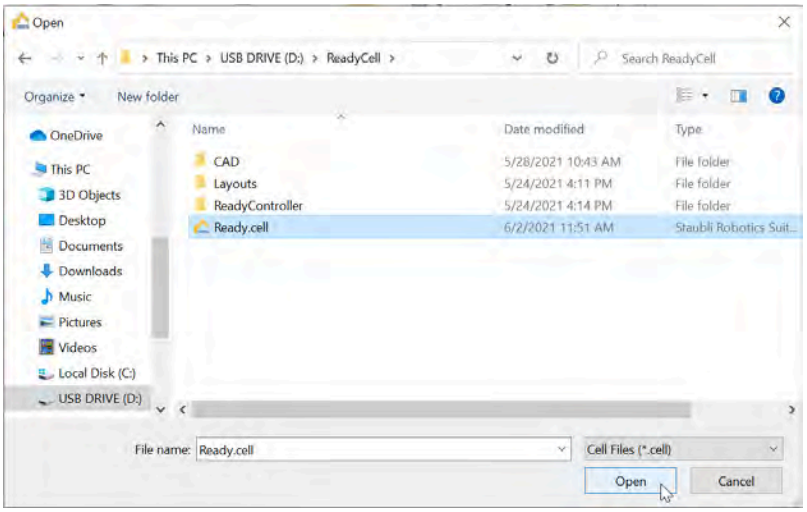


f Click **OK** to save these settings.

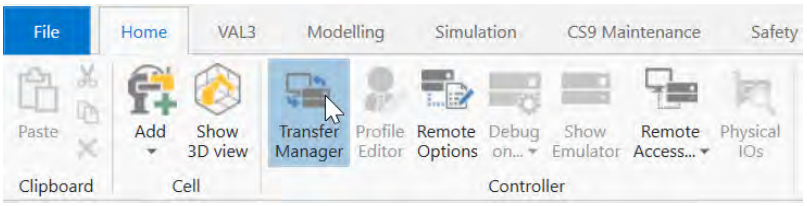
3 Launch Stäubli Robotic Suite (SRS).

4 Insert the USB flash drive into the Windows computer.

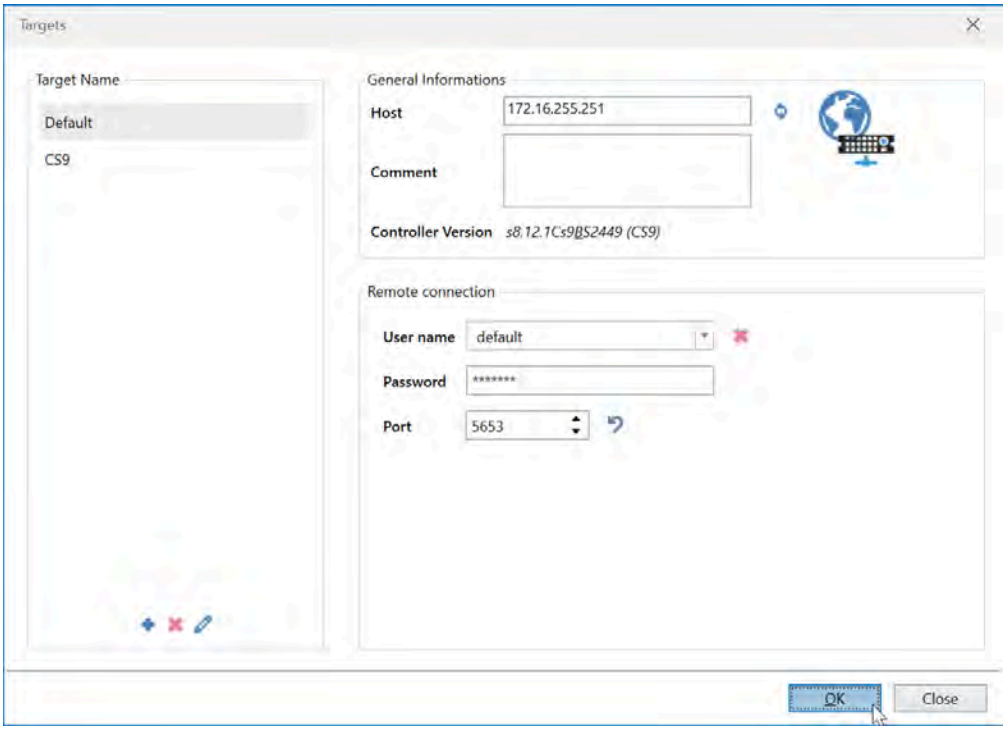
5 Click the **File** tab and select **Open**. Find the ReadyCell folder on the USB flash drive and select **Ready.cell** to open.



6 When the SRS environment launches, select the **Home** tab and click **Transfer Manager**.



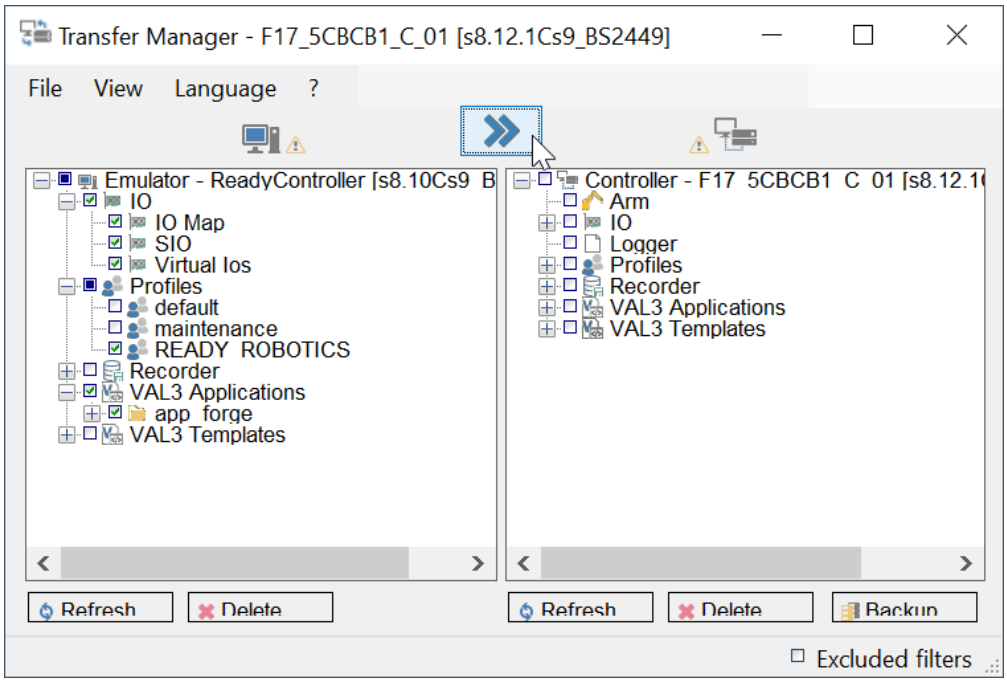
7 Select your controller in the **Target** area. In the **Host** field, enter the IP address of the Stäubli controller (the example below shows the IP address of the robot if you're using the Forge/Ctrl). For the **User name**, select **default**.



8 Click **OK**. If you see an error and you cannot click OK, check the Ethernet cable to the Stäubli controller and the network settings on your PC. Then go back to the SRS Targets window and press the **refresh icon** next to the **Host** address.

