READY

FORGE os 5

EPSON VT6L 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 EPSON robot to work with Forge/OS 5.

You will complete these steps:

1. Check for the requirements.
2. Connect all the devices and power on.
3. Set up Forge/OS.
4. Transfer Forge/OS robot configuration files to the robot.
5. Configure the robot in RC+ and Forge/OS.
6. Program your robot with Forge/OS!

Note: *This guide assumes that you have installed the robot following EPSON instructions.*

Important: Before you start programming, please read the Known Issues section. *The robot may behave unexpectedly when near a singularity. THESE ISSUES ARE NATIVE TO EPSON AND NOT AT THE FAULT OF FORGE/OS.*

HARDWARE REQUIREMENTS

Image	Part Name	Description	Vendor	Part Number
 	READY IPC	Hosts Forge/OS. ***Note:*** *READY offers two IPCs:* ***Forge/Hub*** *and* ***Forge/Ctrl (legacy)***	READY Robotics	
	READY pendant	The touch screen interface for Forge/OS.	READY Robotics	112563
	READY pendant Junction Box (**Forge/Ctrl only**)	Connects the READY pendant to the Forge/Ctrl and robot controller.	READY Robotics	R-101257
	12-Pin M12 to Flying Leads Cable	Connects to the READY pendant Junction Box or Forge/Hub to terminals.	READY Robotics	

Image	Part Name	Description	Vendor	Part Number
	Robot Controller	Connects the robot arm to power and to other devices.	EPSON	
	USB A-Male to B-Male Cable	Connects a Windows PC to the robot controller.	EPSON (Included with robot)	
	Windows PC	Required to load Forge/OS configuration files to the robot controller.		
 	Emergency Terminal Block Kit (with Cable)	Connects the robot controller to the READY pendant and safety devices.	EPSON	RE000975-1
	24V/2.5A Power Supply	Powers the READY pendant and other devices. Min./Max. current: 2.5/5.0 Amps.		e.g., Siemens 6EP1332-5BA00

Image	Part Name	Description	Vendor	Part Number
	Polycarbonate Enclosure or Cabinet	Protects the Terminal Block Kit and the Power Supply in an enclosure.		
	Cat5e Shielded Ethernet Cable (x2)	▪ Connects the robot controller to an IPC. ▪ Connects the READY pendant to an IPC.	McMaster-Carr	7734T6
	USB Flash Drive (with at least 2GB of available memory)	Transfers Forge/OS configuration files to the robot controller..	READY Robotics (or other)	R-400030

SOFTWARE REQUIREMENTS

EPSON RC+ is the software that you use to communicate with the robot in its native language. Access to the full version of RC+ came with the purchase of your robot. Install it on a Windows PC to load Forge/OS configuration files.

Note: *EPSON offers a free trial of RC+ for testing on a simulated robot. This free trial will NOT work for setting up Forge/OS.*

Important: *If you have built or loaded projects on the controller before, you may need to do a factory reset. Contact EPSON Support for help.*

Refer to the table below for the minimum required RC+, controller firmware, and Forge/OS versions.

Controller	Minimum Software Version
VT6L	RC+ 7.0, Compiler v7.4.0.x
	Firmware v7.5.53.0

Tip: *Refer to Checking the Firmware Version for instructions on how to check your controller firmware version.*

CHECKING THE FIRMWARE VERSION

Follow these steps to check what firmware version your EPSON controller is on.

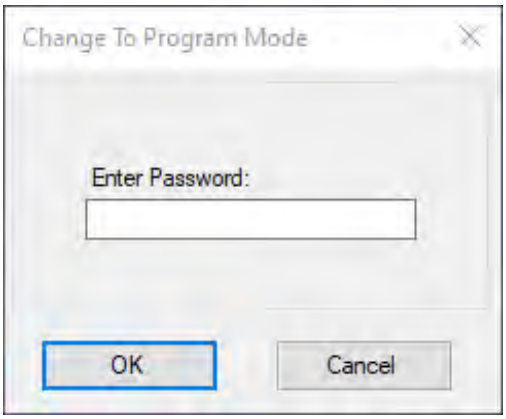
1. Plug the robot controller's power cable into a power outlet. Follow EPSON documentation for powering it on.

2. Plug the USB Cable into the robot controller's **PC** port. Plug the other end into a Windows PC with EPSON RC+ installed.

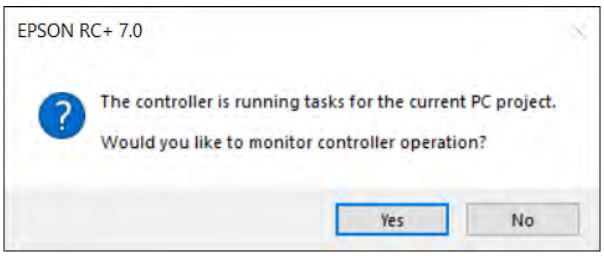
3. Open EPSON RC+ in Program Mode.

   - If you see the pop-up below, click **Change To Program Mode** before the 5 second countdown expires.
   - If the default boot mode is set to Program Mode, wait for the 5 second countdown to expire.

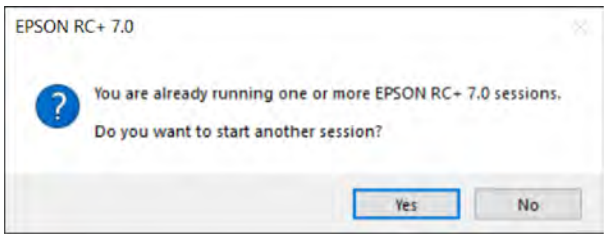
4 If you set a password, enter it. Then click **OK**.



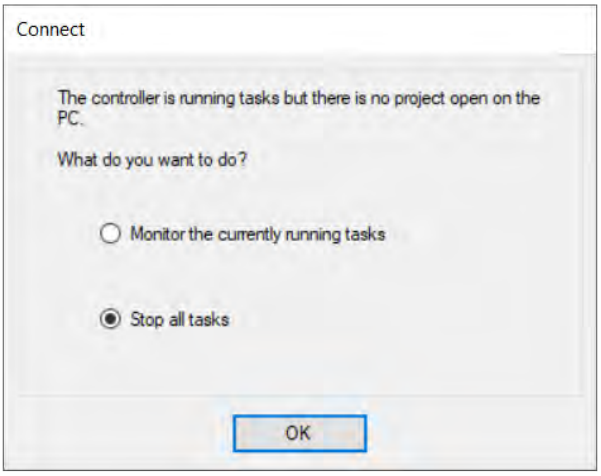
5 If you see a pop-up about monitoring controller operation before Program Mode boots, click **Yes**. If you see it after Program Mode boots, click **No**.



6 If you see a pop-up about starting another session, click **Yes**.



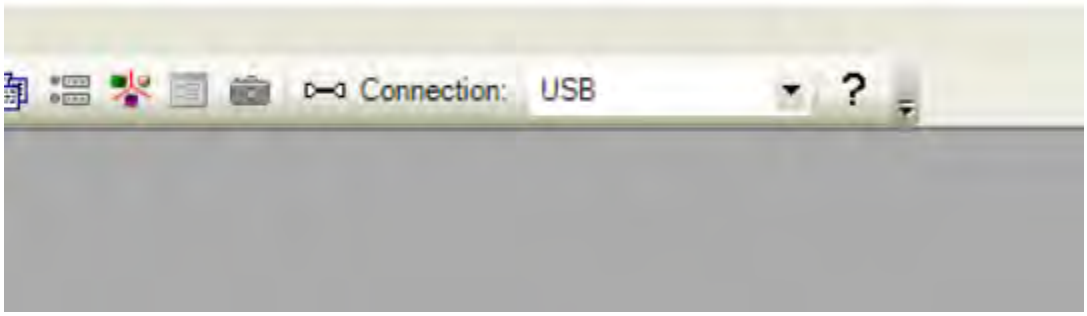
7 If you see a pop-up about current tasks running, select **Stop all tasks**.



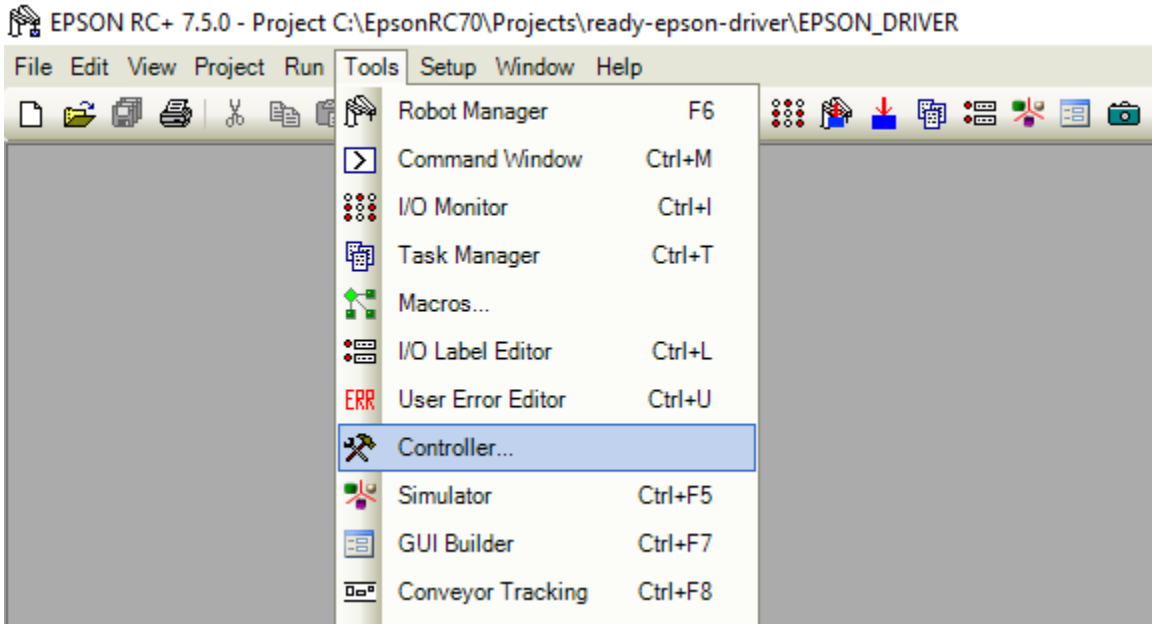
8 In the top menu, select a **Connection** type of **USB**.

Tip: *The USB option is only available when:*

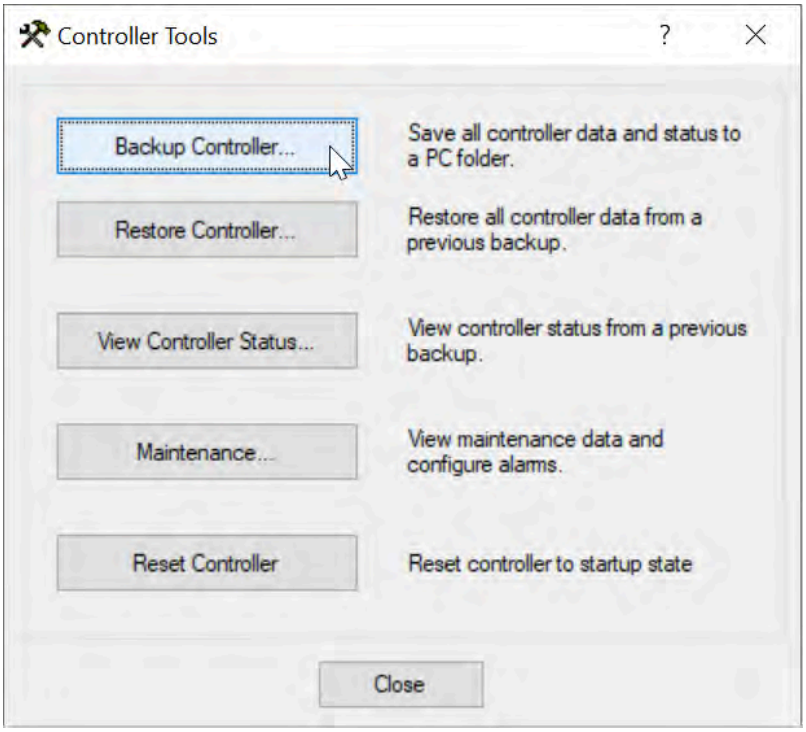
- *You are using the full version of RC+.*
- *Your USB cable is connected to the robot controller and Windows PC.*



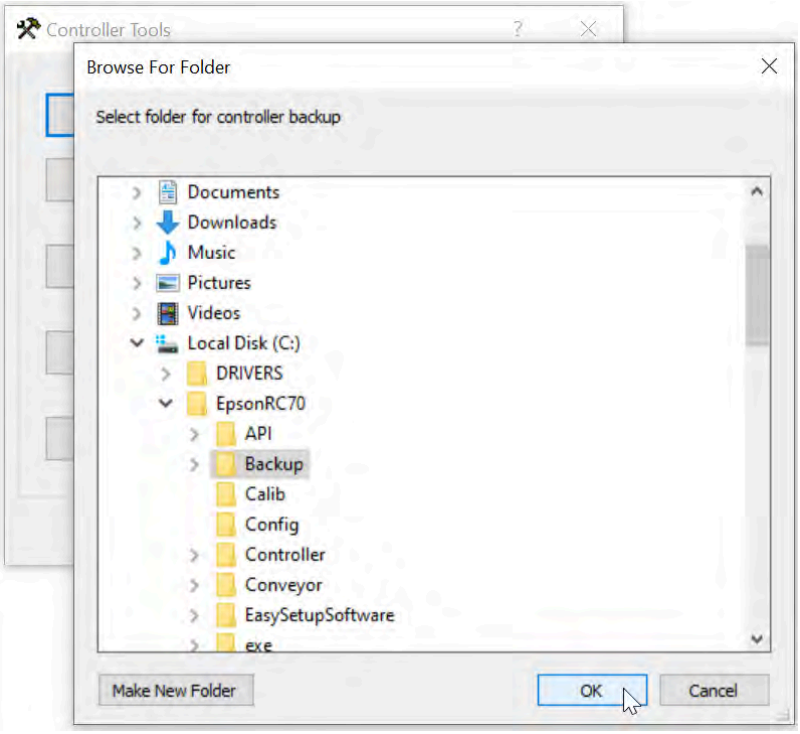
9 Go to **Tools**. Select **Controller** in the dropdown.



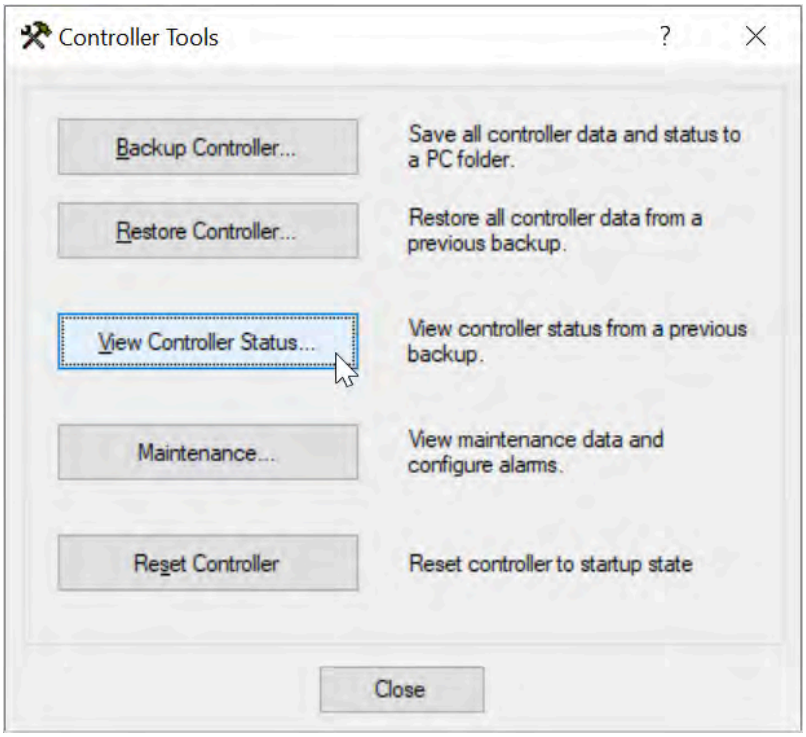
10 Click **Backup Controller**.



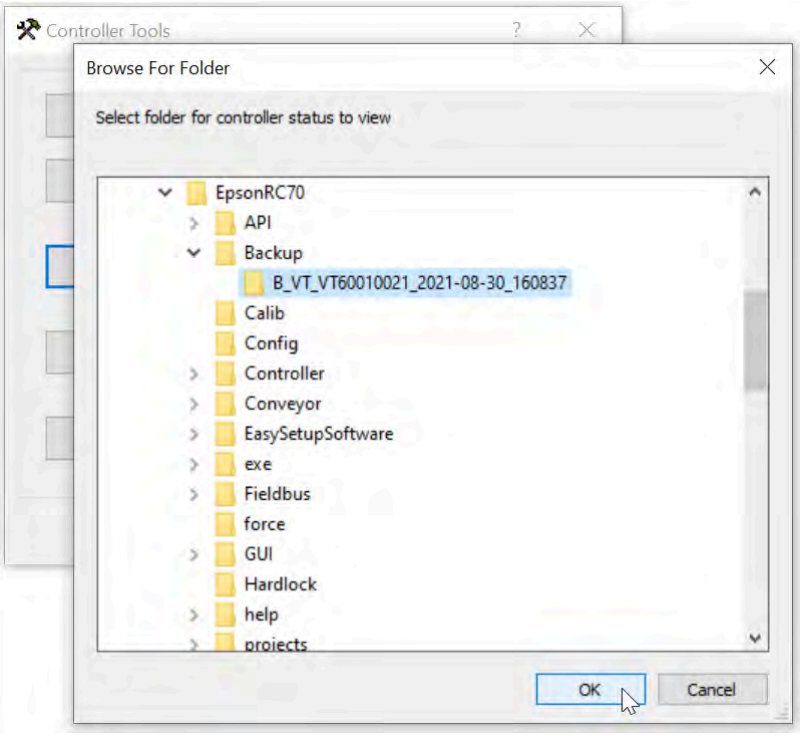
11 Select the location where you would like to store your backup. Click **OK**.



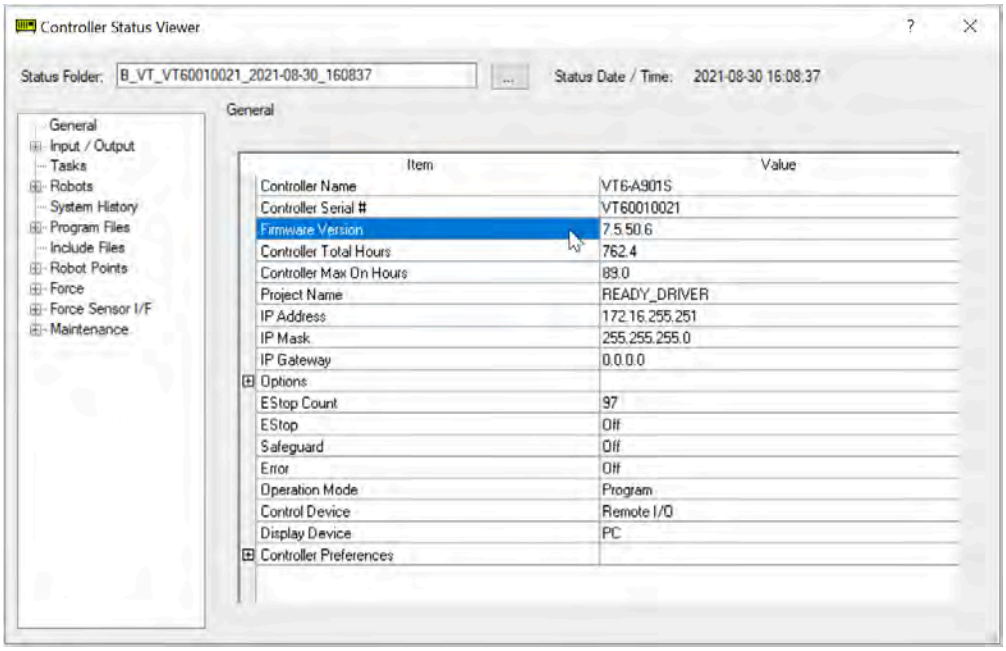
12 Click **View Controller Status**.



13 Select the backup file that you just created. Click **OK**.



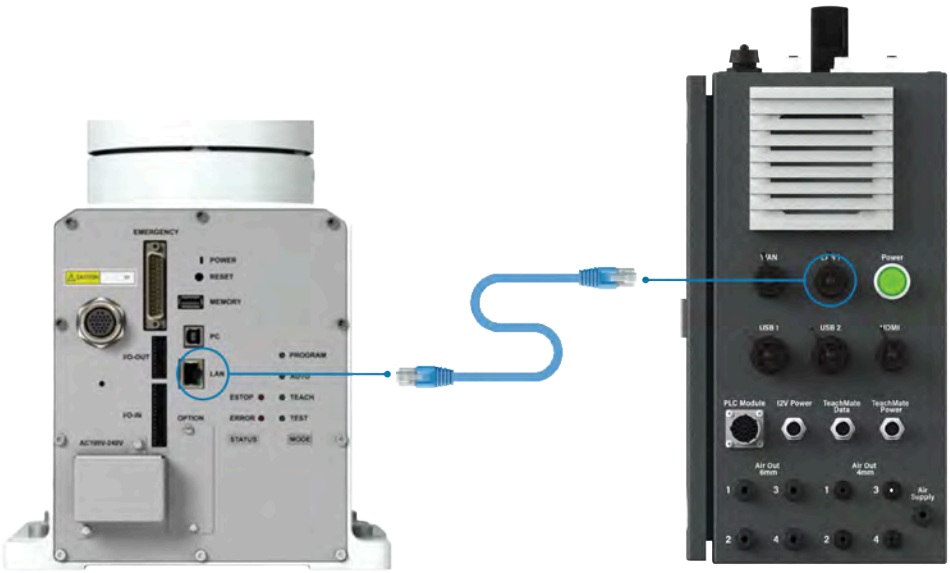
14 Find the **Firmware Version**.



15 Verify that your firmware version matches the requirement. **If you need to upgrade, contact EPSON Support**.

CONNECTING THE ROBOT CONTROLLER

1 Plug an Ethernet cable into the **LAN** port on the robot controller. Plug the other end into a **LAN** port on your IPC.



2 Plug one end of the EPSON Emergency Cable into the **EMERGENCY** port on the robot controller. Plug the other end into the Terminal Block Kit.

CONNECTING THE READY PENDANT

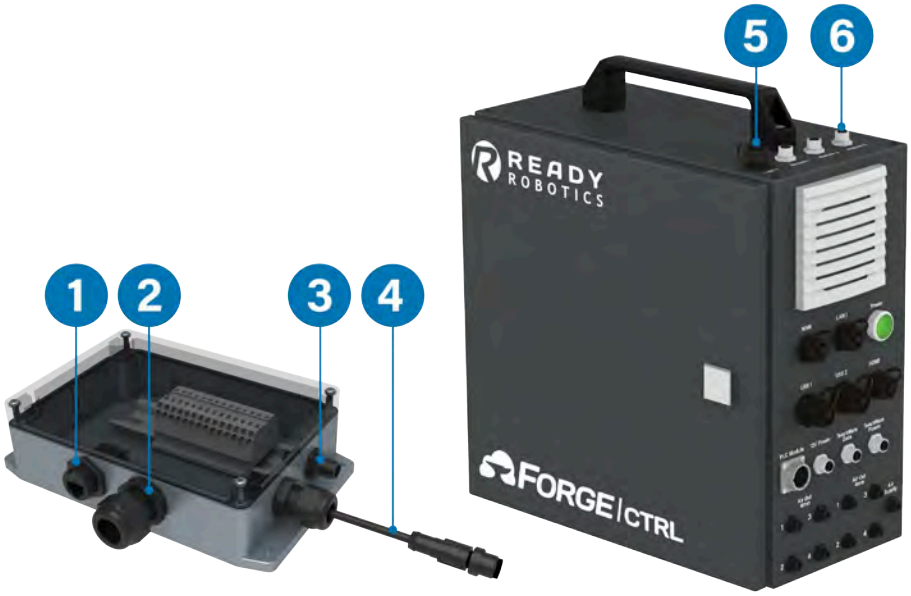
The READY pendant includes these safety outputs:

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

Note: *For EPSON robots, you connect the* ***READY pendant*** *Emergency Stop, but not the Key Switch and Enabling Switch. Always perform a risk assessment and use appropriate safeguards, like a safety fence.*

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

1. If you are using a Forge/Ctrl, prepare the READY pendant Junction Box:



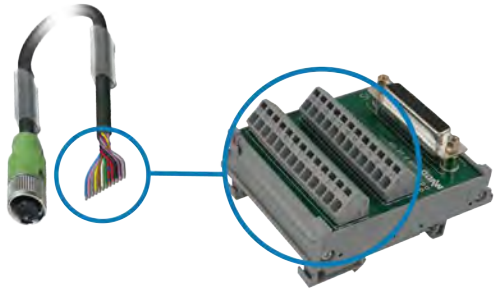
   a. Connect a Cat5e STP Ethernet cable from the junction box Ethernet port (1) into a **LAN** port (5) on the Forge/Ctrl.

   b. Connect the 8-Pin power cable (4) from the junction box into one of the **Module** ports (6) on the Forge/Ctrl.

   c. Connect the 12-Pin flying leads cable to the safety port (3) on the junction box.

2. If you are using a Forge/Hub, connect the 12-Pin flying leads cable to the **Safety** port on the Forge/Hub.

3 Wire the 12-Pin M12 Cable's flying leads to the Terminal Block Kit:



12-Pin Cable	EPSON Emergency Connector	Function
Brown	N/A	Enabling Switch
Blue	N/A	Enabling Switch
White	N/A	Enabling Switch
Green	N/A	Enabling Switch
Pink	Pin 1	Emergency Stop
Yellow	Pin 9	Emergency Stop
Black	Pin 10	Emergency Stop
Grey	Pin 14	Emergency Stop
Red	N/A	Key Switch
Violet	N/A	Key Switch
Grey/Pink	N/A	Key Switch
Red/Blue	N/A	Key Switch
	Pin 2, 3	Jumper
	Pin 15, 16	Jumper
	Pin 4, 11	Jumper
	Pin 12, 17	Jumper

4 Wire the safeguard device (e.g., safety fence) and latching system. You can wire a button or switch to the latch release pins to control the latching mechanism. Or you can jumper the latch release inputs so the safeguard auto resets when you close the fence (shown in the table below).

EPSON Emergency Connector	External 24V Power Supply	Safeguard Device	Function
	24V	Safeguard Contact 11	Safeguard Input 1 Circuit
Pin 7		Safeguard Contact 12	Safeguard Input 1 Circuit
Pin 8	0V		Safeguard Input 1 Circuit
	24V	Safeguard Contact 21	Safeguard Input 2 Circuit
Pin 20		Safeguard Contact 22	Safeguard Input 2 Circuit
Pin 21	0V		Safeguard Input 2 Circuit
Pin 18	24V		Latch Release Input (Jumpered)
Pin 19	24V		Latch Release Input (Jumpered)

Tip: *Refer to EPSON documentation for more information on safeguard wiring and pin assignments.*

POWERING ON

1. Plug the robot controller's power cable into a power outlet.
2. Power on the robot controller.
3. Plug your IPC's power cable into a power outlet.
4. Power on your IPC.

   Note: *If you are using a Forge/Ctrl, turn the* ***Power Disconnect Switch*** *to* ***ON****. Then press the green power button on the opposite side.*

SIGNING IN TO FORGE/OS

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

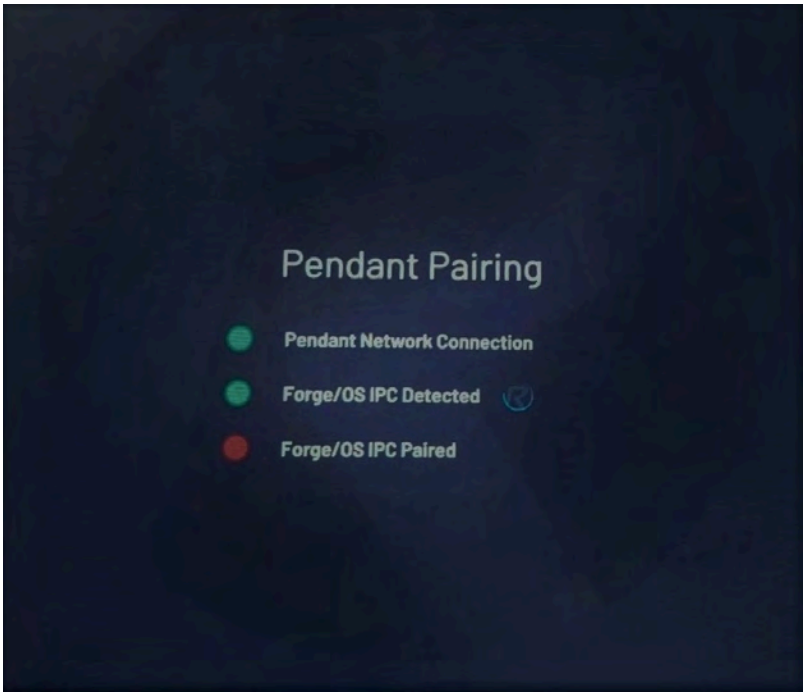
1 If you need to install Forge/OS 5 on your IPC, stop here and follow all the steps in Appendix A, then come back to these steps.

> ***Tip:*** *Forge/OS 5 is installed on all Forge/Ctrls and Forge/Hubs shipped after June 1, 2021.*

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.

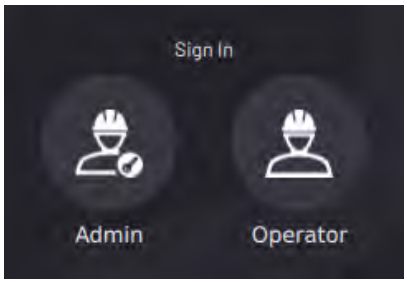


The UI shows the real-time state of each step. For example, if the pendant loses its network connection during

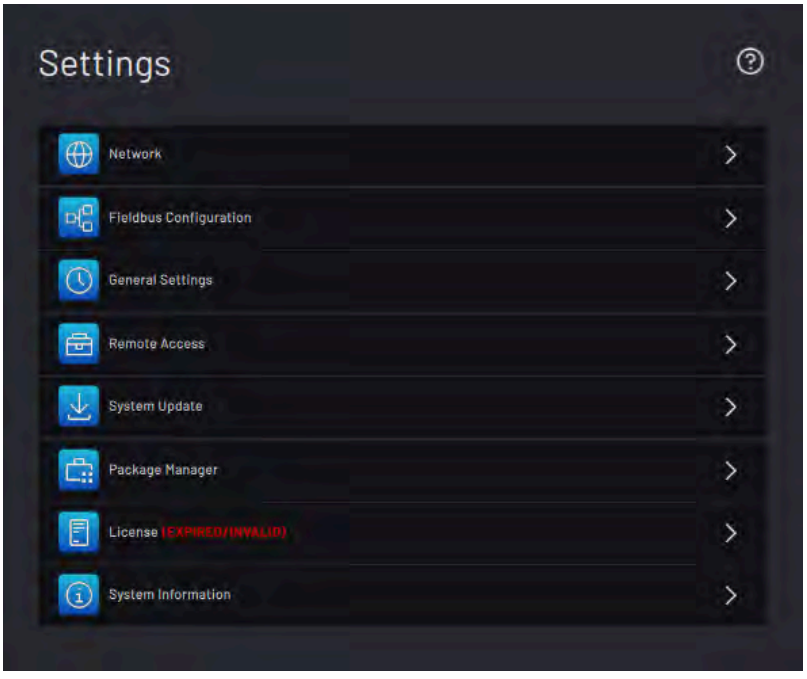
pairing, all steps become undone.

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.

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.

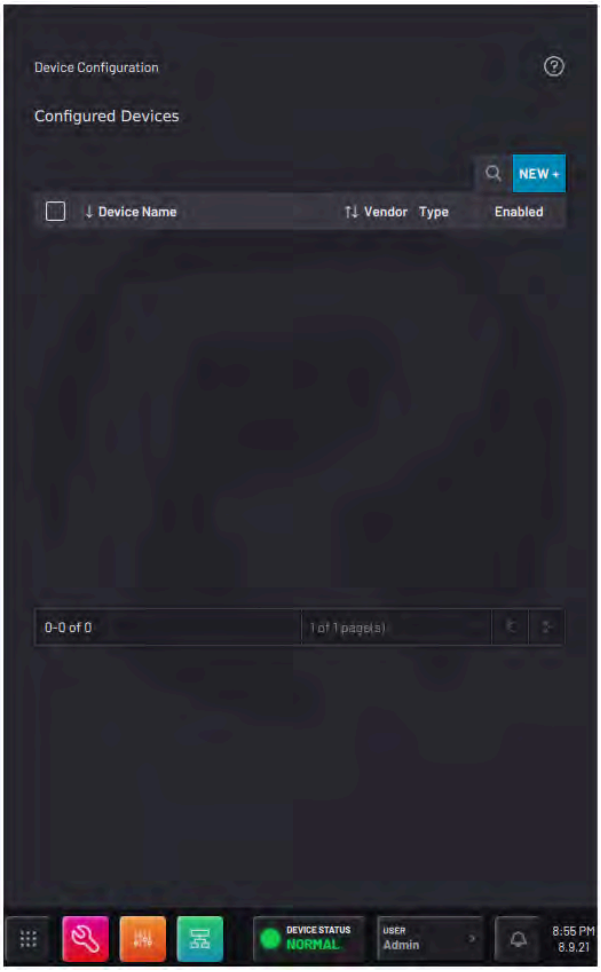


5 With Forge/OS active, move on to the next section.

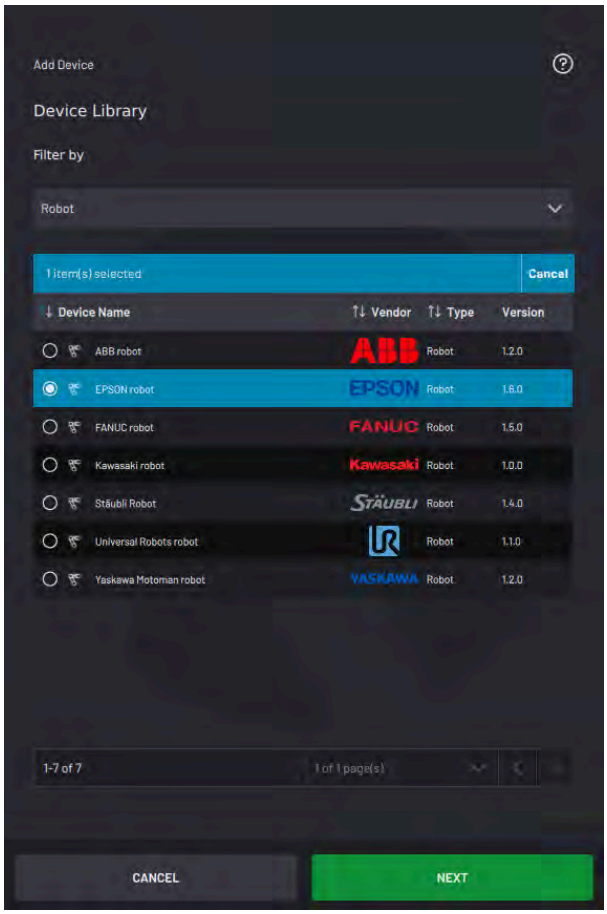
DEVICE CONFIGURATION - PT.1

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

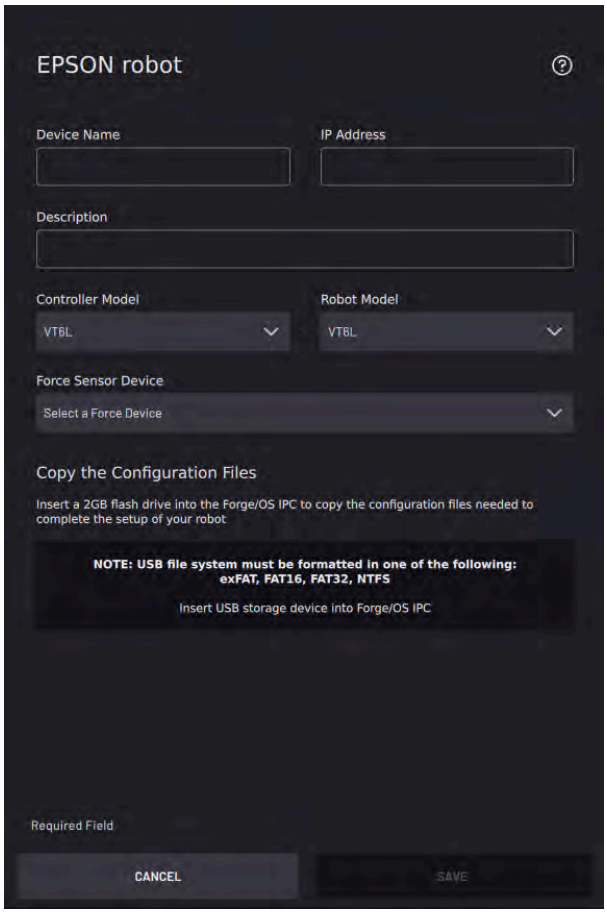
2 Tap **New +** to open the Device Library.