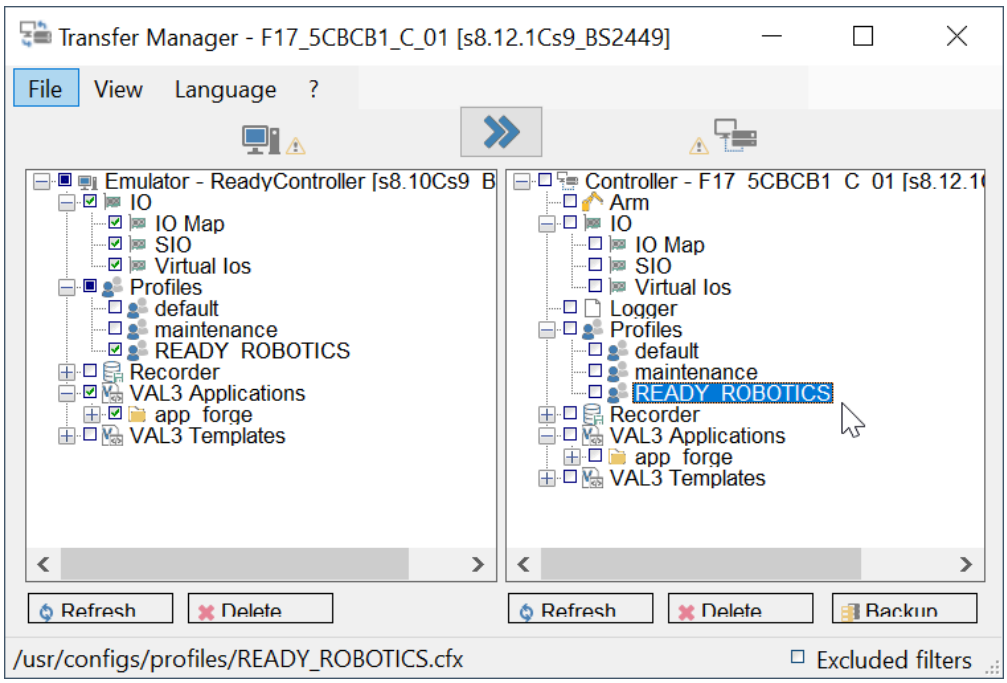
9 On the **Transfer Manager** window, the left side shows the READY driver files and the right side shows the files on the Stäubli controller. On the right side, select the checkbox next to **VAL3 Applications** and click **Delete** to remove existing programs from the Stäubli controller. Wait for the process to finish. If there are no VAL3 applications on the Stäubli controller, move on.

10 On the left side, select all **IO** options, select **Profiles > READY_ROBOTICS**, and select **VAL3 Applications > app forge**.



11 Click the **>>** button at the top of the Transfer Manager to start the transfer. If SRS asks you whether to overwrite the existing files, hit **Yes**.

12 Wait for the transfer to finish (when the blue **>>** button reappears). Expand the tree on the right to make sure the IO, Profiles, and VAL3 Applications transferred onto the Staubli controller.

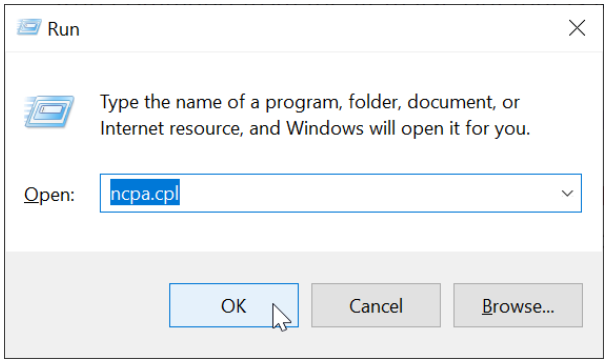


13 Disconnect the Ethernet cable from the Windows computer and connect it to a LAN port on the IPC.

14 On your Windows computer, change the IP settings back to what they were before.

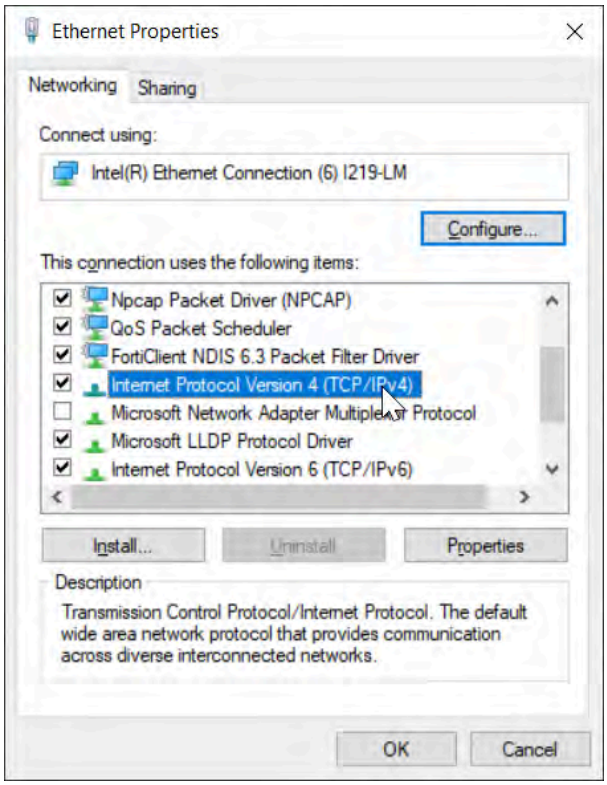
a On your Windows computer, open the Run box. To open Run, press **Windows key + R** on the keyboard or right-click the Start Menu button and select **Run**.

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 you are using on the computer. For computers with one Ethernet port, it's the **Ethernet** option.

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



e In the IPv4 Properties pop-up **General** tab, select **Obtain an IP address automatically**.

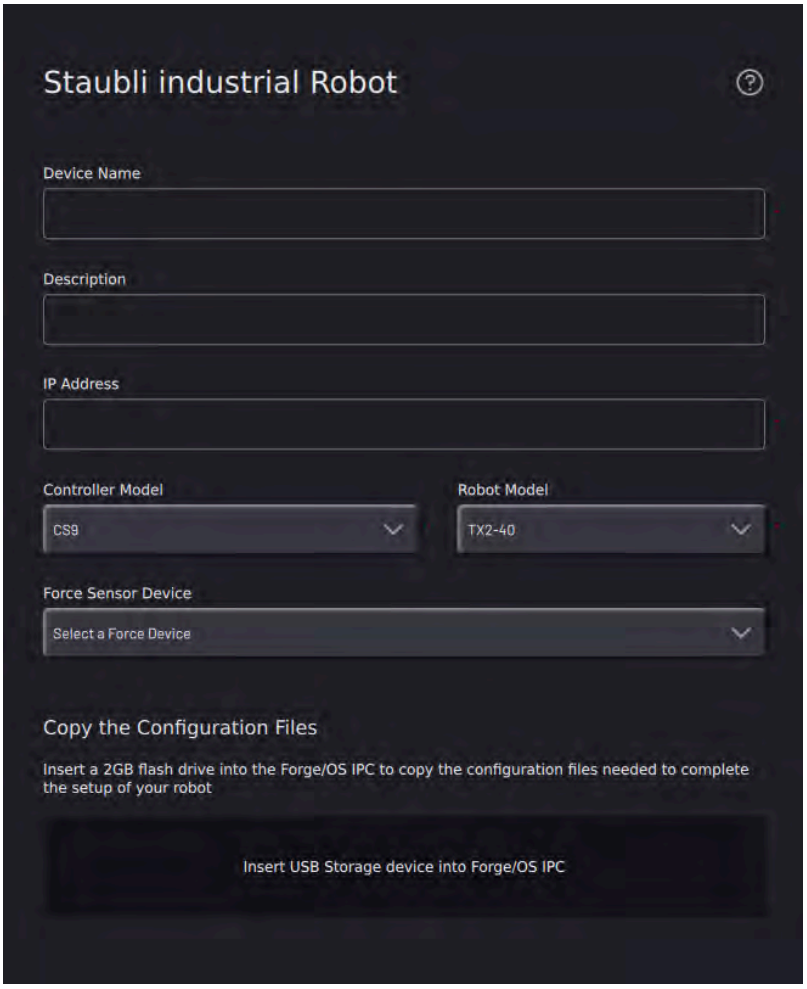
f Click **OK** to save these settings.

15 Restart the CS9 controller. Wait for the controller to restart before you move on.

ADDING THE ROBOT IN DEVICE CONFIGURATION

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

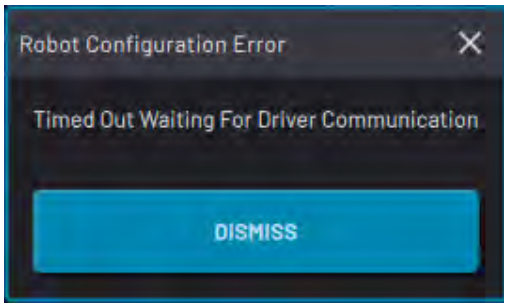
1. In Forge/OS, finish entering your Stäubli device information:
   a. Give your device a name.
   b. For the IP Address, enter **192.168.1.20** or the IP address you assigned to the robot, if different.



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. .

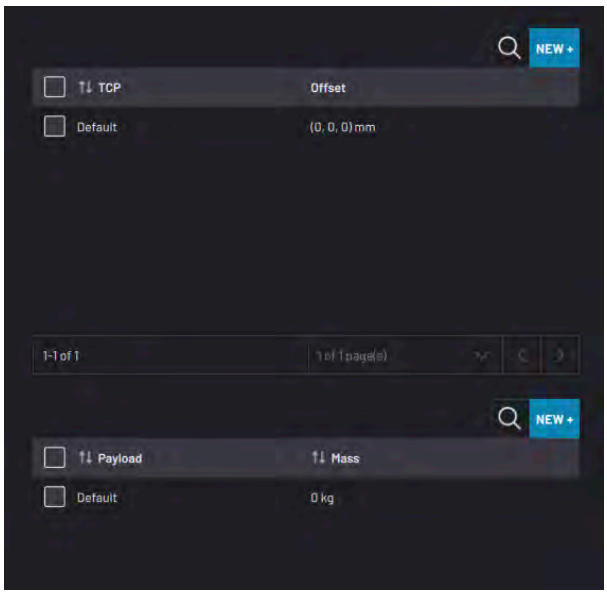


Click **DISMISS**, do the following, then try to tap **SAVE** again:

- 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.

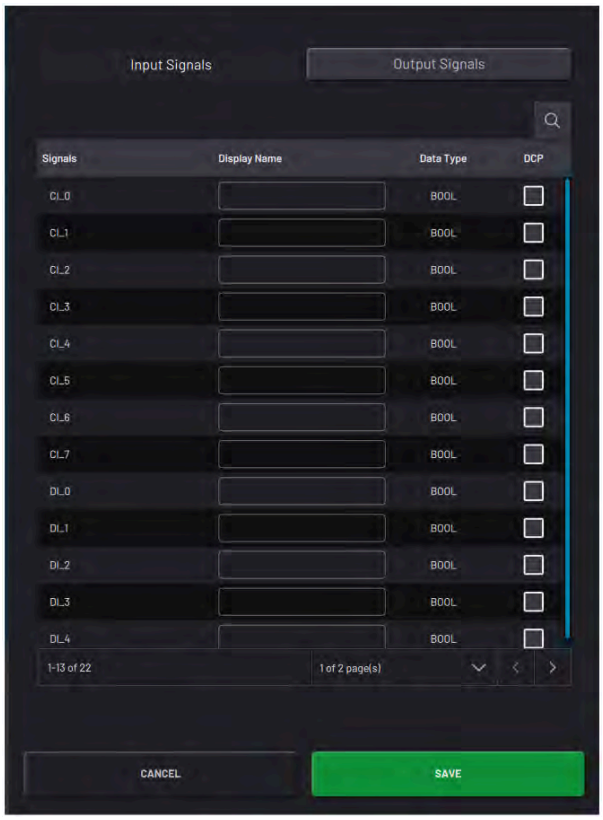
3 When the robot connects, you can add Tool Center Points (TCPs) or Payloads for the robot. You can come back to this later by editing the device's configuration. Tap **SAVE** to continue.

> ***Note:*** *The default TCP is at the robot's tool flange. The default Payload is zero.*



4 *(Optional):* Set up the robot controller's Input/Output (IO) signals for use in the Device Control Panel and Task

Canvas.



a. Enter a **Display Name** (i.e. "Open Machine Door", "Open Pneumatic Vise", or "Start Machining Cycle") to show what each signal does in other apps.

b. If you want a signal to appear in the Device Control Panel, check the **DCP** box next to that signal.

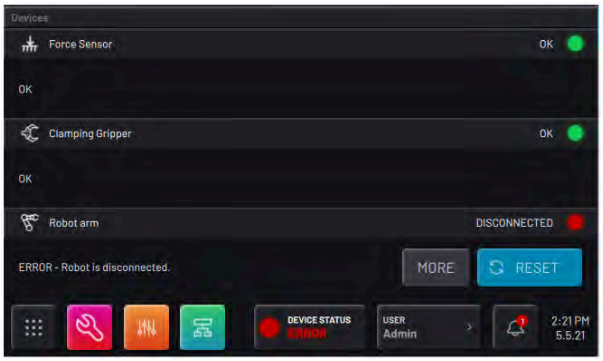
> ***Note:*** *To use these I/O signals, integrate your I/O devices with the robot controller.*

c. Tap **SAVE**. Forge/OS returns to the Configured Devices list, which shows the new robot as **enabled**.

> ***Note:*** *A device is **enabled** when its switch is green and toggled to the right.*

5 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.

Congratulations! You are ready to control your robot in the Device Control Panel and Task Canvas apps.

APPENDIX A: SETTING UP FORGE/OS

INSTALLING FORGE/OS

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

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

   Important: *Installing Forge/OS will erase all data on the target hard drive.*

   a. Connect a monitor, keyboard, and mouse to the IPC where you want to install Forge/OS.

   b. Plug the Forge/OS installation USB flash drive into the IPC.

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

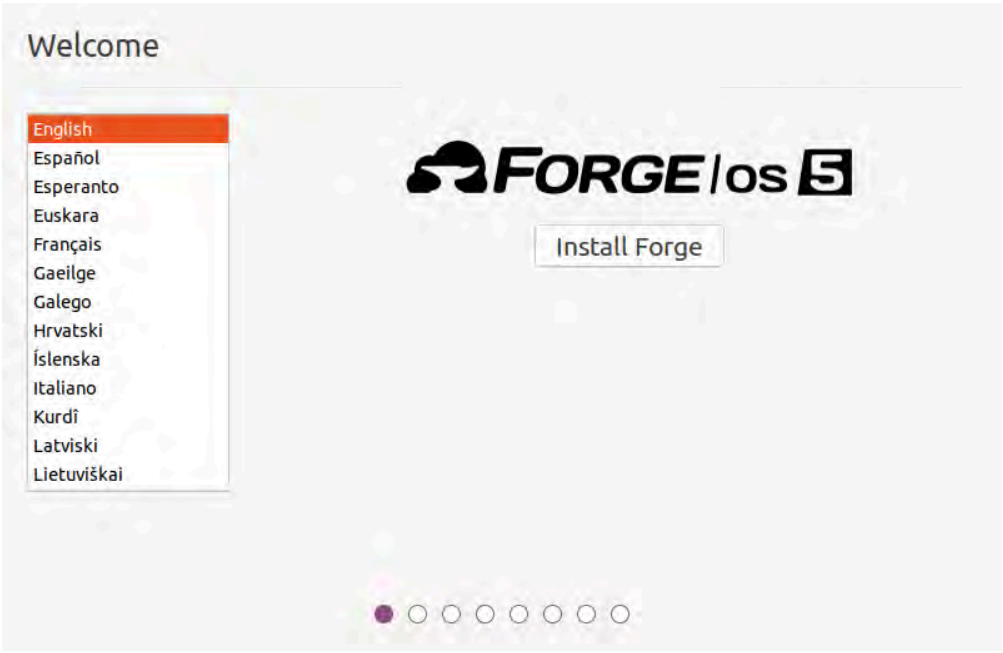
   c. Restart the IPC. While the IPC is powering on, press the keyboard hotkey that takes you to the Boot Menu.

   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.*

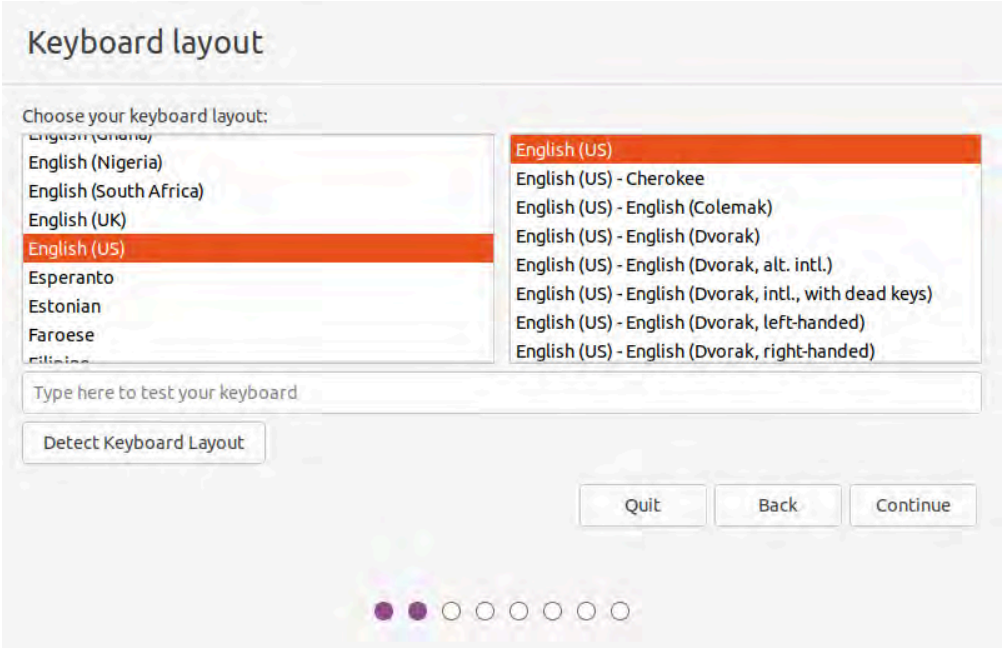
   d. From the boot options, select **Install Forge/OS** to boot from the installation USB flash drive.

   e. The installer may take several minutes to load. Wait until the installation wizard opens.