3 In the Device Library list, select **EPSON industrial robot**. Then tap **NEXT**.



4 Select **VT6L** for the **Controller Model**. 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****.*

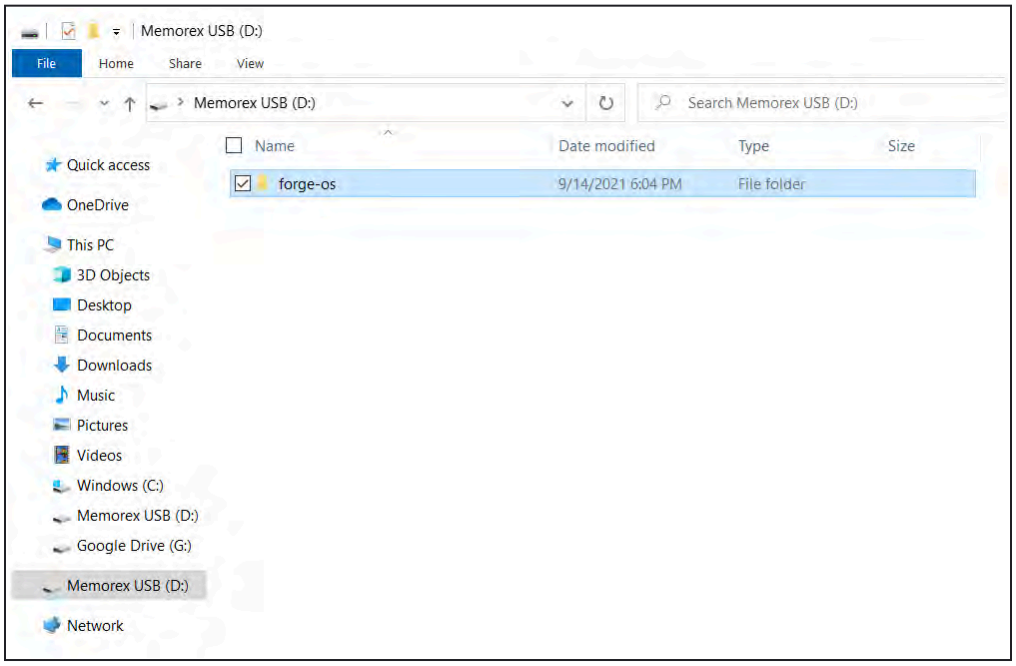
6 Tap **Start Transfer** and wait for it to finish.

7 Remove the USB flash drive when prompted.

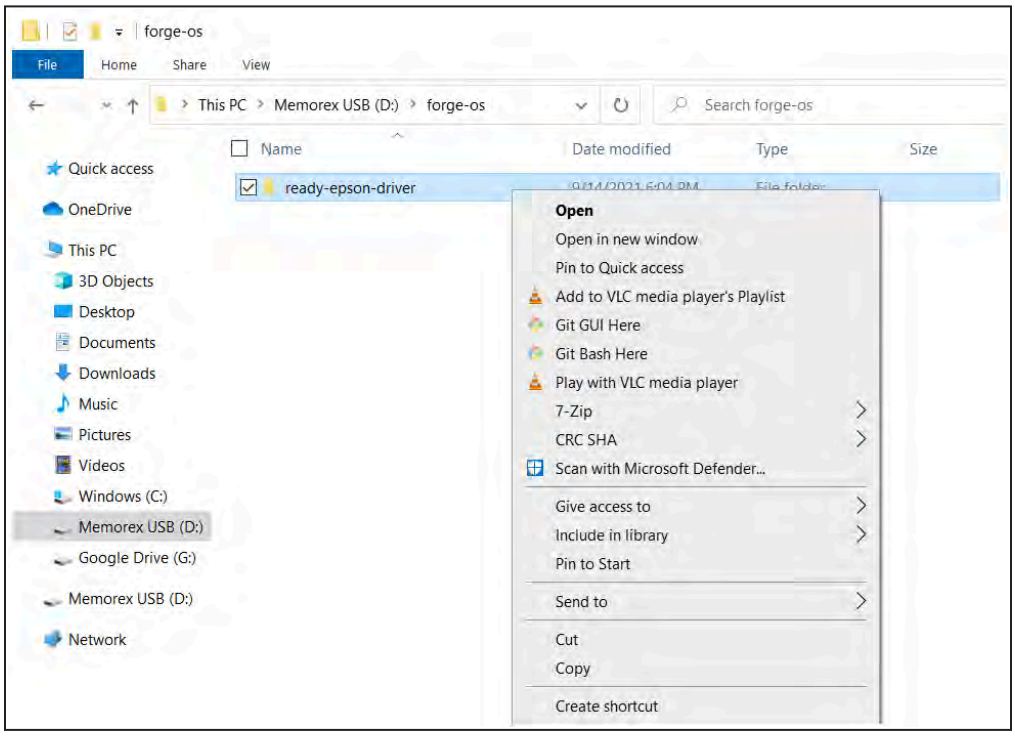
IMPORTING THE PROJECT IN RC+

1. Insert the USB flash drive (that has the configuration files from the IPC) into the Windows PC.

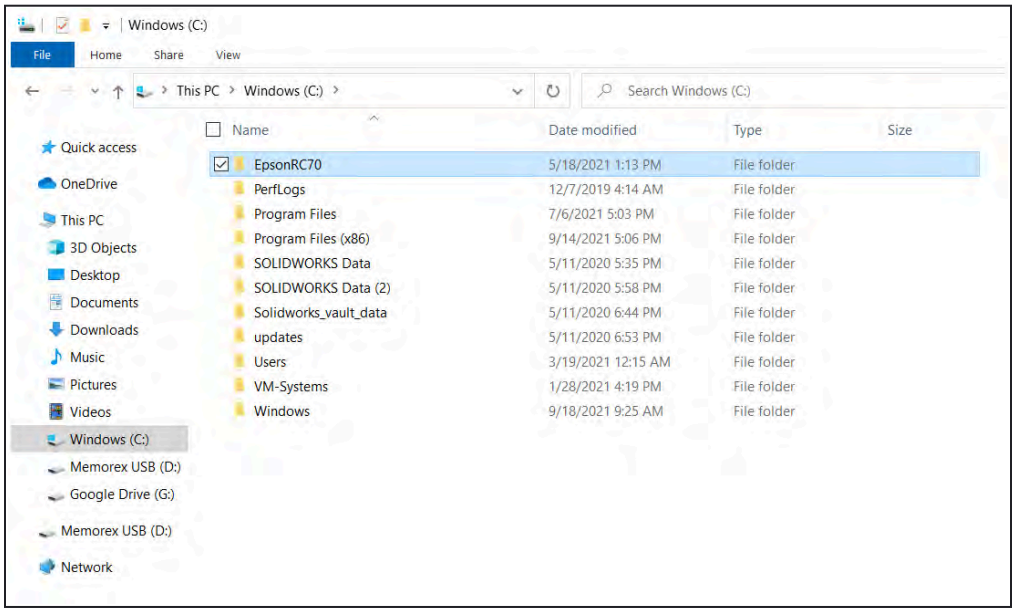
2. In **File Explorer**, go to your USB flash drive's storage. Open the **forge-os** folder.



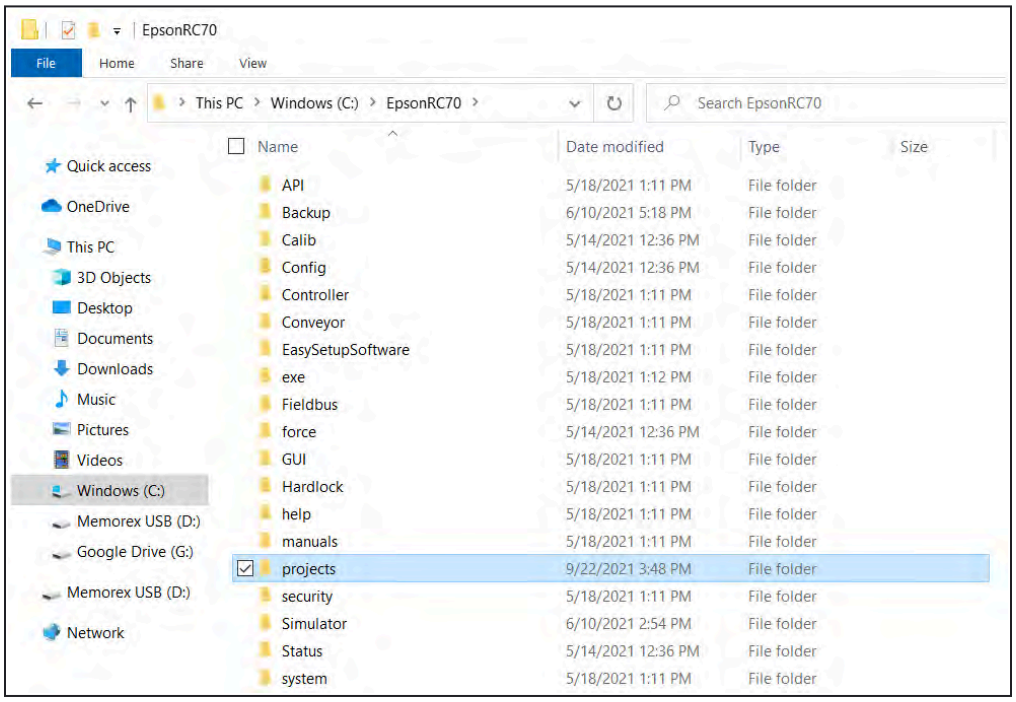
3 In that forge-os folder, right-click the **ready-epson-driver** folder to **copy** it.



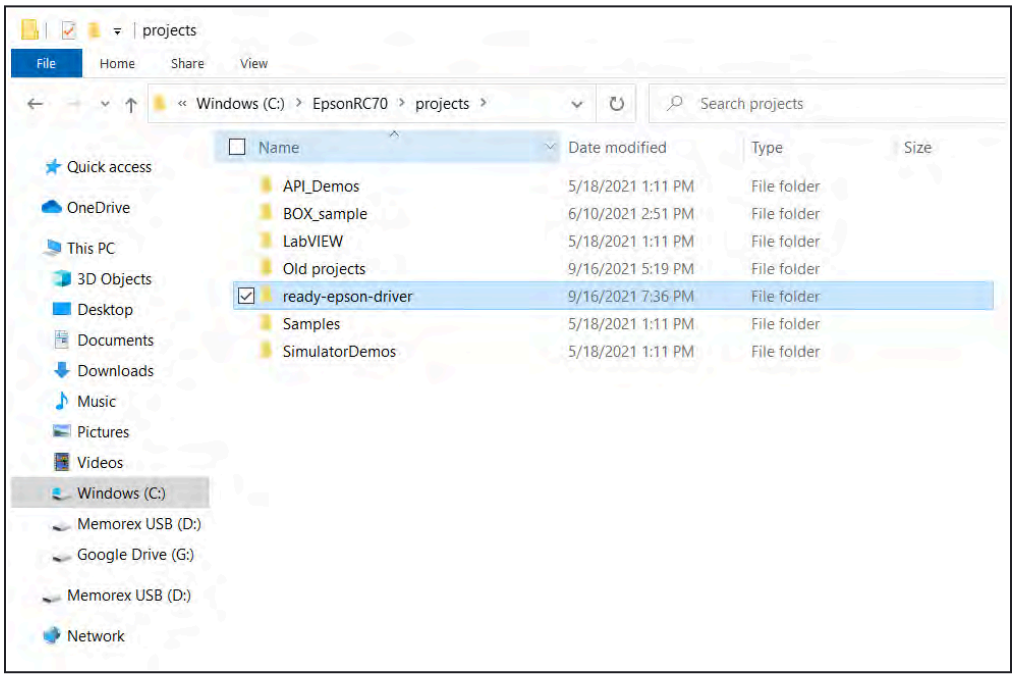
4 In your **Windows (C:)** drive, open the **EpsonRC70** folder that was made when you installed the EPSON RC+ software.



5 In that EpsonRC70 folder, open the **projects** folder.



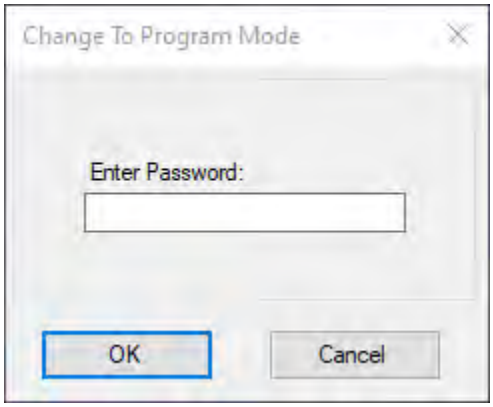
6 In that projects folder, right-click to **paste** the **ready-epson-driver** folder that you copied.



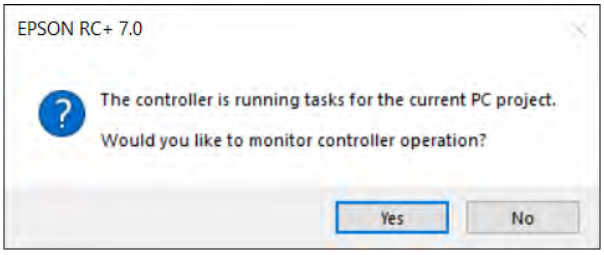
7 Open RC+ in Program Mode.

- If you see the pop-up below, click **Change To Program Mode** before the 5 second countdown expires.
- If the default boot mode is set to Program Mode, wait for the 5 second countdown to expire.

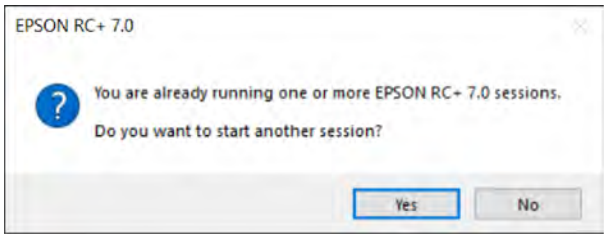
8 If you set a password, enter it. Then click **OK**.



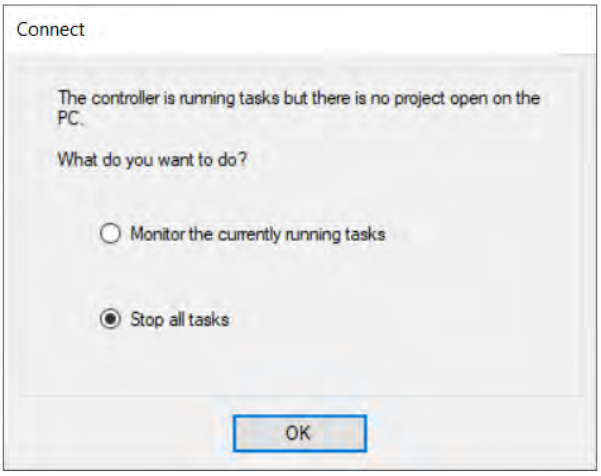
9 If you see a pop-up about monitoring controller operation before Program Mode boots, click **Yes**. If you see it after Program Mode boots, click **No**.



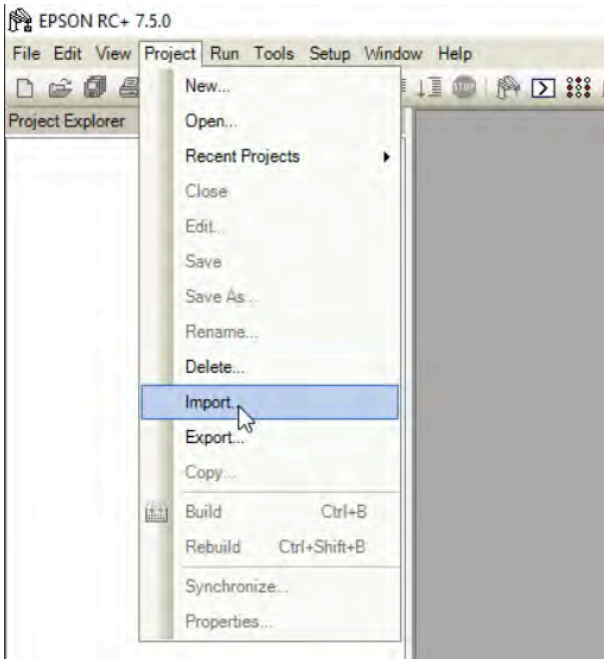
10 If you see a pop-up about starting another session, click **Yes**.