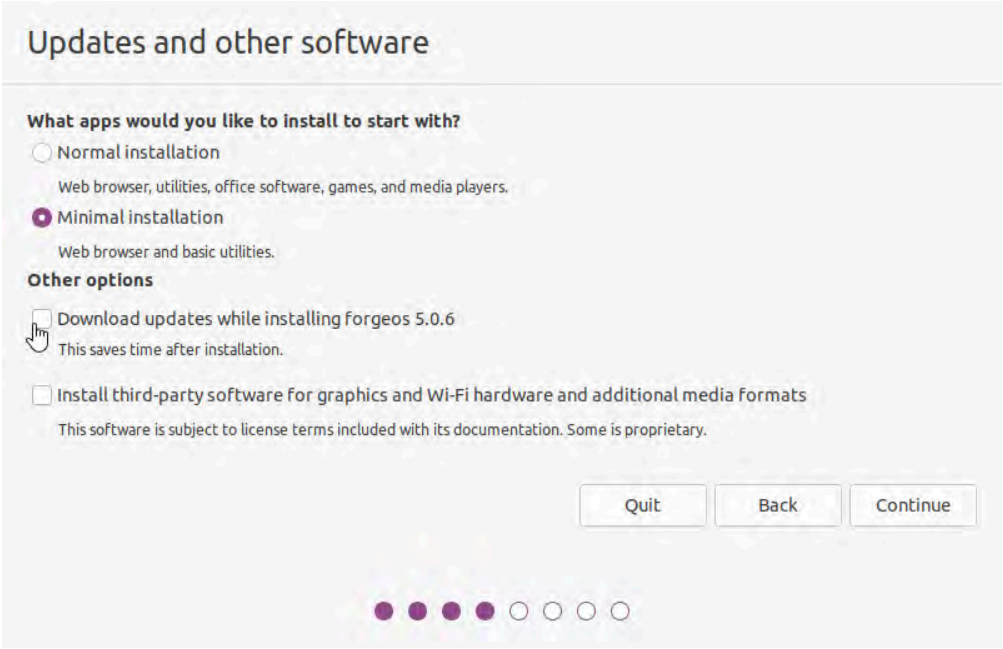
f Select your language. Then click **Install Forge**.



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

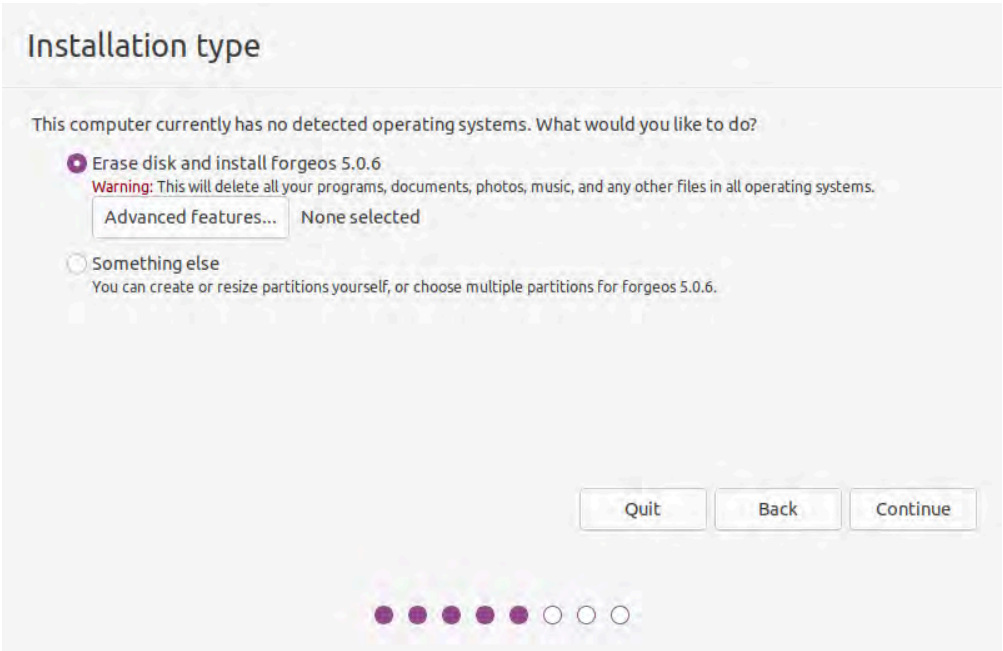


h. Select **Minimal installation**. Uncheck **Download updates while installing forgeos**. Then click **Continue**.

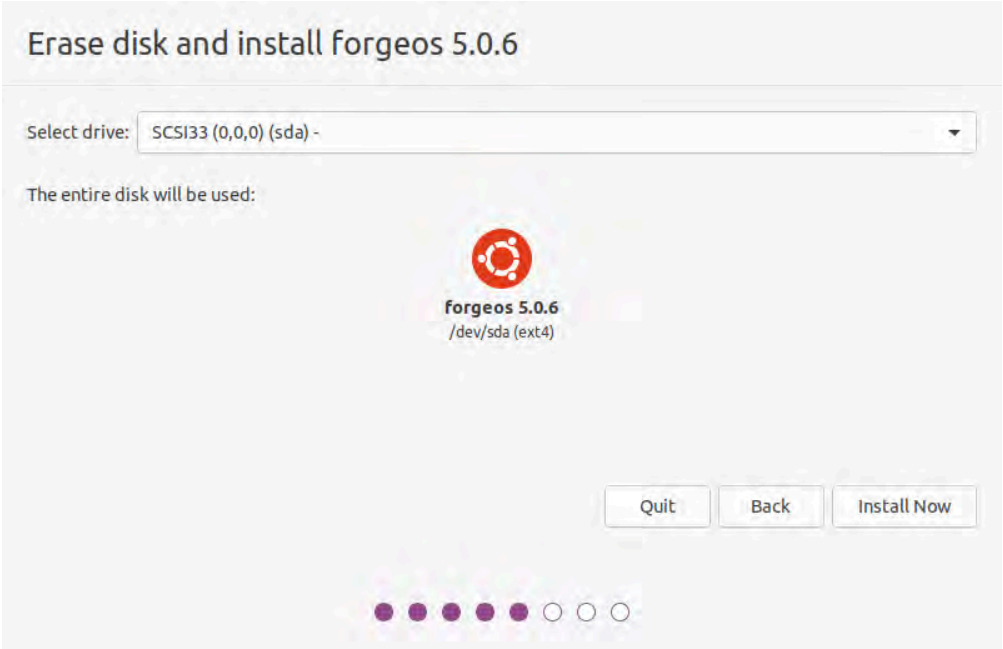


i. Select **Erase disk and install forgeos**. Then click **Continue**.