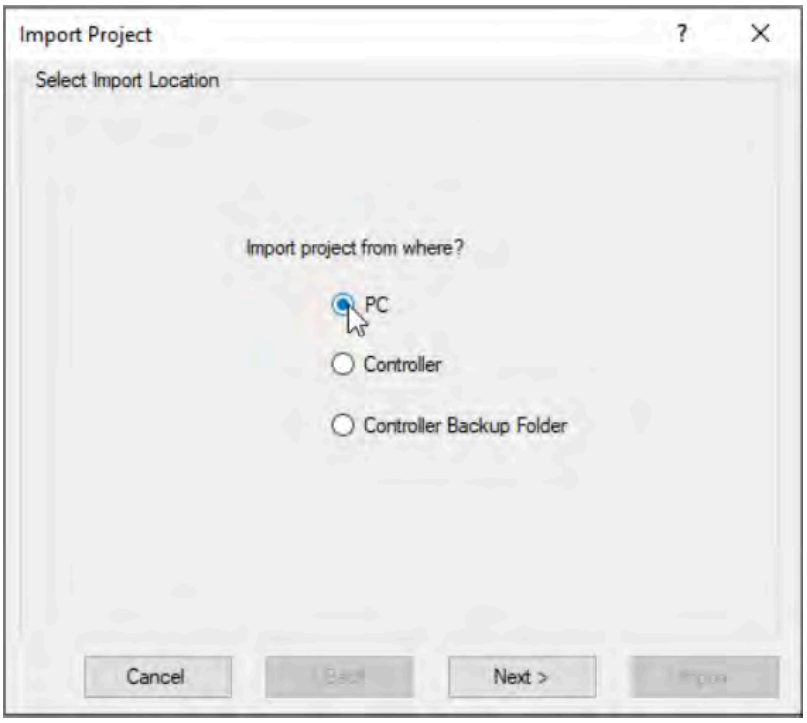
11 If you see a pop-up about current tasks running, select **Stop all tasks**.



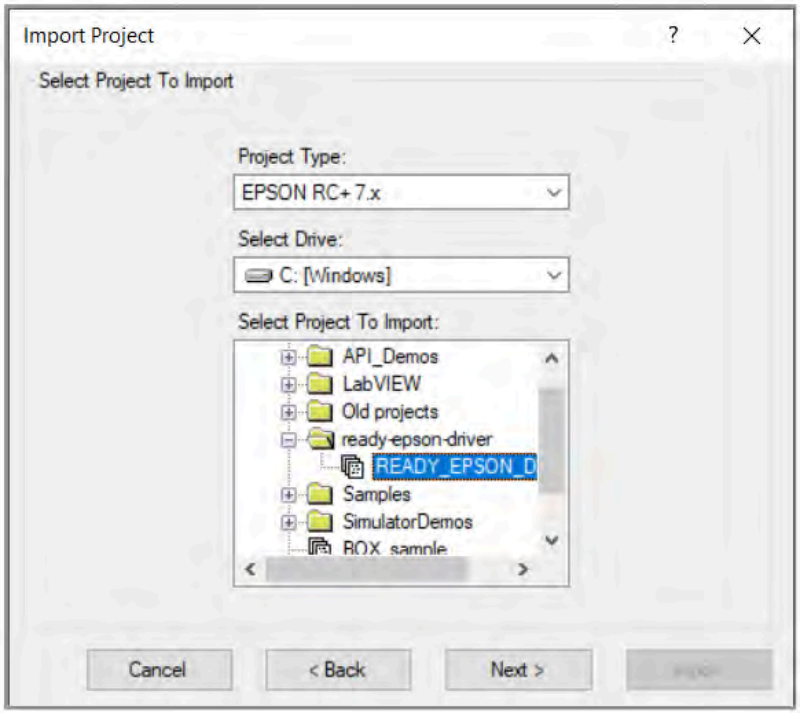
12 In the menu bar across the top of EPSON RC+, open the **Project** tab. Click **Import**.



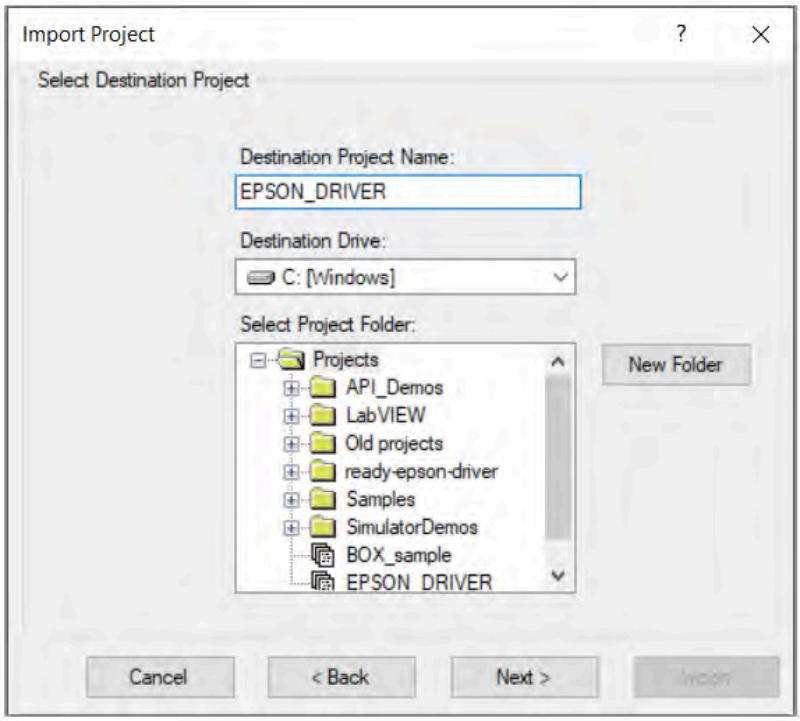
13 Set the import location as **PC**. Then click **Next**.



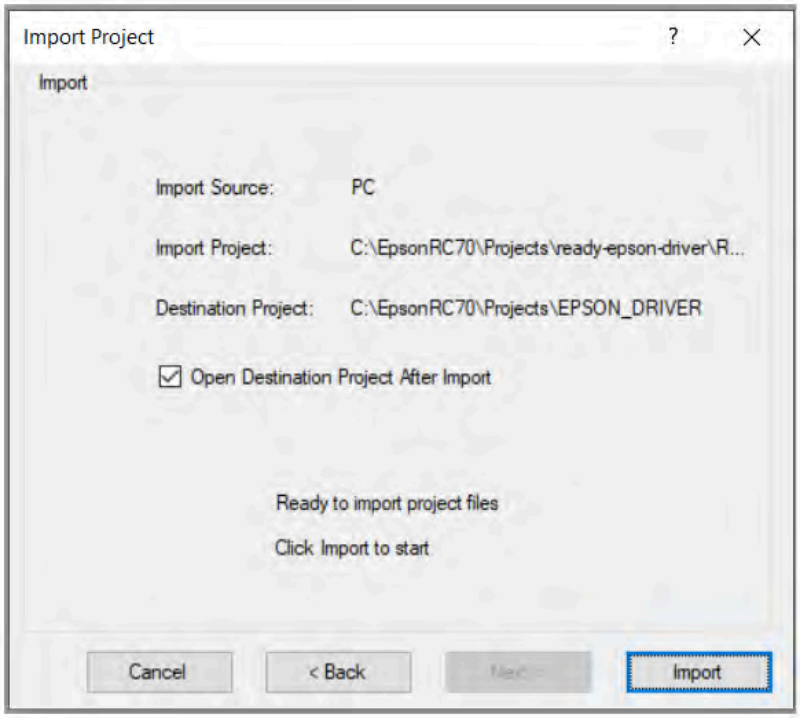
14 Select a project type of **EPSON RC+ 7.x**. Select the copied "ready-epson-driver" project. Then click **Next**.



15 Type "EPSON_DRIVER" in the **Destination Project Name** field. Then click **Next**.

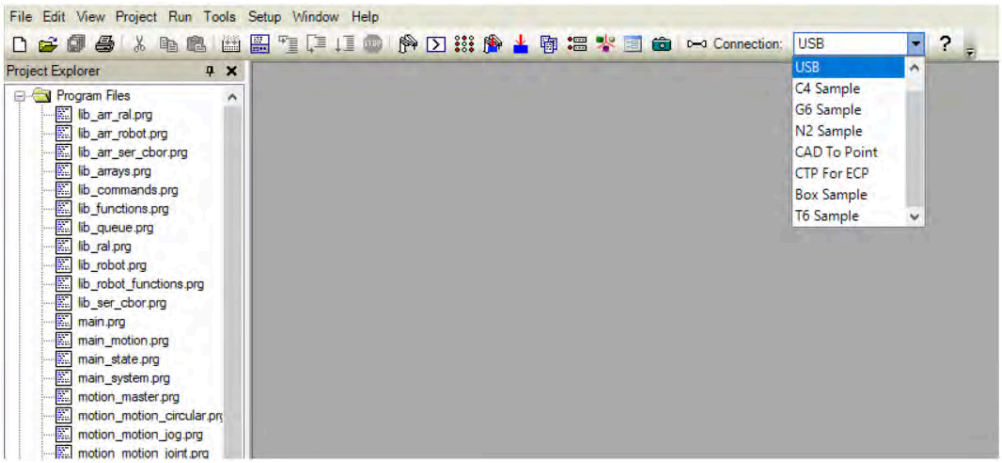


16 Select the **Open Destination Project After Import** checkbox. Then click **Import**.



CONFIGURING THE ROBOT

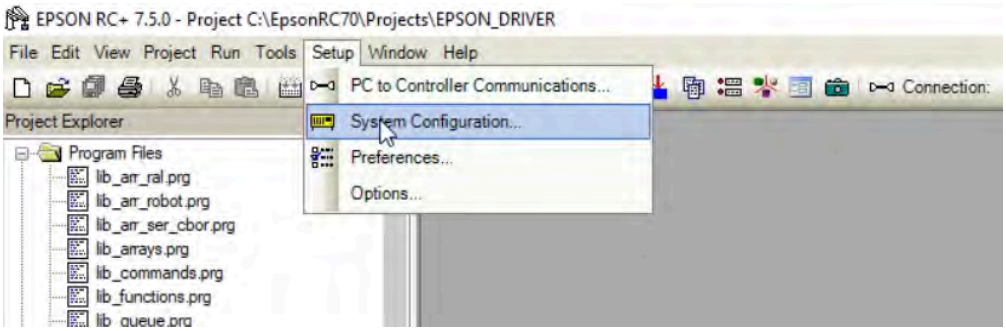
1 Expand the **Connection** dropdown in the top-right corner. Select **USB** to connect to your robot.



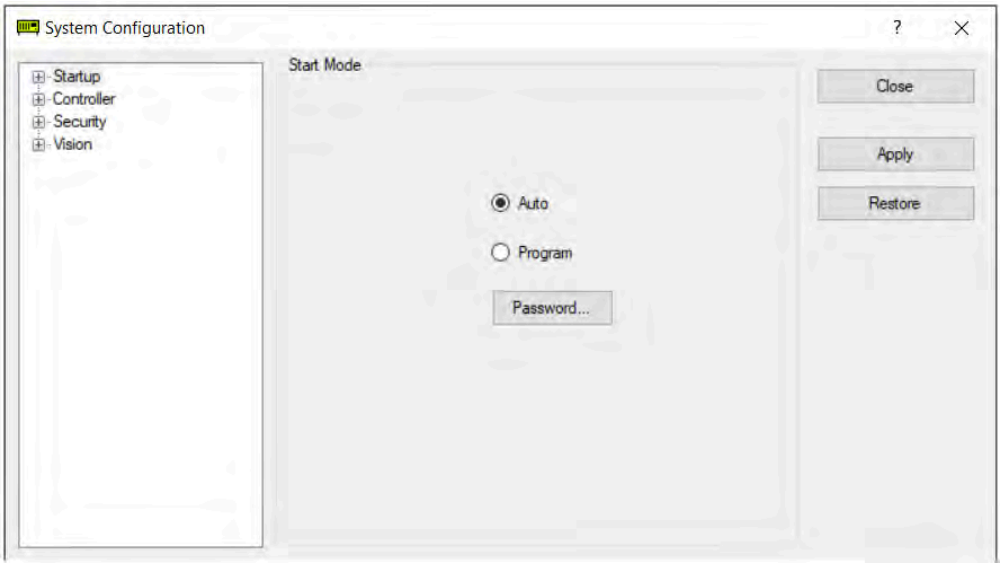
Tip: *The USB option is only available when:*

- *You are using the full version of RC+.*
- *Your USB cable is connected to the robot controller and Windows PC.*

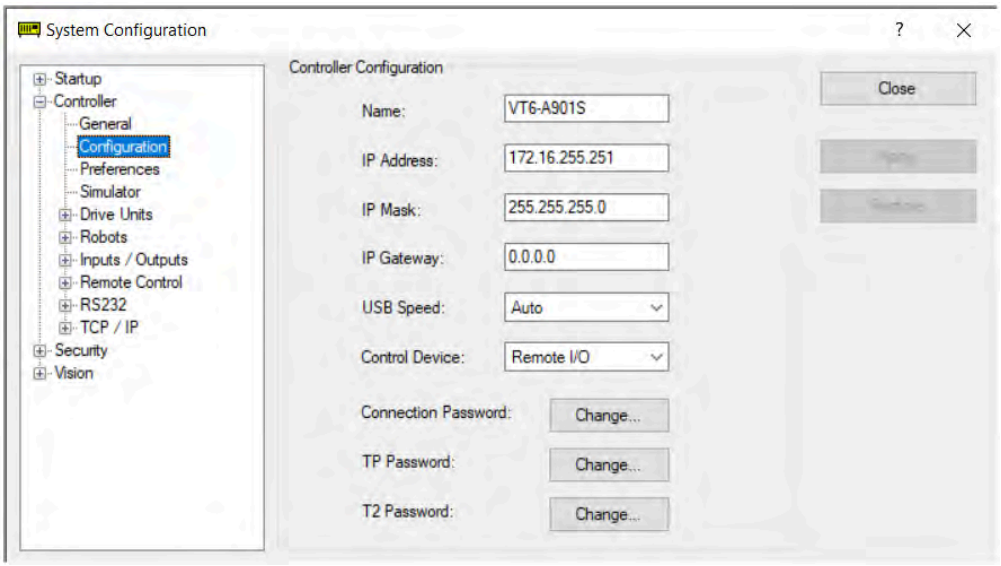
2 In the top menu bar, select **Setup**. Go into **System Configuration**.



3 The **Startup** menu automatically appears. If **Auto** mode is not already selected, select it and click **Apply**.



4 In the **Controller** menu, select **Configuration**:



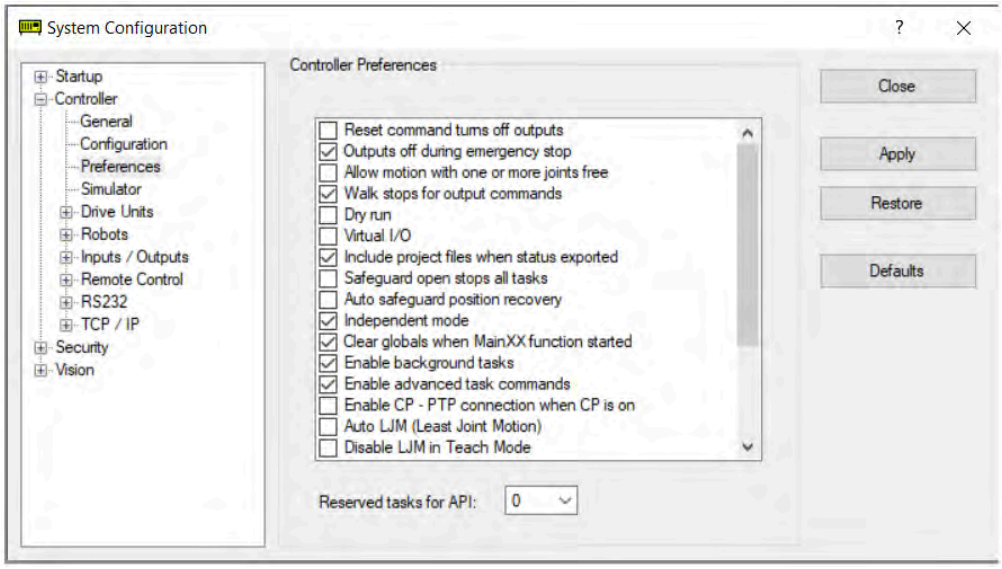
a Set the IP Address and Subnet Mask according to the READY IPC you have:

- *Forge/Ctrl:* set the **IP Address** to **172.16.255.251** and set the **Subnet Mask** to **255.255.255.0**.
- *Forge/Hub:* set the **IP Address** to **192.168.1.20** and set the **Subnet Mask** to **255.255.255.0**.

b Select a **Control Device** of **Remote I/O**. This allows your robot to run through a READY pendant instead of through a Windows PC.

c Click **Apply**.

5 In the **Controller** menu, select **Preferences**:



a Uncheck **Virtual I/O** to disable it.

b Uncheck **Auto safeguard position recovery** to disable it.