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

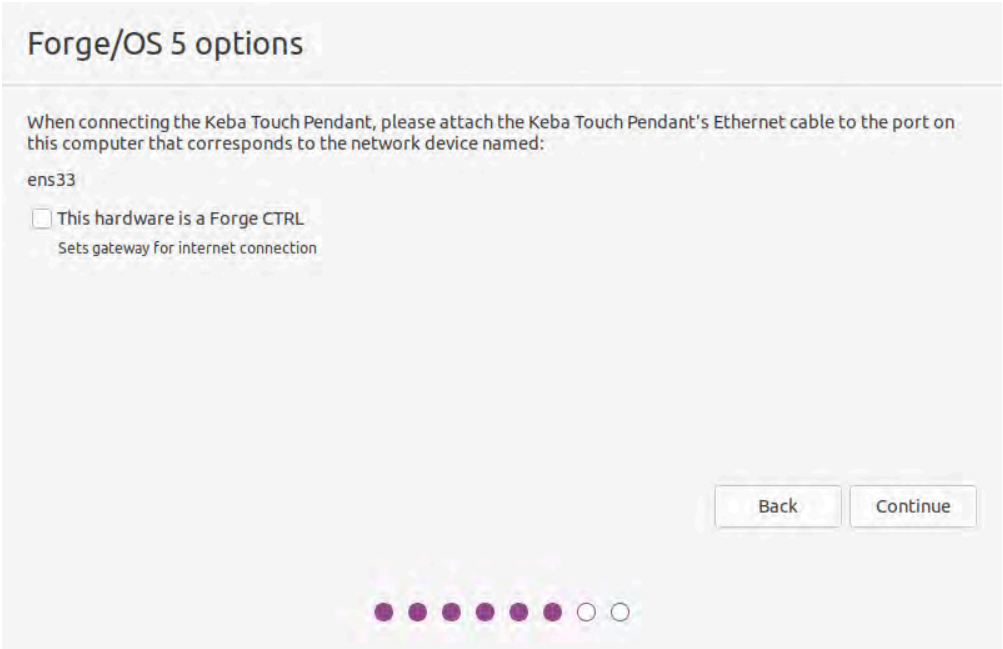


j Select the IPC hard drive for Forge/OS and click **Install Now**.

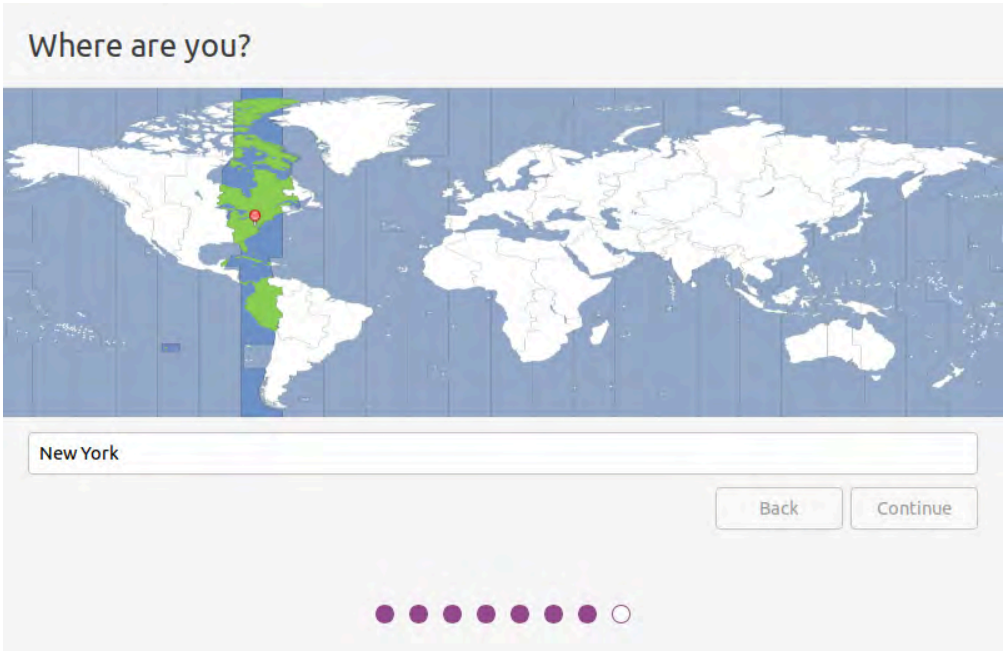


k Confirm that you want to erase the entire disk by clicking **Continue**.

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**.

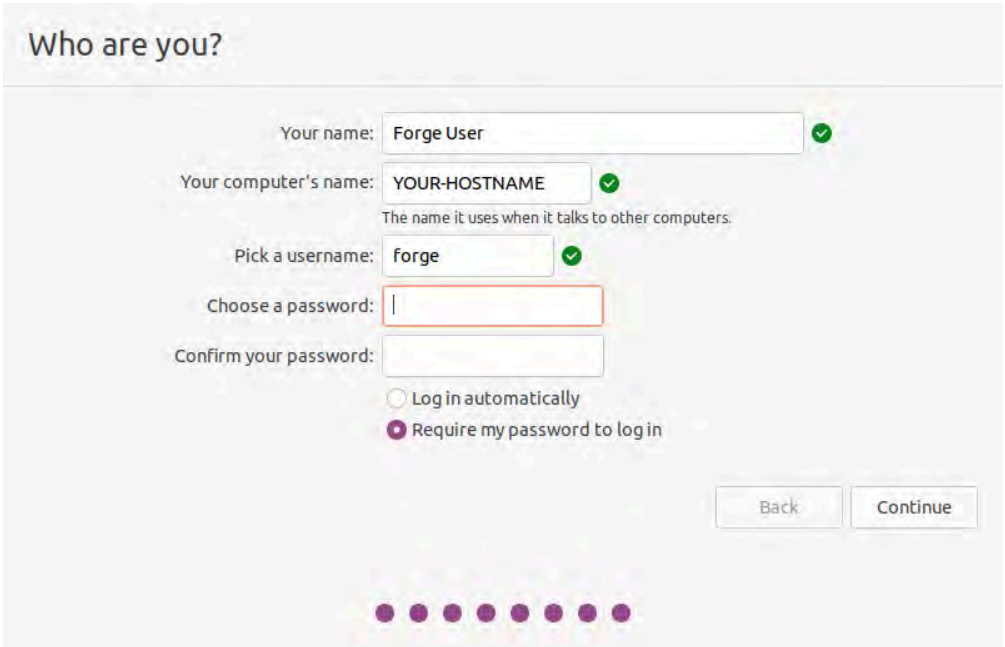


m Choose your timezone. Then click **Continue**.

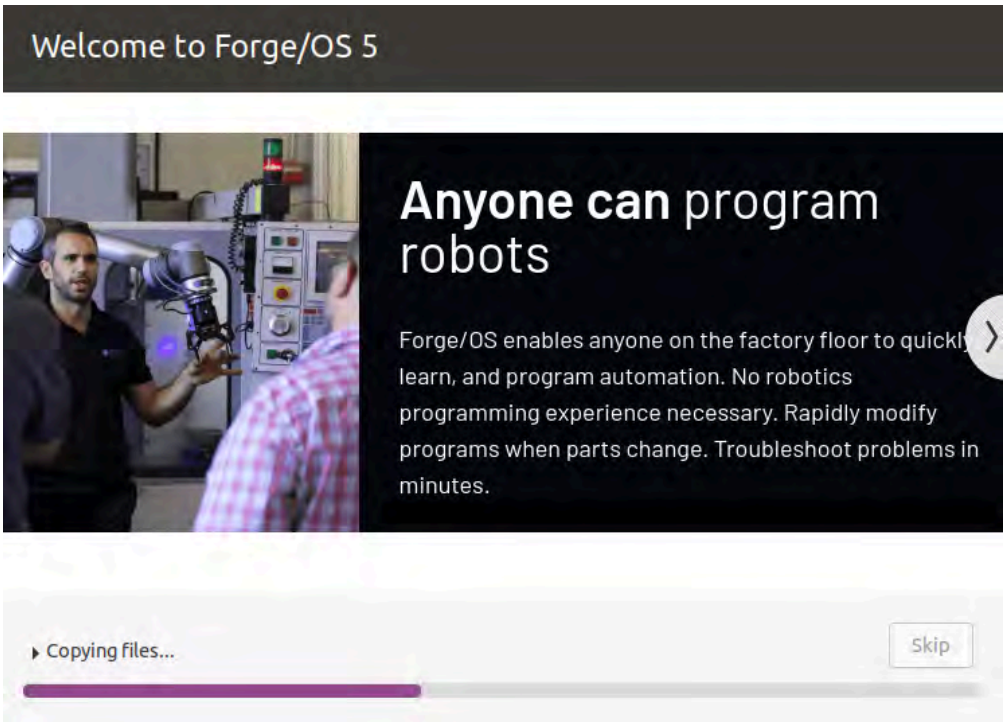


n Choose your IPC's host name. The host name identifies the IPC on the network. Pick a username and password. Then click **Continue.**

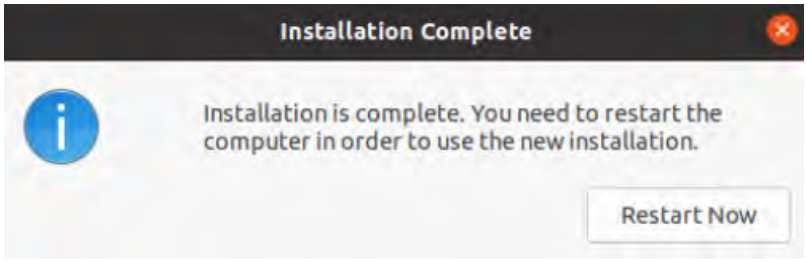
> ***Note:*** *The username and password that you create here are for accessing the IPC desktop. They are NOT for signing into Forge/OS on the* ***READY pendant****.*



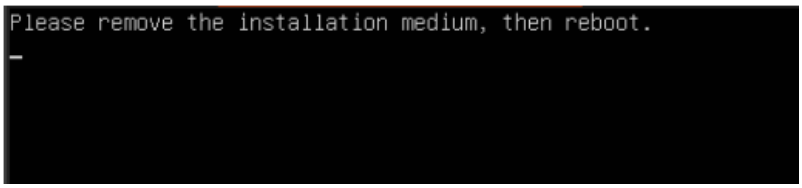
o Wait for the installer to copy and install Forge/OS.