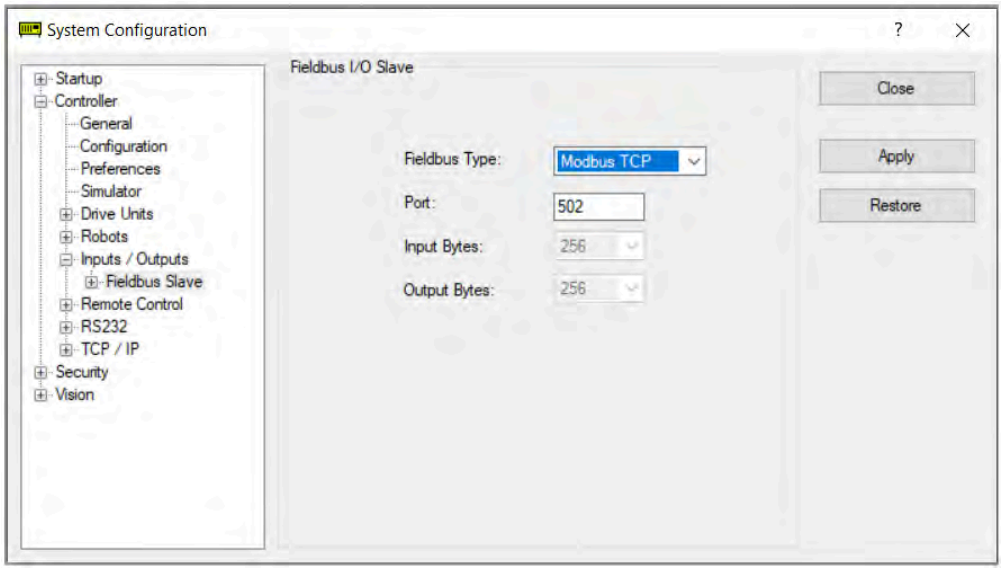
c Select **Independent mode**.

d Select **Enable background tasks**.

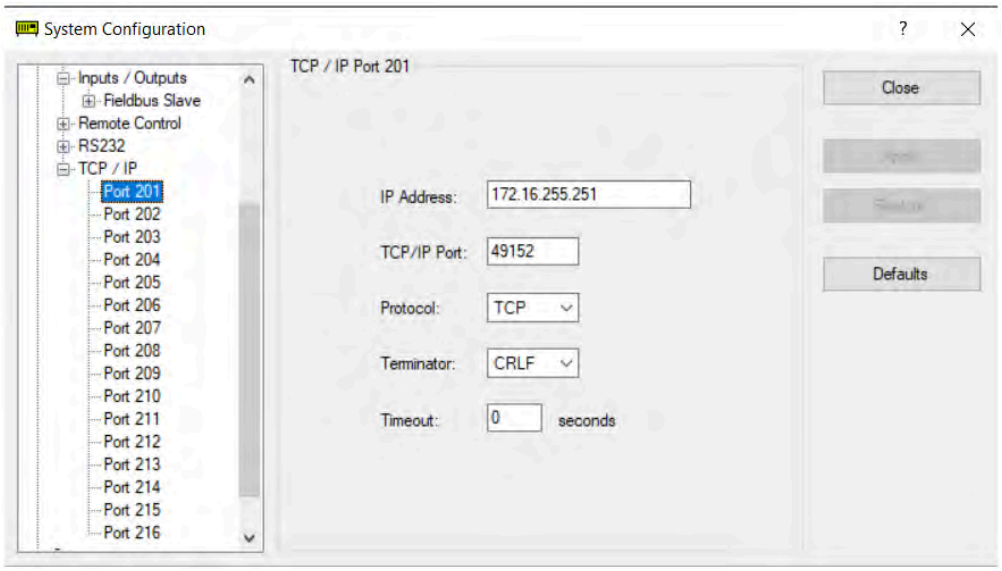
e Select **Enable advanced task commands**.

f Click **Apply**.

6 In the **Inputs/Outputs** menu, select **Fieldbus Slave**. Select a **Fieldbus Type** of **Modbus TCP**. Click **Apply**.



7 In the **TCP/IP** menu, set the **TCP/IP Ports** to the values listed below. Use the same **IP Address** as earlier for each port.



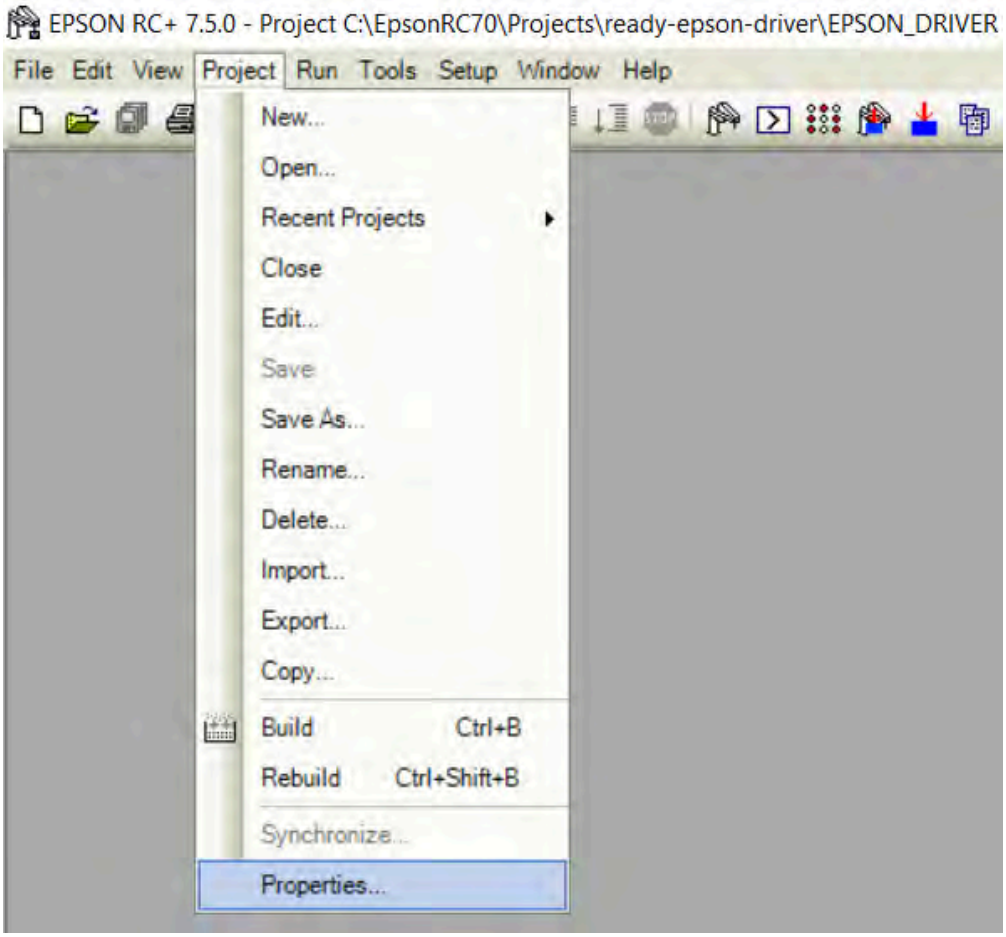
a Set **Port 201** to **49152,** enter the correct IP address, then **Apply**.

b Set **Port 202** to **49153,** enter the correct IP address, then **Apply**.

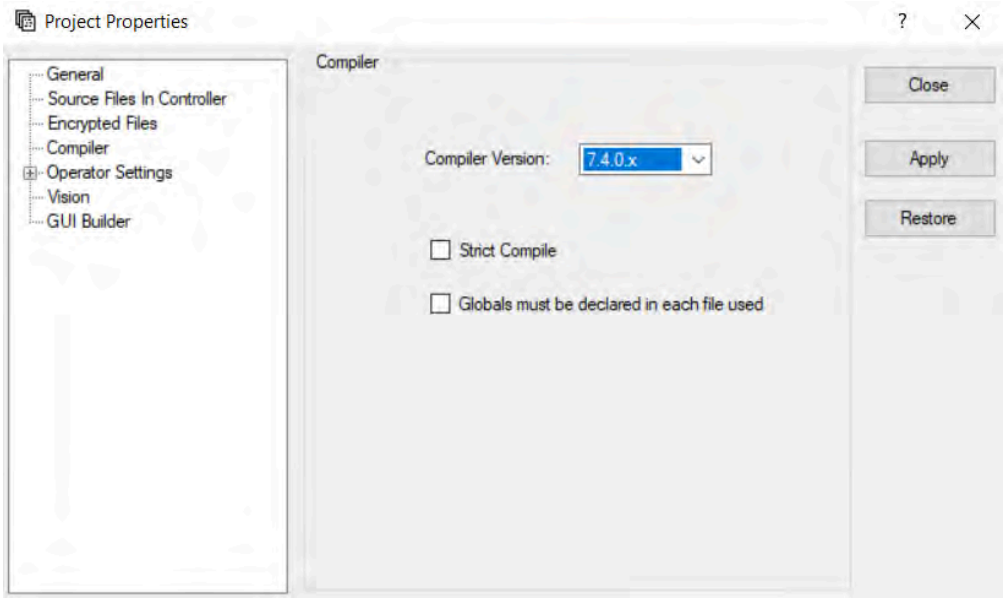
c Set **Port 203** to **49154,** enter the correct IP address, then **Apply**.

8 Click **Close.**

9 Open the **Project** tab. Click **Properties**.



10 In the **Compiler** menu, expand the **Compiler Version** dropdown. Select **7.4.0.x** (or later).

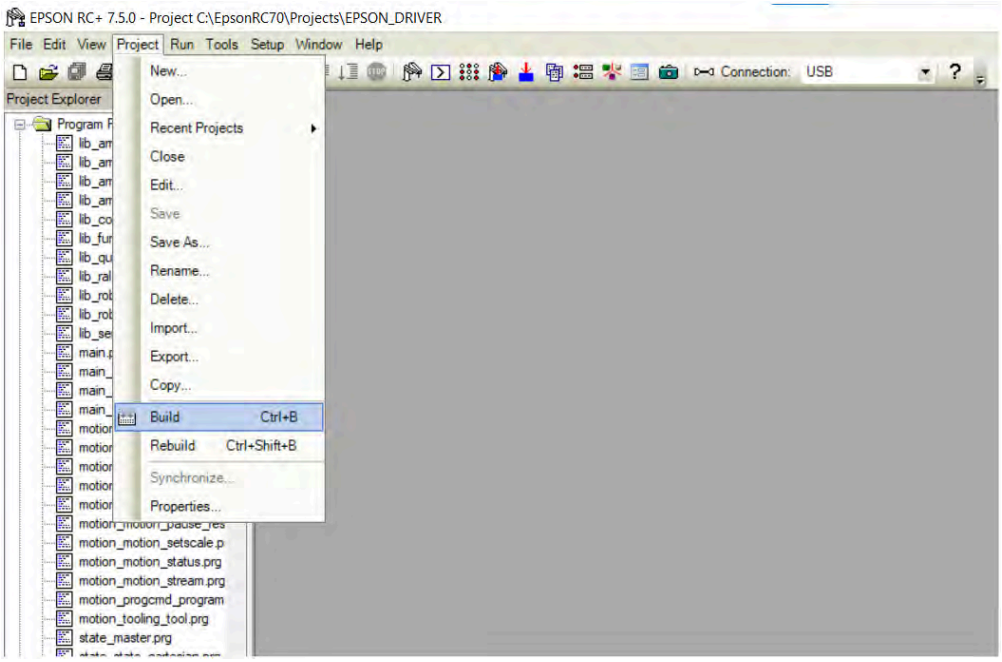


11 Click **Apply**, then **Close** out of the pop-up.

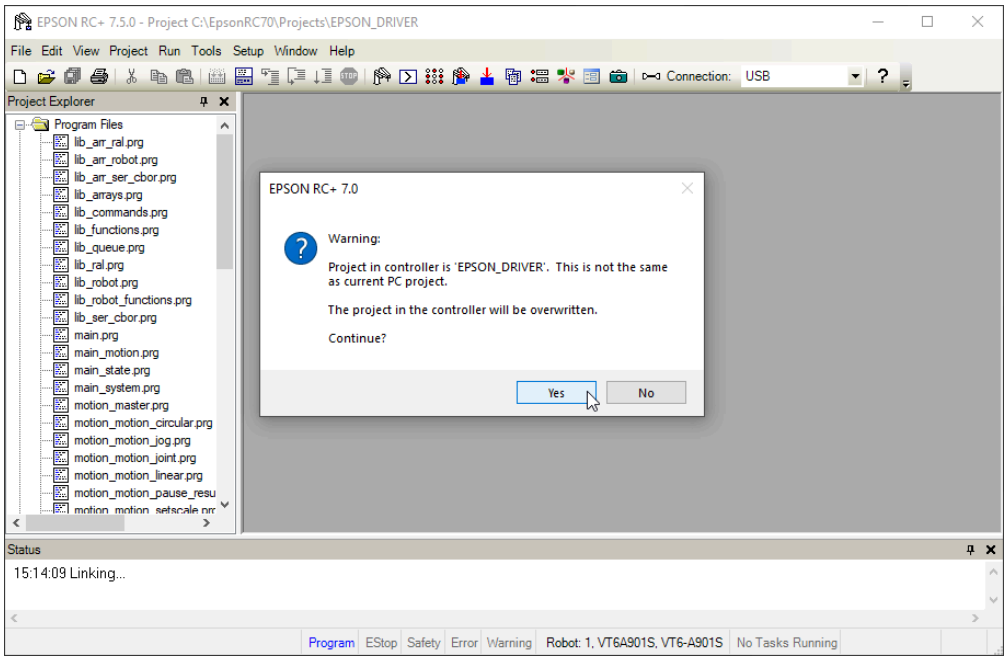
BUILDING THE DRIVER

It's time to build the driver. This step sends the program files to the robot.

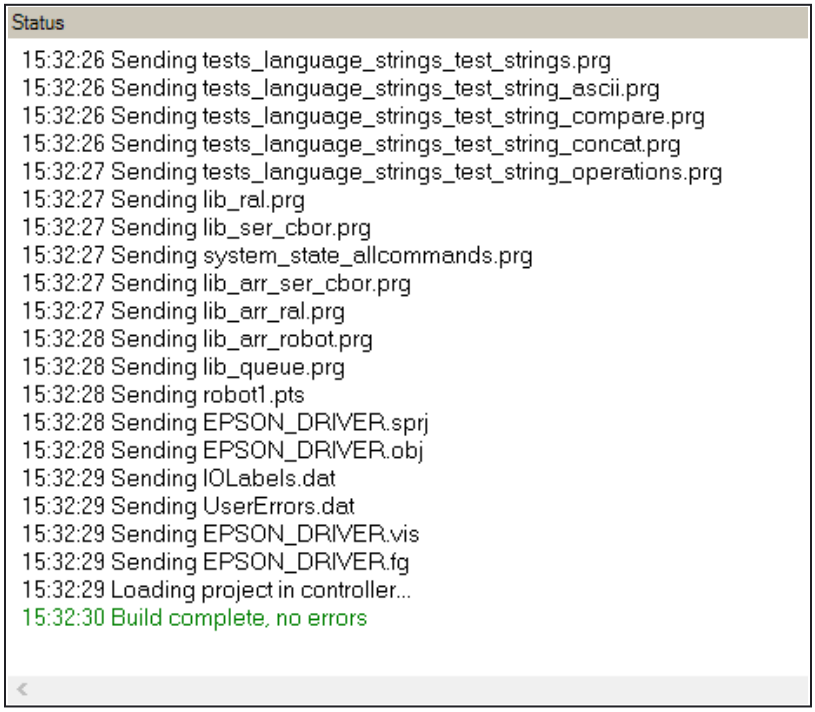
1 In the top menu bar, open the **Project** dropdown. Click **Build**.



2 If you see the prompt below, select **Yes** to overwrite the project on the controller.



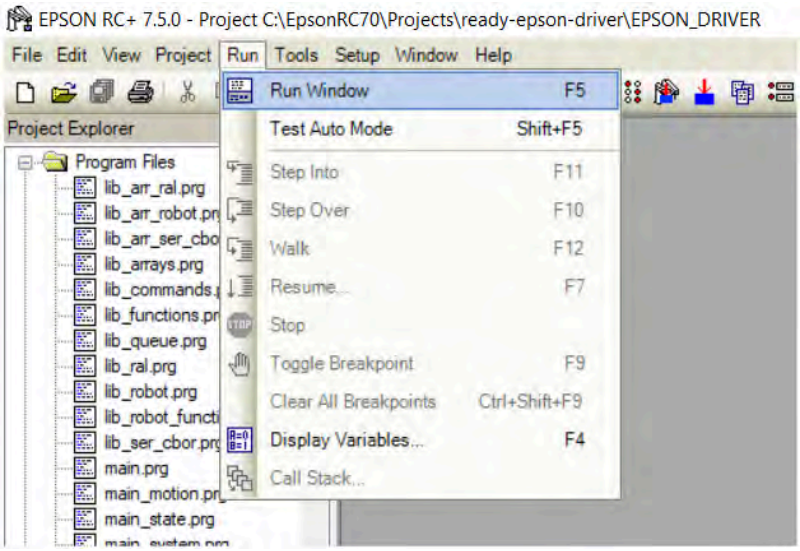
3 Check that you have a successful build by looking for a "**Build complete, no errors**" message in the **Status** window.



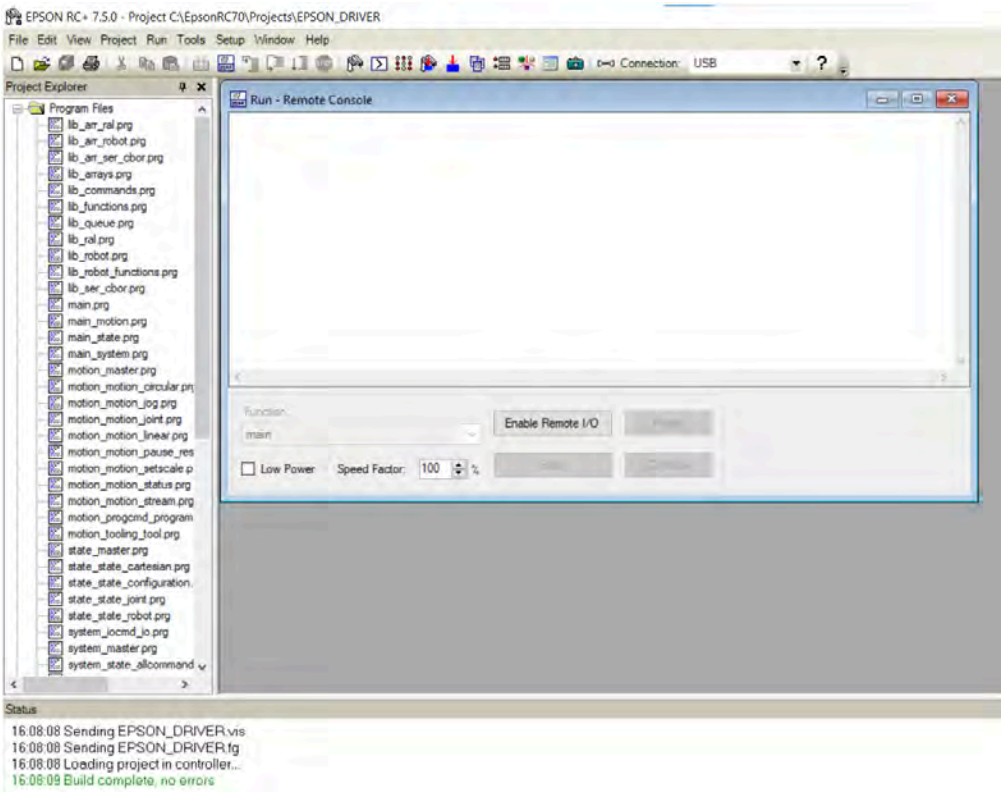
Tip: *If you see build errors, refer to Appendix C: Troubleshooting.*

STARTING THE DRIVER

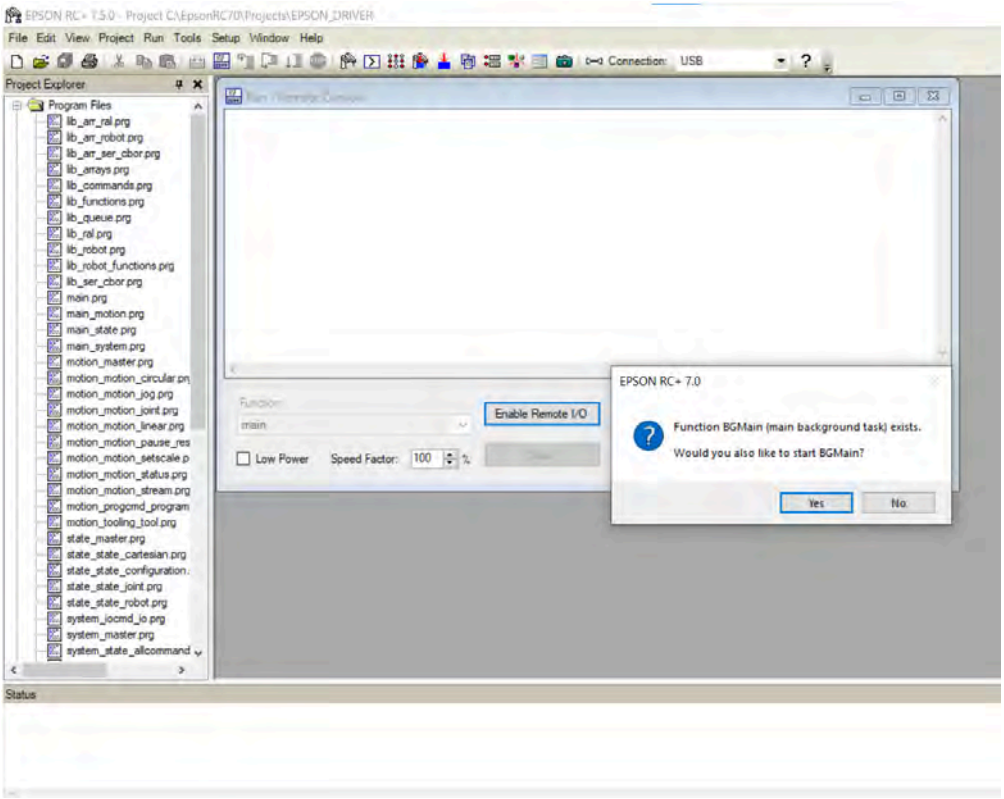
1 In the top menu bar, open the **Run** dropdown. Click **Run Window**.



2 To start the driver in Remote I/O mode, click **Enable Remote I/O**.



3 In the pop-up below, click **Yes** to start BGMain.



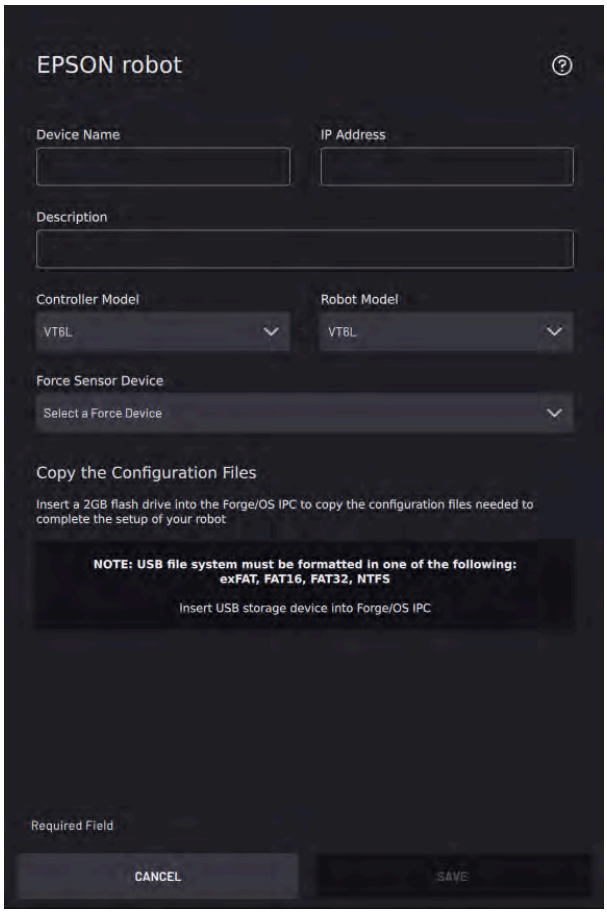
DEVICE CONFIGURATION - PT.2

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

1. Finish entering your EPSON device information.

   a. Give your device a name.

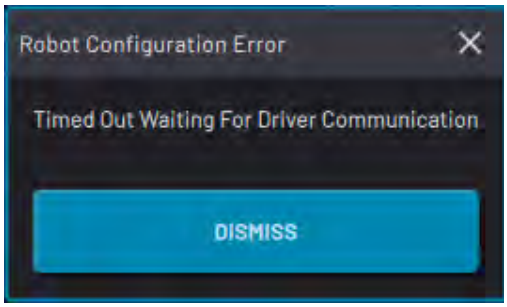
   b. If you are using the READY-made **Forge/Ctrl**, enter the IP Address **172.16.255.251**. If you are using the READY-made **Forge/Hub**, enter the IP Address **192.168.1.20**. If the IP address you assigned to the robot is different, enter that.



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.

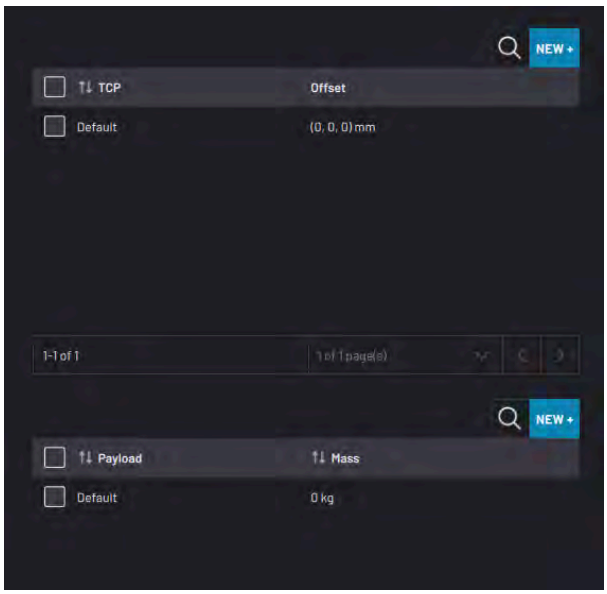


Click **DISMISS**, do the following, then try to tap **SAVE** again:

- 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.

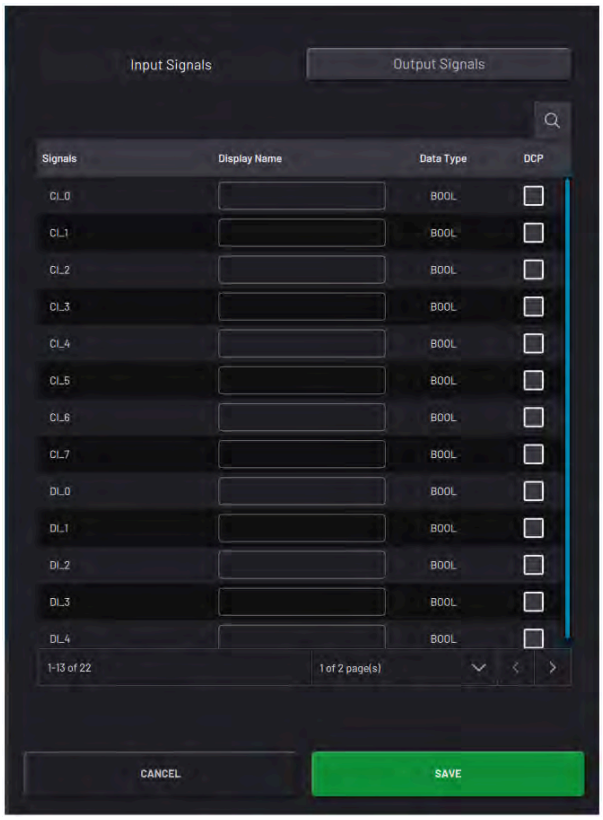
3 When the robot connects, you can add Tool Center Points (TCPs) or Payloads for the robot. You can come back to this later by editing the device's configuration. Tap **SAVE** to continue.

> ***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.

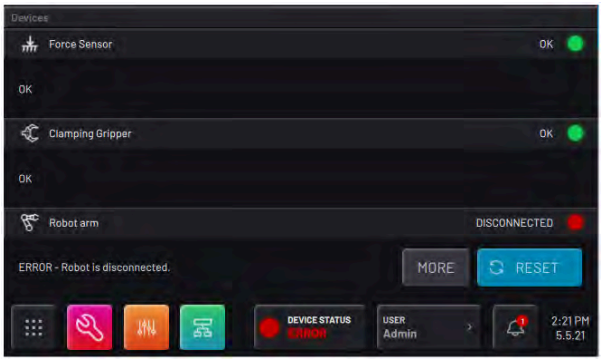
> ***Note:*** *To use these I/O signals, integrate your I/O devices with the robot controller.*

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**.



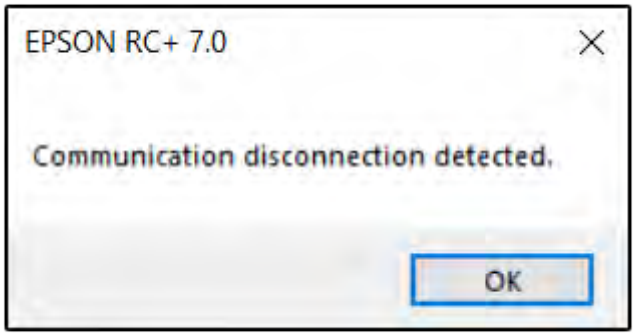
b Tap **RESET** to try to recover from the errors. If you can't **RESET** an error, tap **MORE** to get more details and instructions.

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

CLOSING RC+

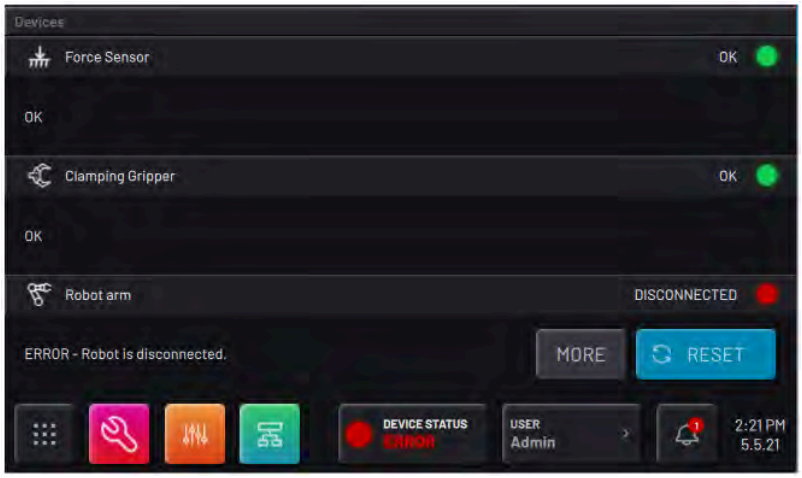
You can now control the robot arm with just the READY pendant. Follow these steps to disconnect your PC from RC+.

1. Unplug the USB cable from your Windows PC and robot controller. A "Communication disconnection detected" pop-up appears in RC+.



2. Check the READY pendant for errors, such as the "Communication Disconnection Between RC+ and Controller" error. Follow these substeps to resolve it:

   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 error. If you can't **RESET** the error, tap **MORE** to get more details and instructions.

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.

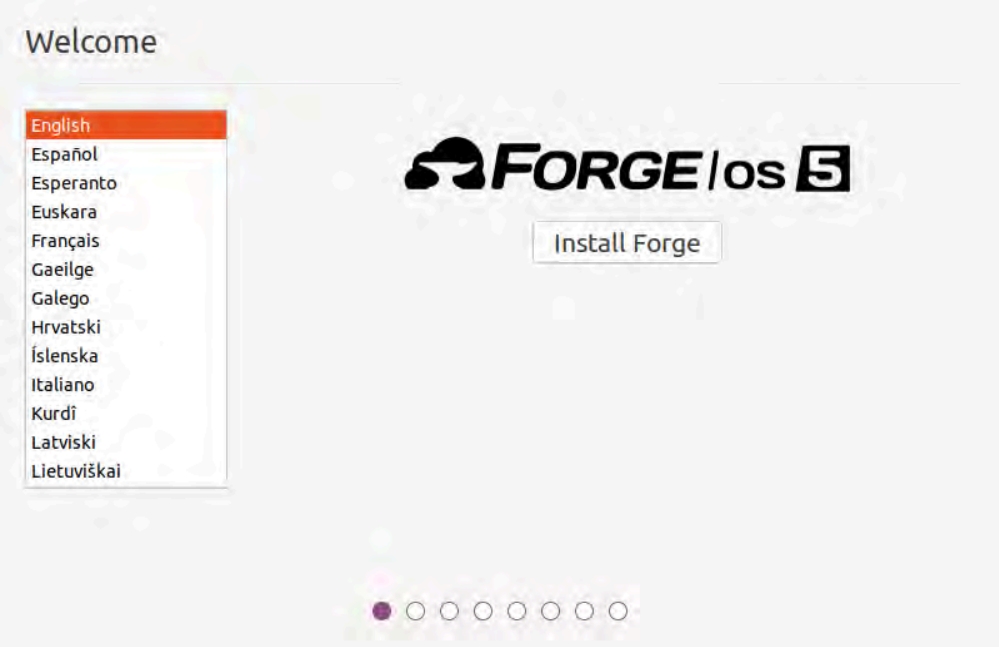
Tip: *The key that opens the Boot Menu depends on the* ***IPC*** *model. The most common keys that do this are ESC, F10, F11, or F12. Refer to your computer's documentation for boot options.*

Note: *If you're installing Forge/OS on a* ***Forge/Ctrl****, press F11. You may need to enter the* ***BIOS Admin password****. Contact READY Support if you run into this issue.*

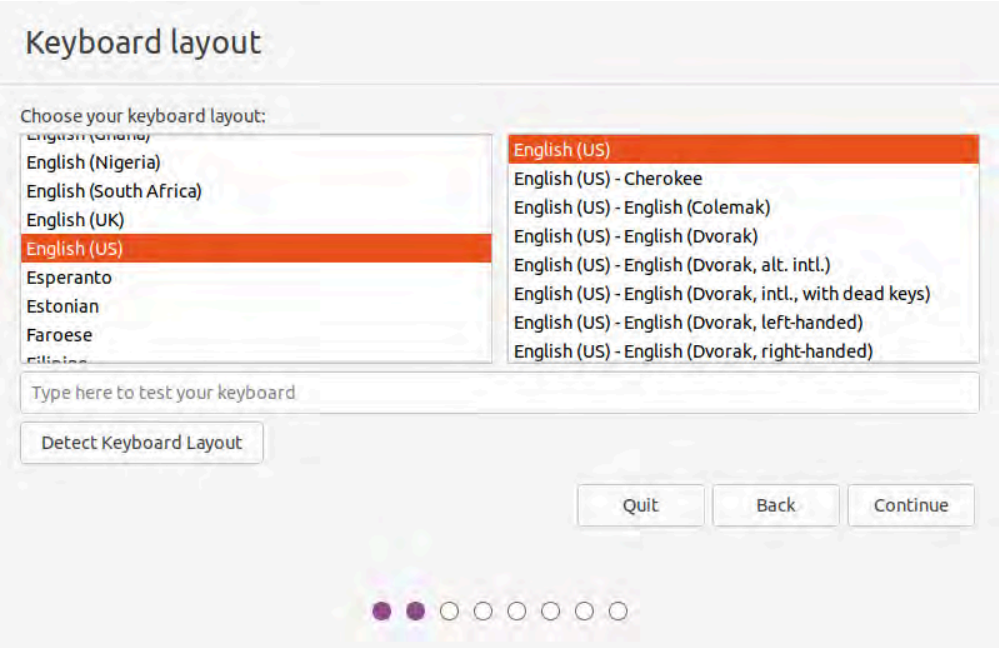
d From the boot options, select **Install Forge/OS** to boot from the installation USB flash drive.