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

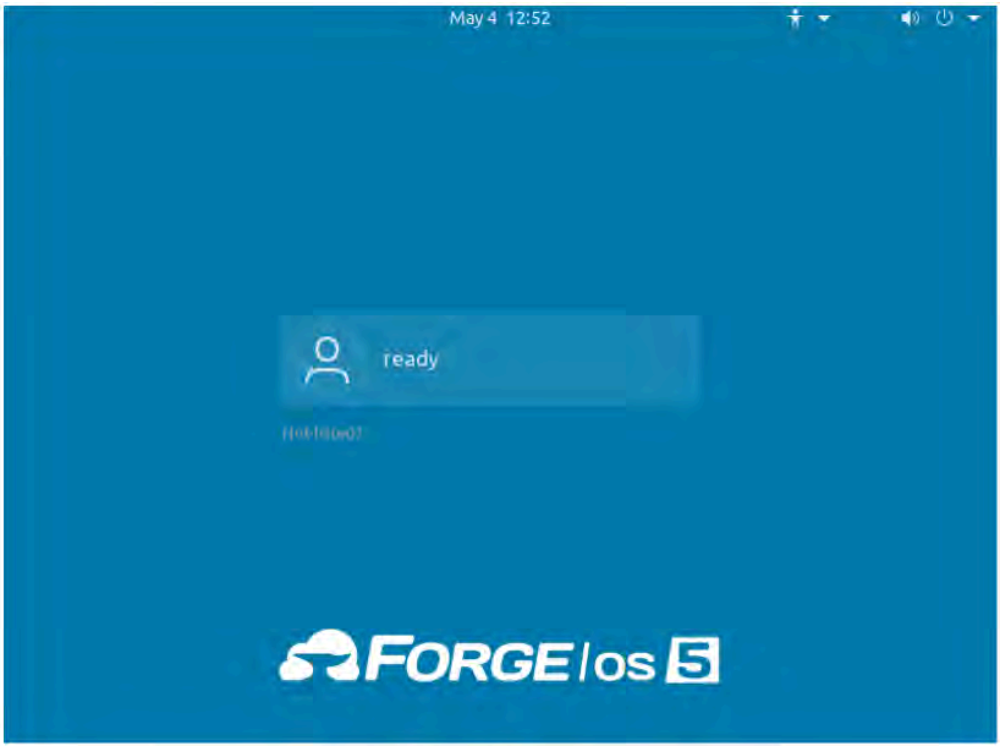


q When prompted, remove the installation flash drive. Then reboot.

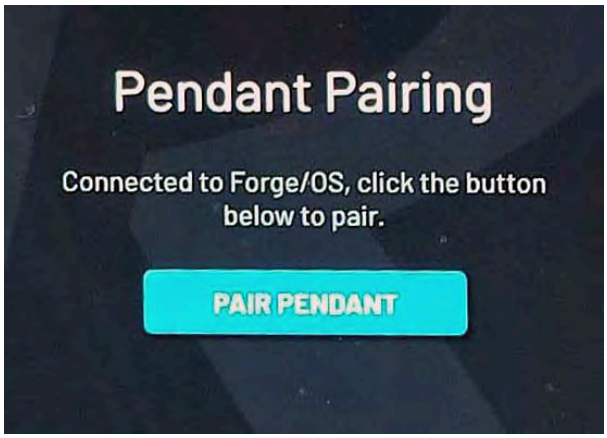


r Wait for Forge/OS to finish booting.

5 When you see the login screen with the Forge/OS 5 logo, Forge/OS 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 Forge/OS.

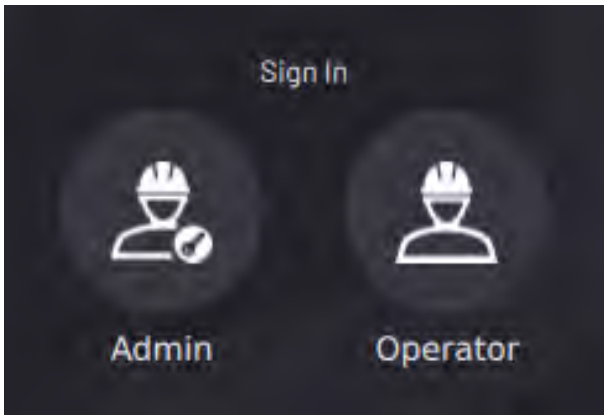


2 On the READY pendant, the Pendant Pairing screen appears. This is where you connect the pendant to Forge/OS each time you reboot. Tap the blue **PAIR PENDANT** button when it appears. It may take up to two minutes to appear.



Note: *If the pendant fails to pair or the* ***PAIR PENDANT*** *button is unavailable for longer than two minutes, check the Ethernet connection to the* ***IPC****. If the pendant still doesn't pair, connect the pendant's Ethernet cable to another LAN port on the* ***IPC****. 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 Forge/OS until you activate it with a license code. See Activating Forge/OS with a License Code.*

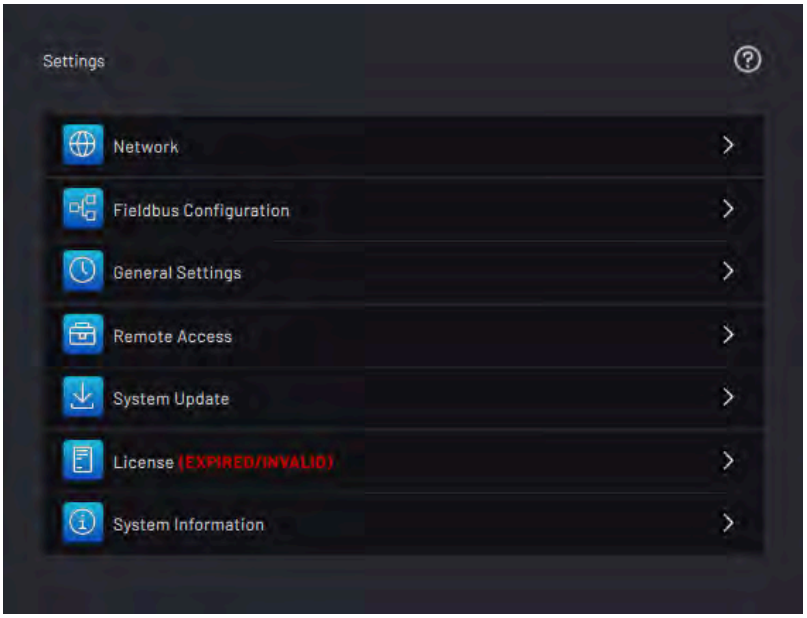
ACTIVATING FORGE/OS WITH A LICENSE CODE

To activate a Forge/OS license, you need:

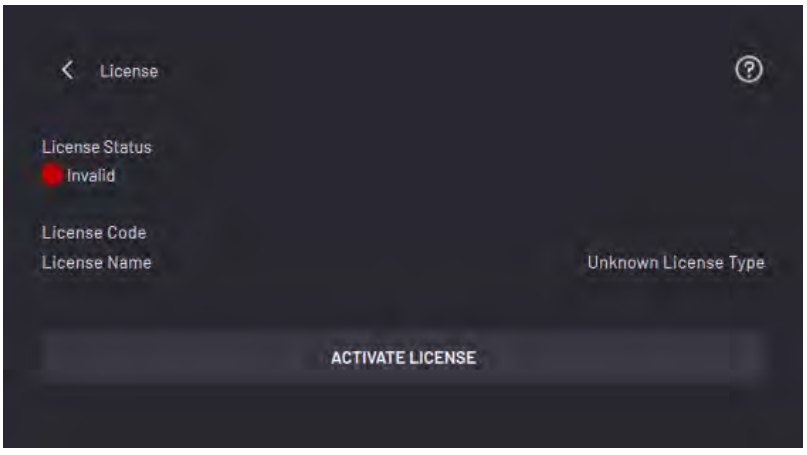
- A USB flash drive (2GB or greater)
- An internet-connected PC
- A valid Forge/OS license code

> ***Tip:*** *Connect a USB keyboard to the port on the bottom of the* ***READY pendant*** *to type in any text field in Forge/OS.*

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



2 Tap **ACTIVATE CERTIFICATE**.

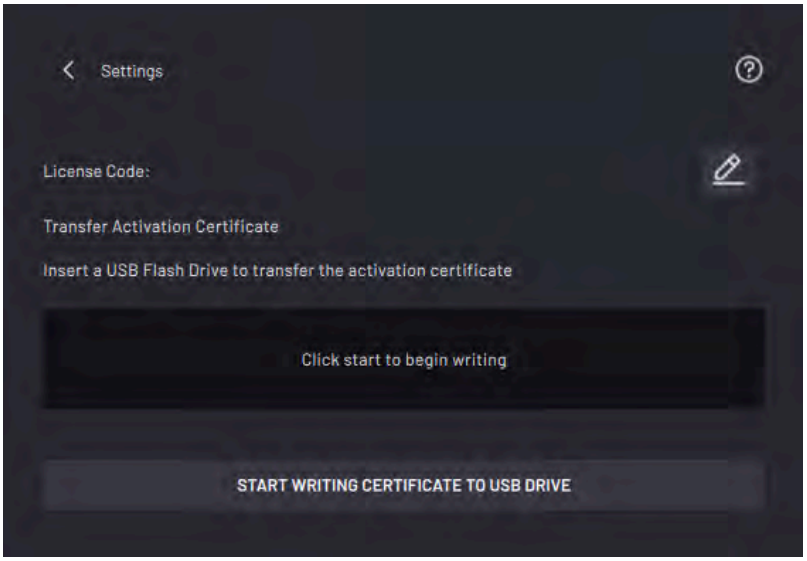


3. Enter your license code. Then tap **ACCEPT**.

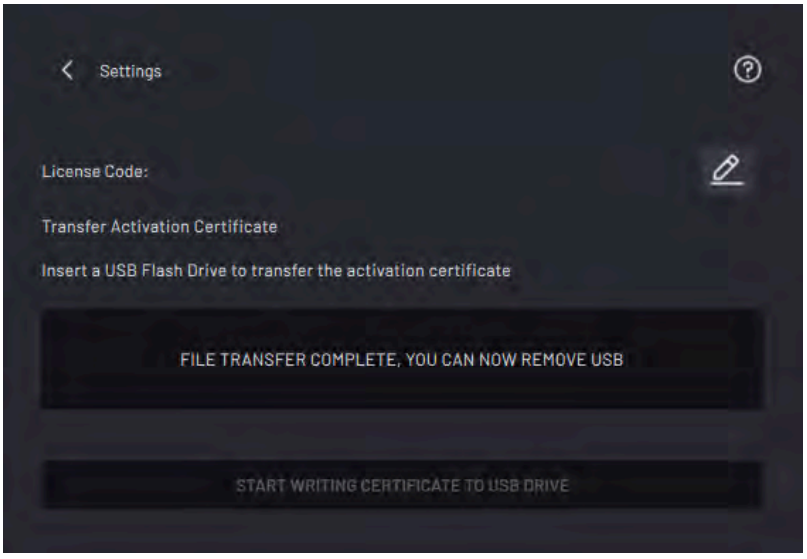
   Note: *To edit the license code after you've tapped ACCEPT, tap the pencil icon in the top-right corner.*

4. Insert the USB flash drive into your IPC.

5. Insert the USB flash drive into your IPC. Then tap **START WRITING CERTIFICATE TO USB DRIVE**.



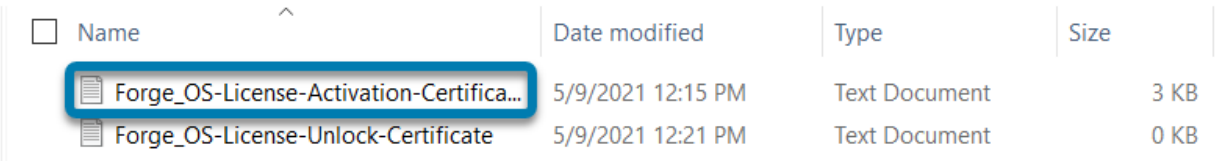
6. Wait for the files to finish transferring. When the file transfer is complete, remove the USB flash drive and tap **NEXT**.



7. Use the activation certificate and create the unlock certificate:

   a. Insert the USB flash drive into your PC.

b. Find the USB drive in your PC file explorer. Open the new "Forge_OS-License-Activation-Certificate.txt" file from the USB drive and copy all the contents.

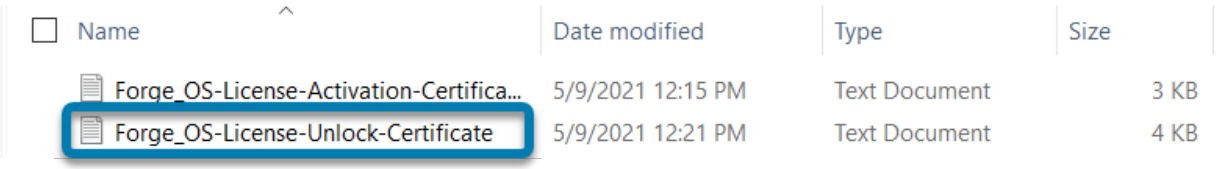


c. Open an internet browser and go to the Forge/OS 5 License Activation Portal.

> ***Note:*** *Access the license activation portal at www.activationportal.me/selfservice/activation.aspx?Type=1&cid=7461&pid=8933&lang=en-US*

d. Paste the contents of the activation certificate file and click **Activate**.

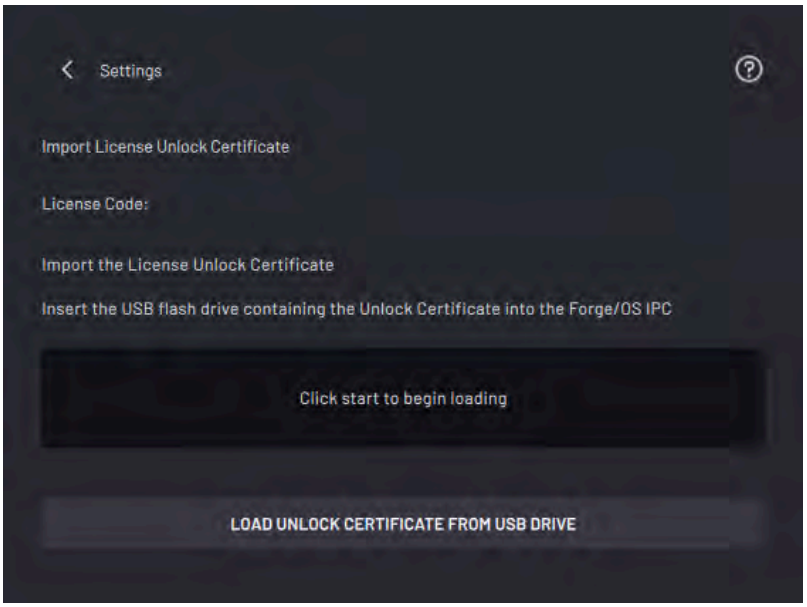
e. The portal generates new text characters. Copy all of the text and paste it in the empty "Forge_OS-License-Unlock-Certificate.txt" file.