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

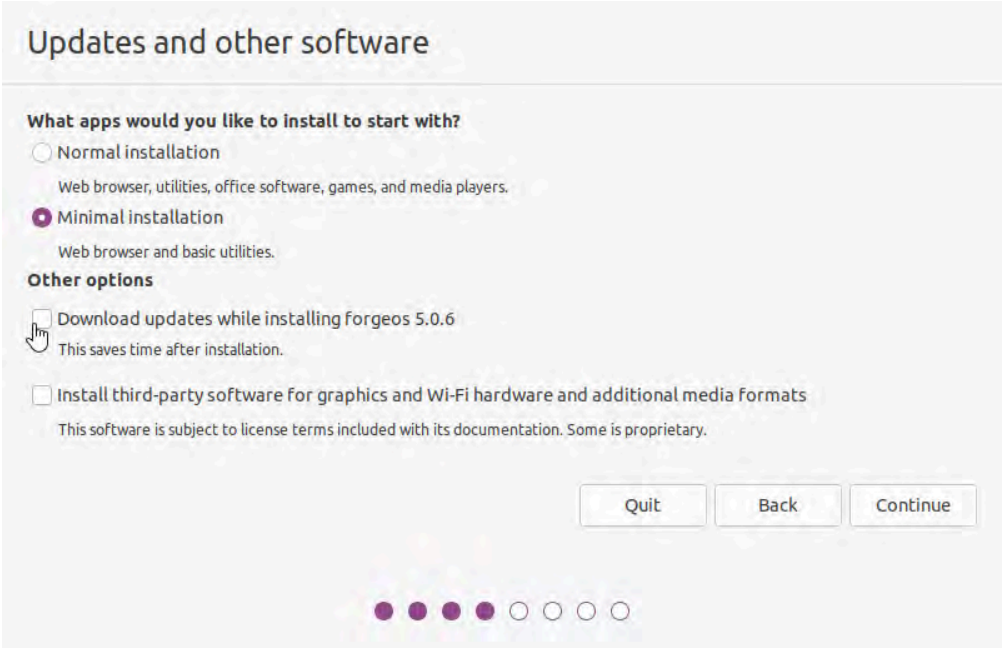
f Select your language. Then click **Install Forge**.



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

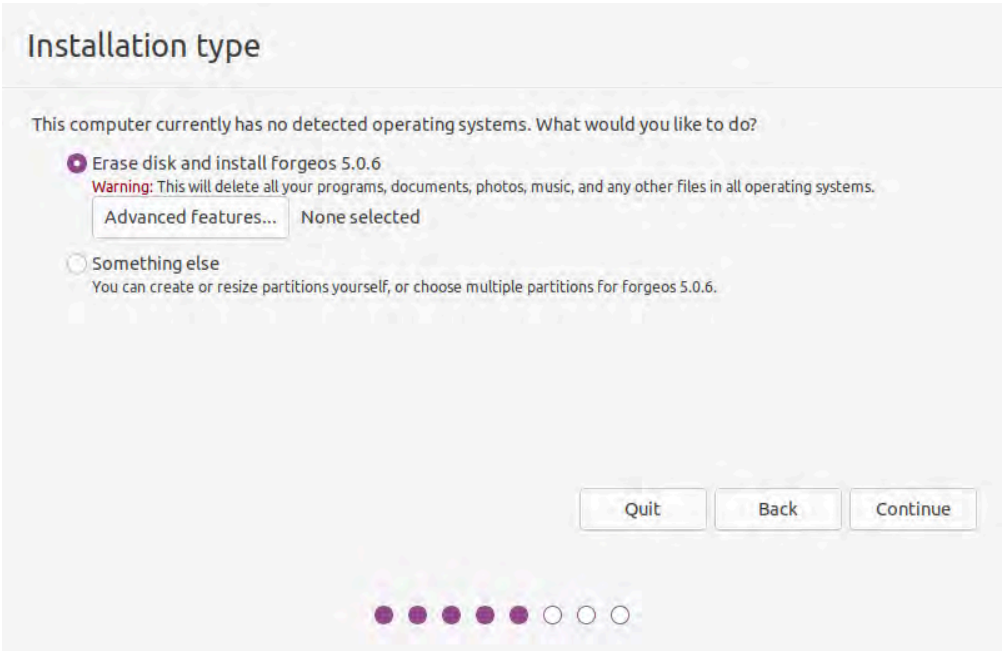


h. Select **Minimal installation**. Uncheck **Download updates while installing forgeos**. Then click **Continue**.

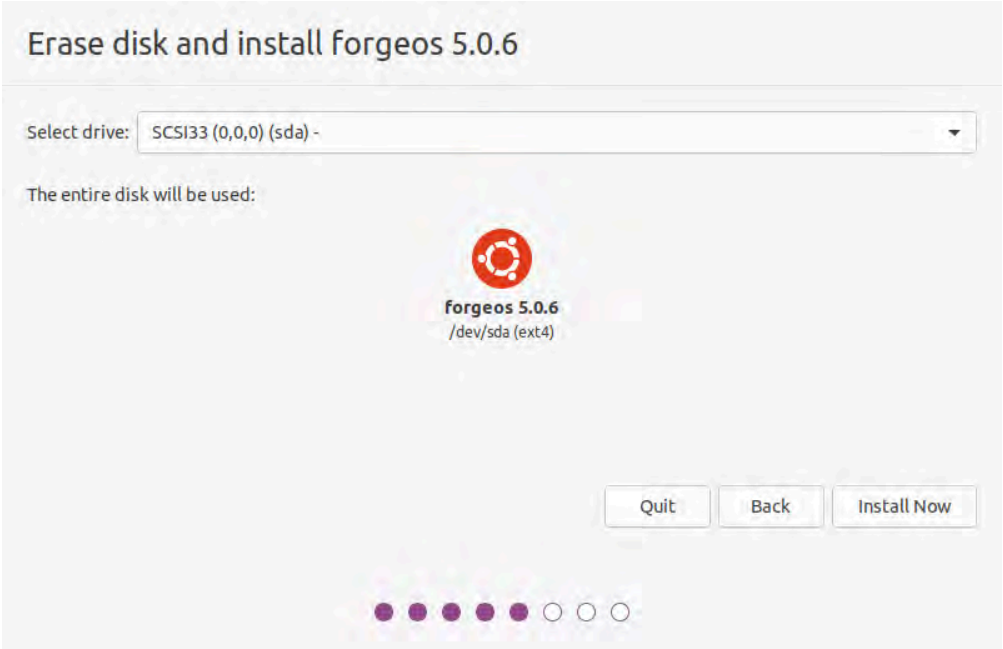


i. Select **Erase disk and install forgeos**. Then click **Continue**.

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.*

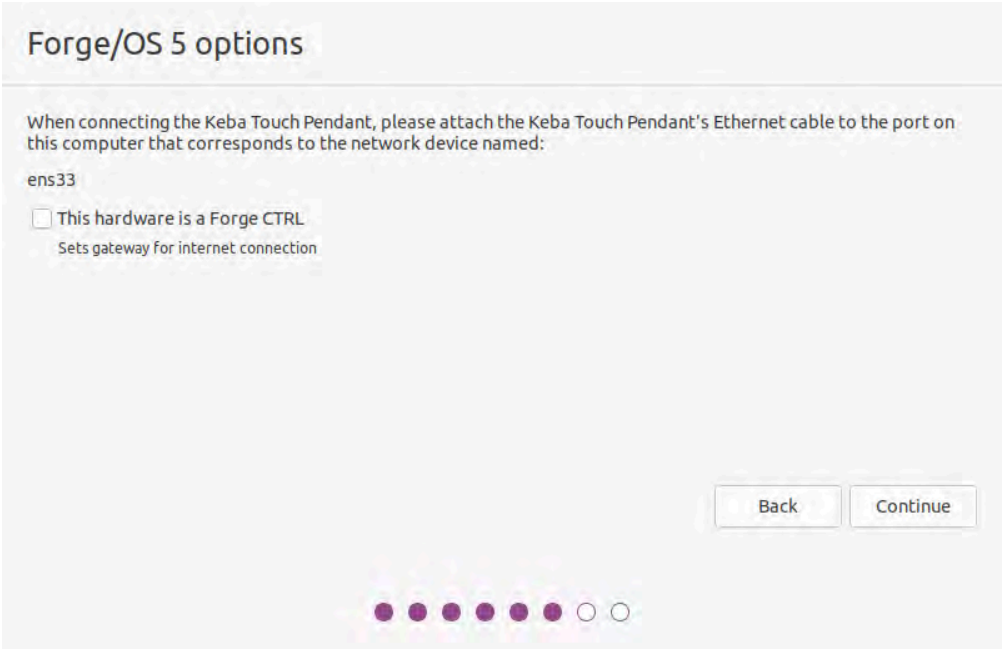


j Select the IPC hard drive for Forge/OS and click **Install Now**.

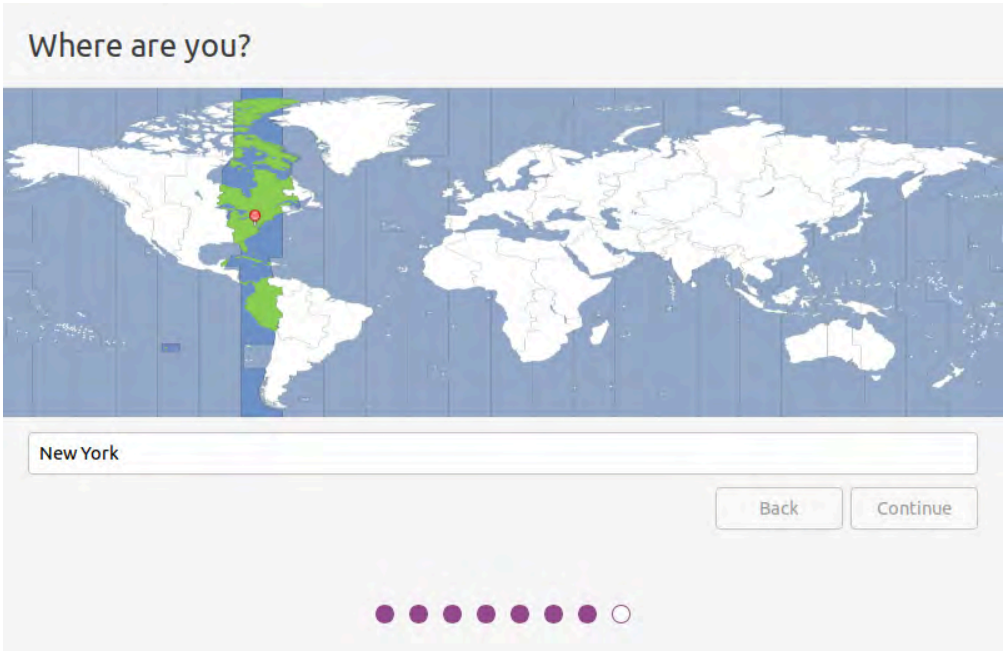


k Confirm that you want to erase the entire disk by clicking **Continue**.

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**.

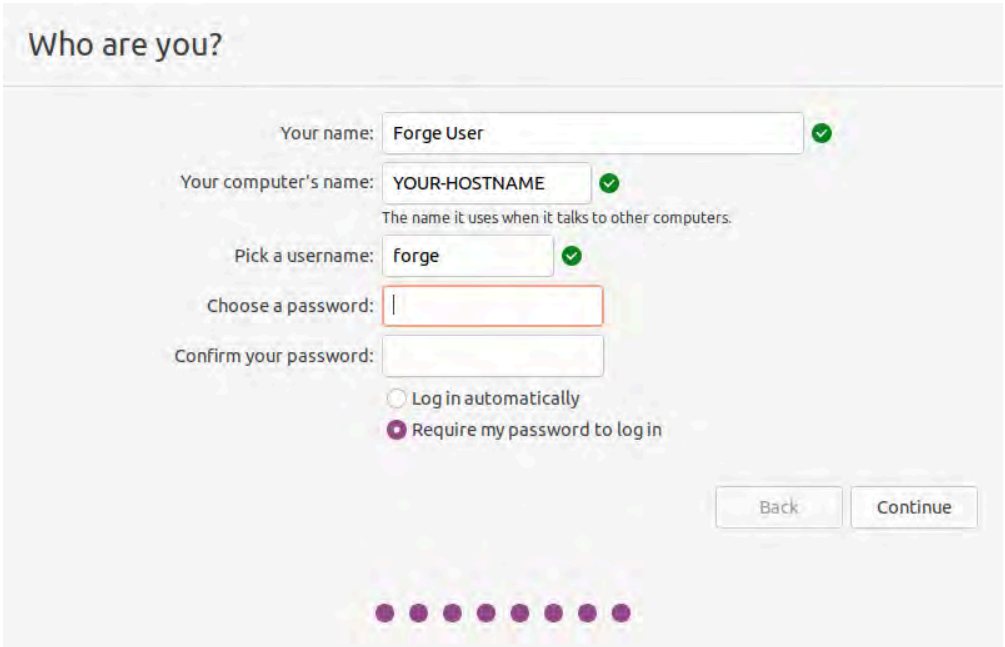


m Choose your timezone. Then click **Continue**.

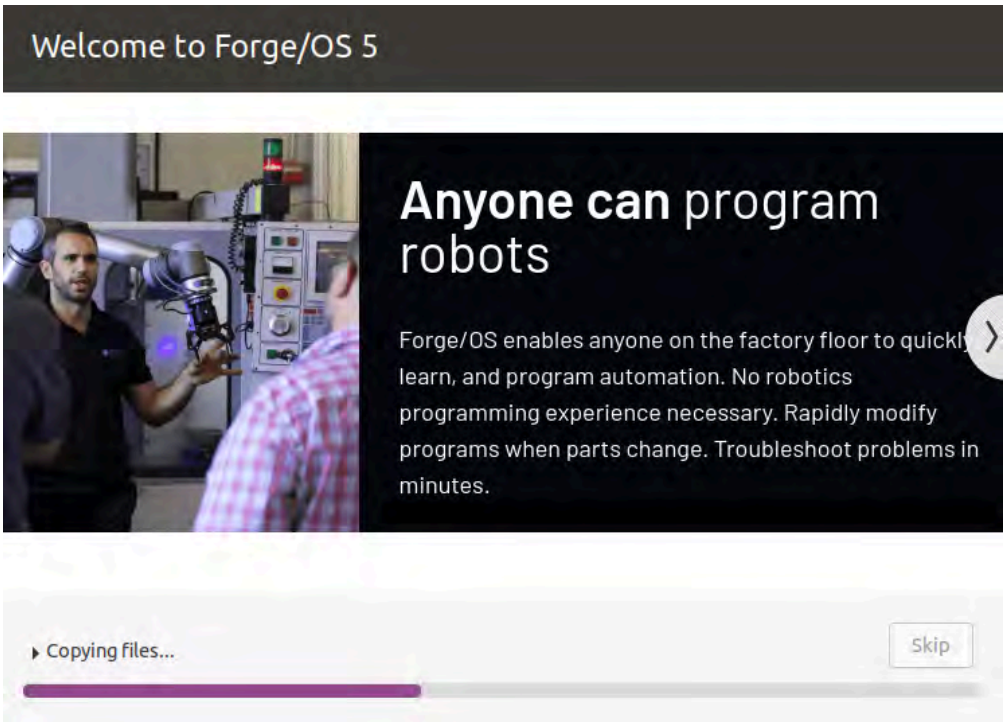


n Choose your IPC's host name. The host name identifies the IPC on the network. Pick a username and password. Then click **Continue.**

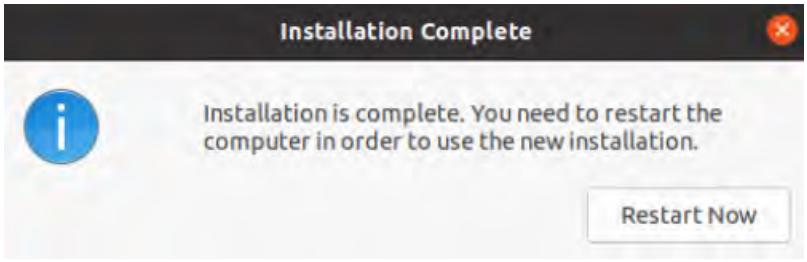
> ***Note:*** *The username and password that you create here are for accessing the IPC desktop. They are NOT for signing into Forge/OS on the* ***READY pendant****.*



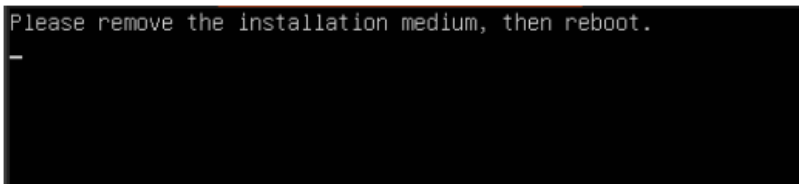
o Wait for the installer to copy and install Forge/OS.