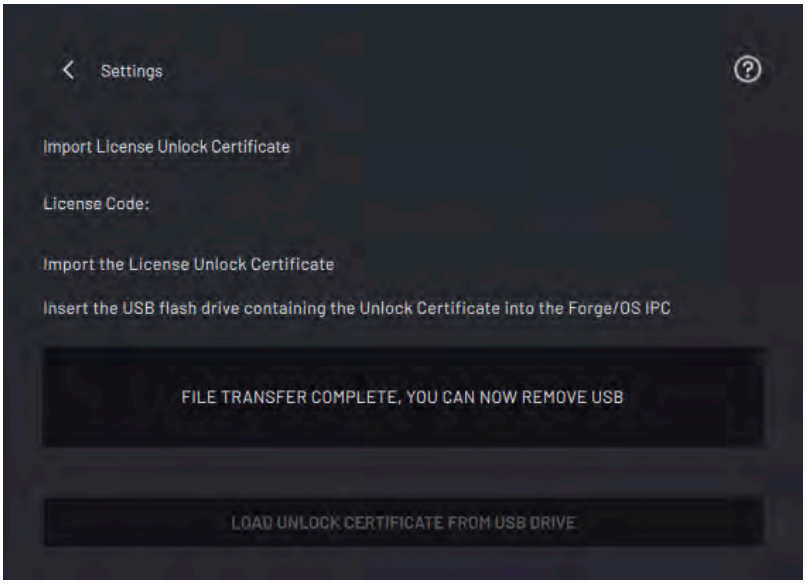
f. Save the unlock certificate file.

8. Remove the USB flash drive from your PC.

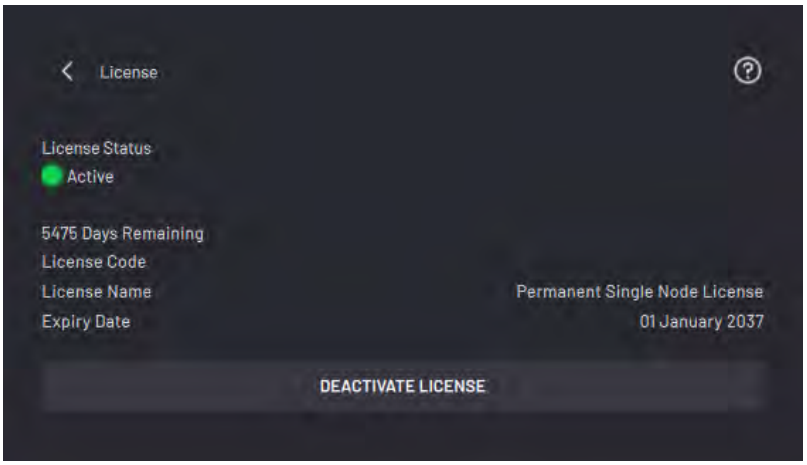
9 Insert the USB flash drive into the IPC again. Tap **LOAD UNLOCK CERTIFICATE FROM USB DRIVE**.



10 Wait for the file to finish transferring. When the file transfer is complete, remove the USB flash drive and tap **SAVE**.



11 Forge/OS 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

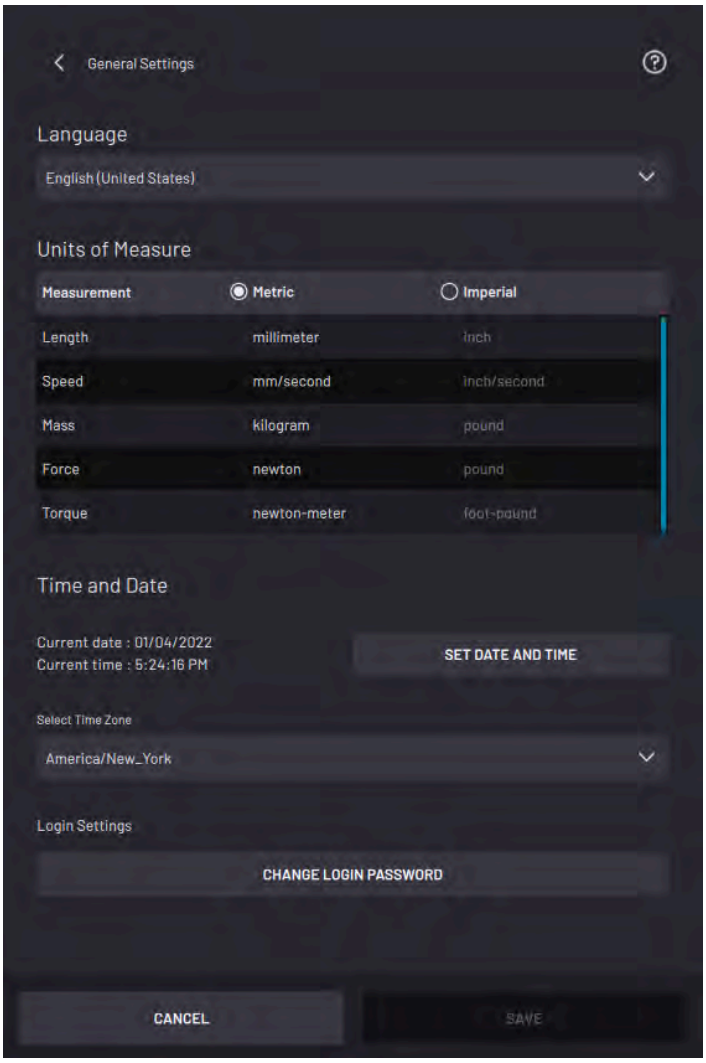
These steps help you choose system preferences, including language, units, time, and network settings.

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.*

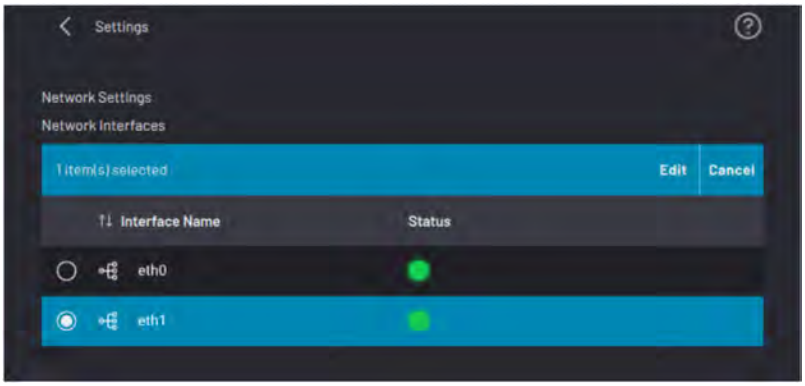


   c. Tap **SAVE** to save changes and exit the General Settings menu.

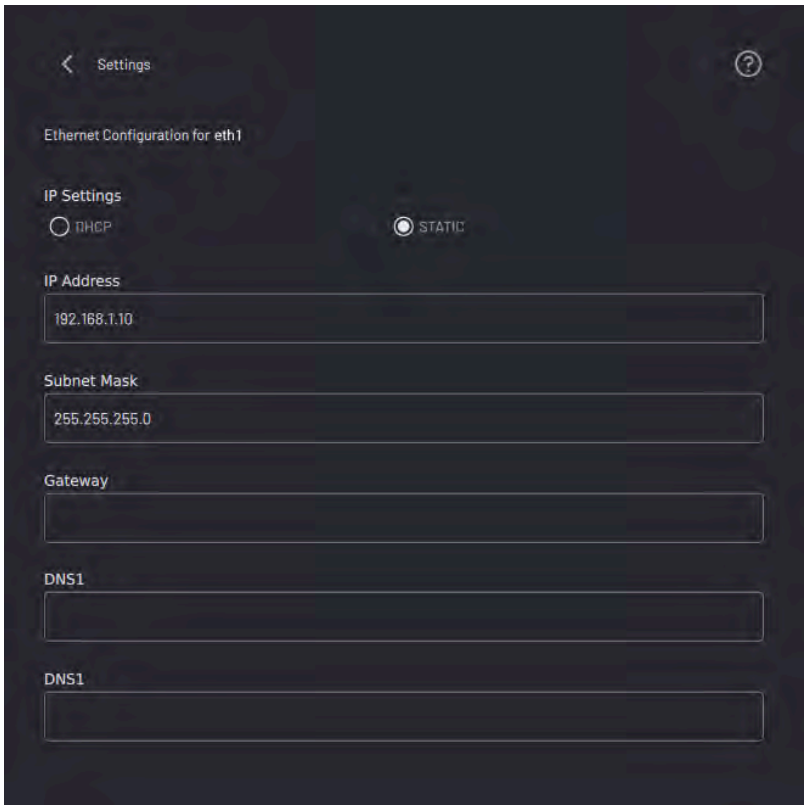
2 Check the Network settings in Forge/OS and set them as you want.

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**.

RESOURCES

Want to learn more about how Forge/OS can empower you?

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

Visit **READY.market** (market.ready-robotics.com) for products and services offered by READY and our partners.

Visit our **Support** site (support.ready-robotics.com) for robot startup guides, FAQs, and more.

Visit our **Resources** page (ready-robotics.com/resources) for articles, whitepapers, and other resources.

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