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

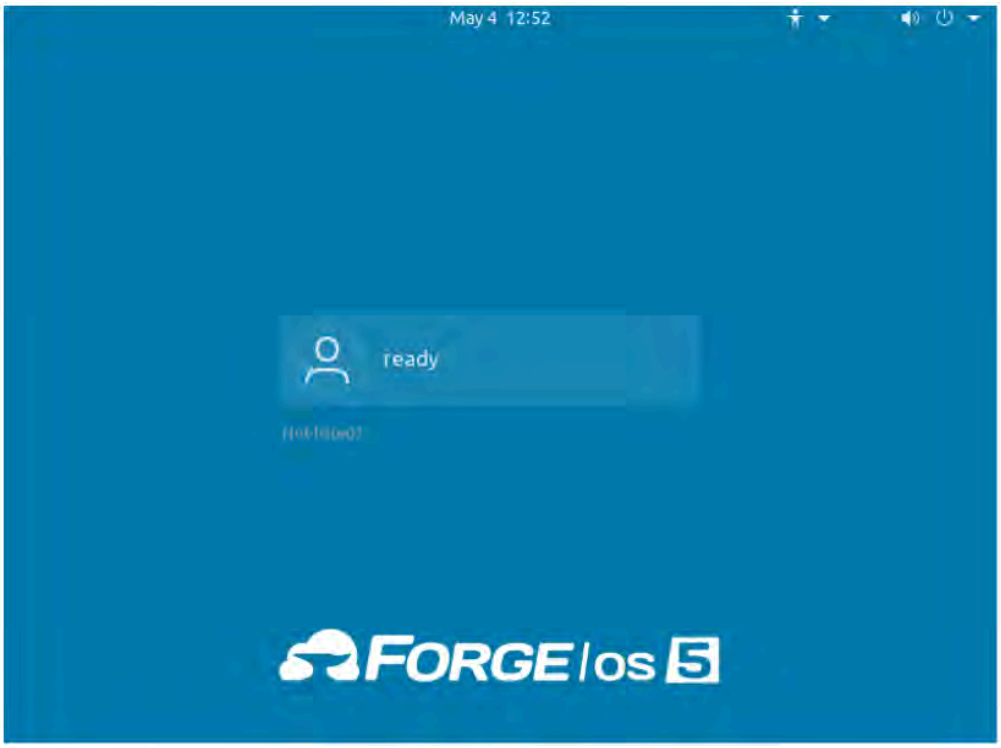


q When prompted, remove the installation flash drive. Then reboot.



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 The READY pendant automatically finds and pairs with the IPC. The three LEDs on the screen help you track the status:

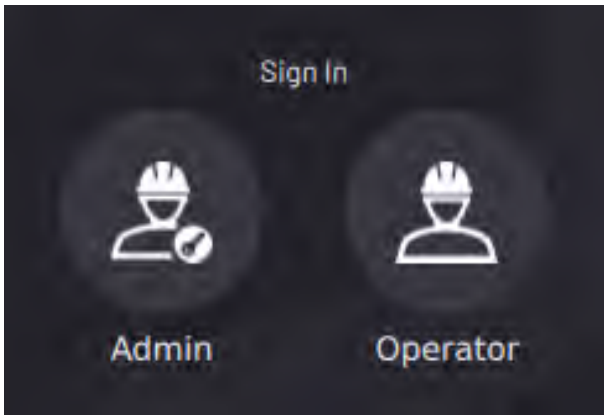
- **Pendant Network Connection**: This condition is satisfied when the READY pendant has a valid network connection (i.e., the Ethernet cable is plugged in).
- **Forge/OS IPC Detected**: This condition is satisfied when the READY pendant detects a Forge/OS IPC on the network.
- **Forge/OS IPC Paired**: 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.

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

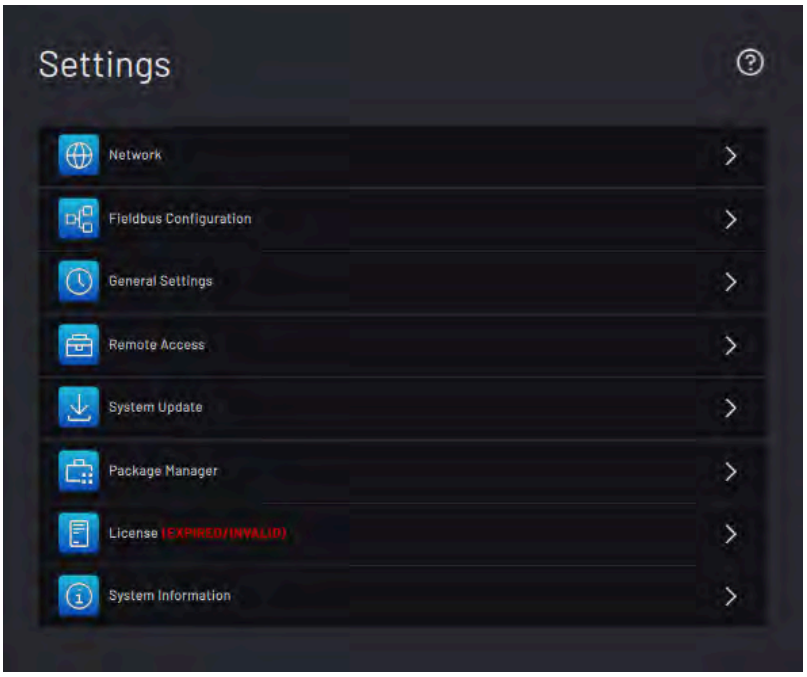
There are two methods to activate Forge/OS: **Online license activation** and **offline license activation**.

The table below lists the requirements for each method.

Online License Activation	Offline License Activation
▪ An internet-connected Forge/OS ▪ A valid Forge/OS license code	▪ A 2GB or larger USB flash drive ▪ An internet-connected PC ▪ A valid Forge/OS license code

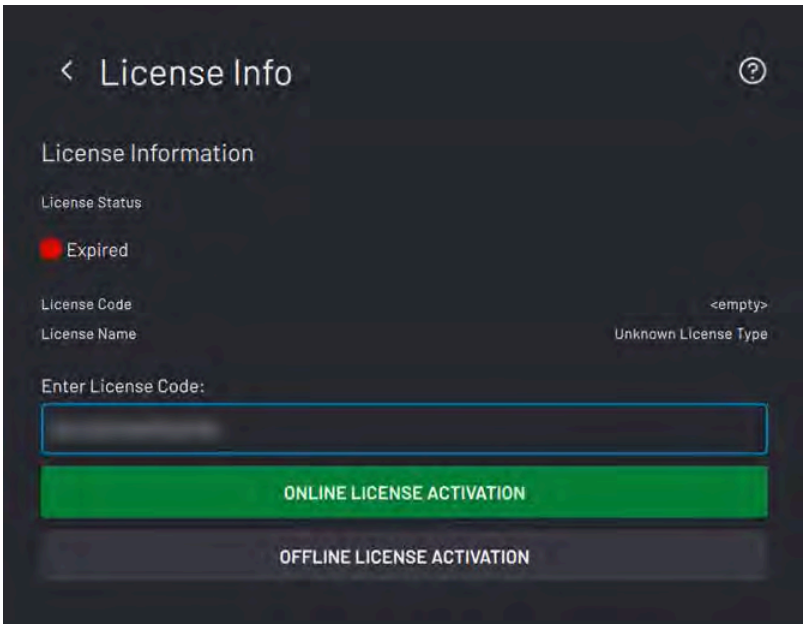
***Tip:** Connect a USB keyboard to the port on the bottom of the **READY pendant** to type in any text field in Forge/OS.*

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



2 Type in your license code.

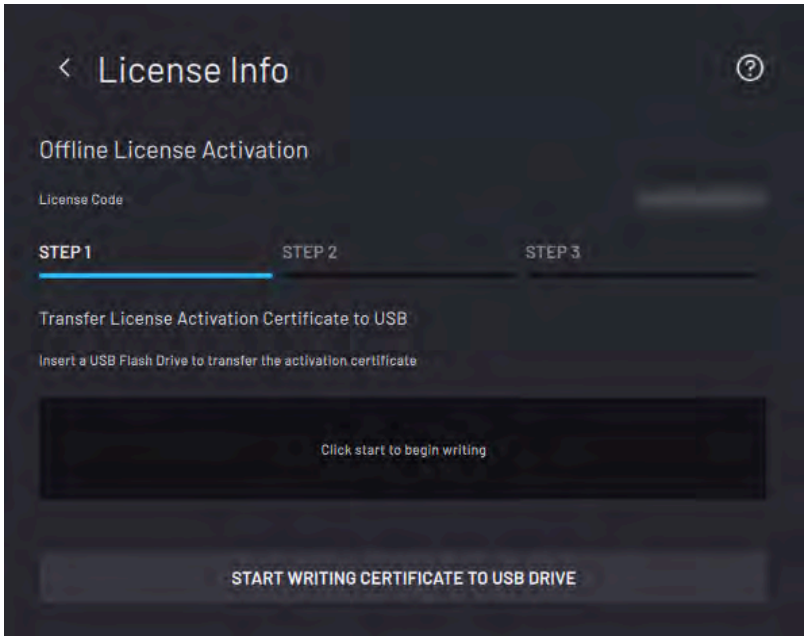
3 Choose **ONLINE LICENSE ACTIVATION** if Forge/OS is connected to the internet. If not, choose **OFFLINE LICENSE ACTIVATION**.



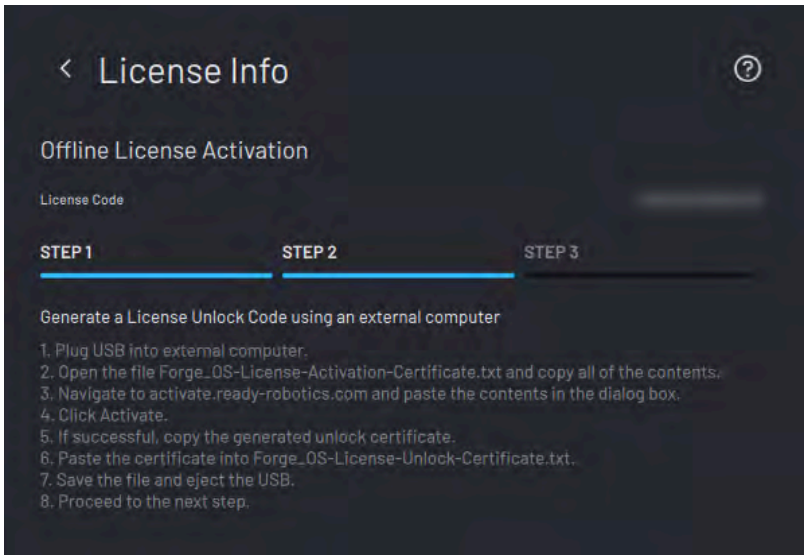
4 If you chose online license activation, you're done!

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

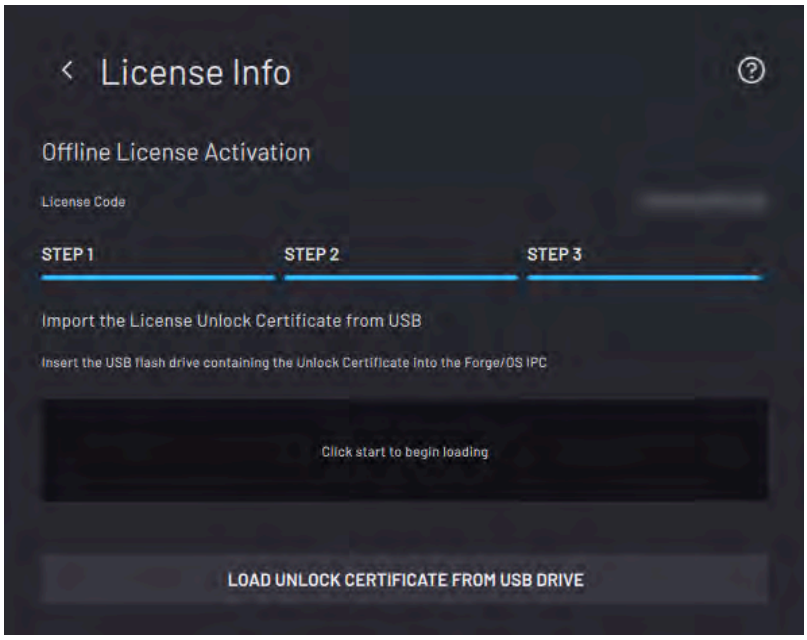
a Insert the USB flash drive into your IPC. Tap **START WRITING CERTIFICATE TO USB DRIVE**.



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 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

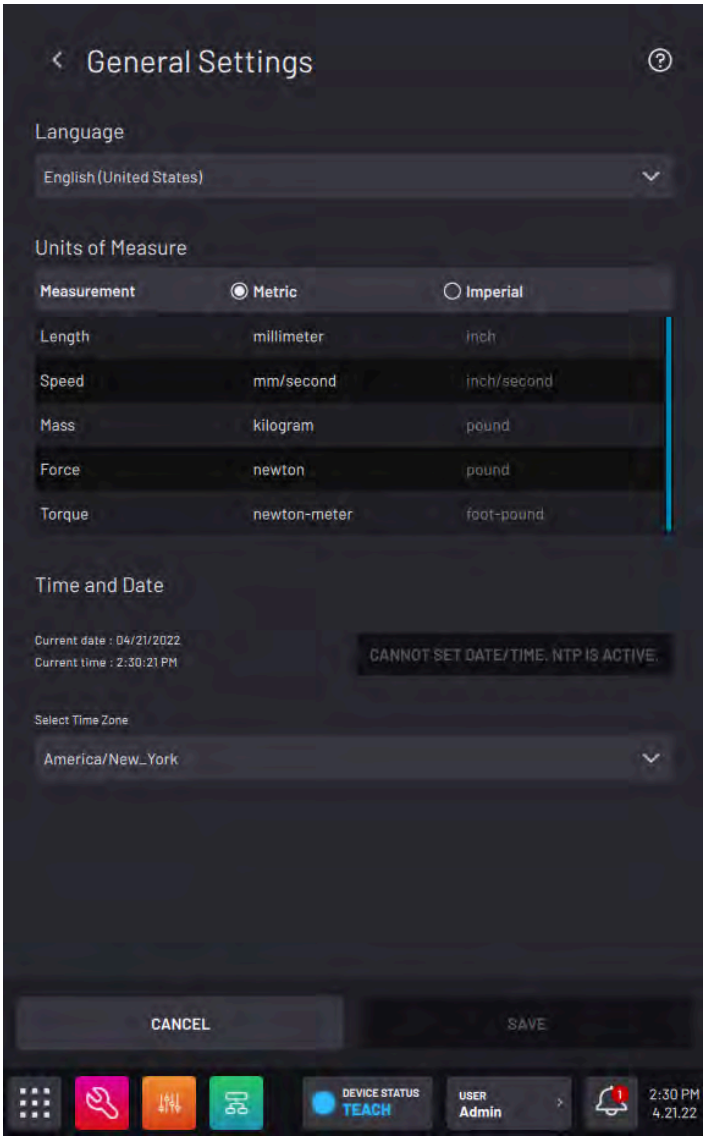
These steps help you choose system preferences, including language, units, time, and network settings.

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.*

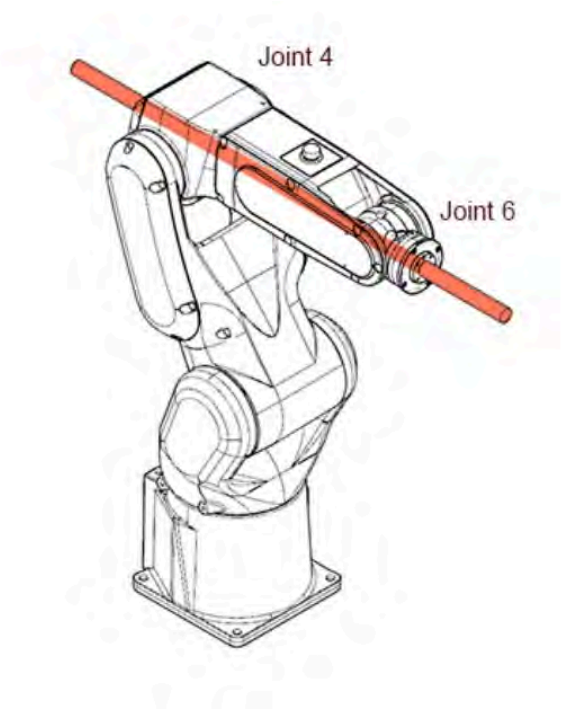


   c. Tap **SAVE** to save changes and exit the General Settings menu.

APPENDIX B: KNOWN ISSUES

You may encounter programming issues when the EPSON robot comes near a singularity. **THESE ISSUES ARE NATIVE TO EPSON AND ARE NOT CAUSED BY FORGE/OS.**

What is a singularity? A singularity is a position that prevents a robot from making certain movements. A singularity can occur when two or more joint axes are co-linear, such as the axes of Joint 4 and Joint 6.



In a singularity, a robot cannot reach a specified waypoint due to physical limitations. This doesn't mean that it can't reach the waypoint, but it is unable to move to the position in that way.

Important: *When you move a robot near a singularity, the robot may move unexpectedly, speed up, or enter an error state.*

Two behaviors you may see near a singularity are excess jogging and rejected stop requests.

EXCESS JOGGING AT A SINGULARITY

When you jog the robot near a singularity, the robot may move for an extra 1-2 seconds after letting go of the jog button.

This issue is the common with linear jogs on EPSON robots. Linear jogs move the robot's tool center point (TCP) in the Cartesian space (X, Y, Z, Rx, Ry, Rz). Use joint moves around singularities.

When jogging the robot near objects, use a low speed to avoid unpredictable collisions.

STOP REQUESTS REJECTED BY THE ROBOT

When the robot is moving through a singularity, it might not immediately stop with the READY pendant **Stop** button or with an external safety device (such as a light curtain or a safety fence). However, the robot will always immediately stop with the E-Stop.

Important: *In emergency situations, ALWAYS hit an emergency stop button that is wired to the emergency stop circuit of the EPSON controller.*

For example, if you execute a circle move that has an arc point near a singularity, the robot might finish its entire path of programmed motion regardless of any stop signal it receives (other than the E-Stop).

To minimize risk, use a low speed as you first build out your task. This will help avoid unpredictable collisions.

APPENDIX C: TROUBLESHOOTING

Use this section to recover from an unresponsive robot or from build errors.

DRIVER KILL SWITCH FOR UNRESPONSIVE ROBOT

If a port fails to configure when you load the driver, you may lose all connection to the robot when you reboot.

To shut down an unresponsive driver, set **IO23** (pin 27) to **HIGH** by making these connections:

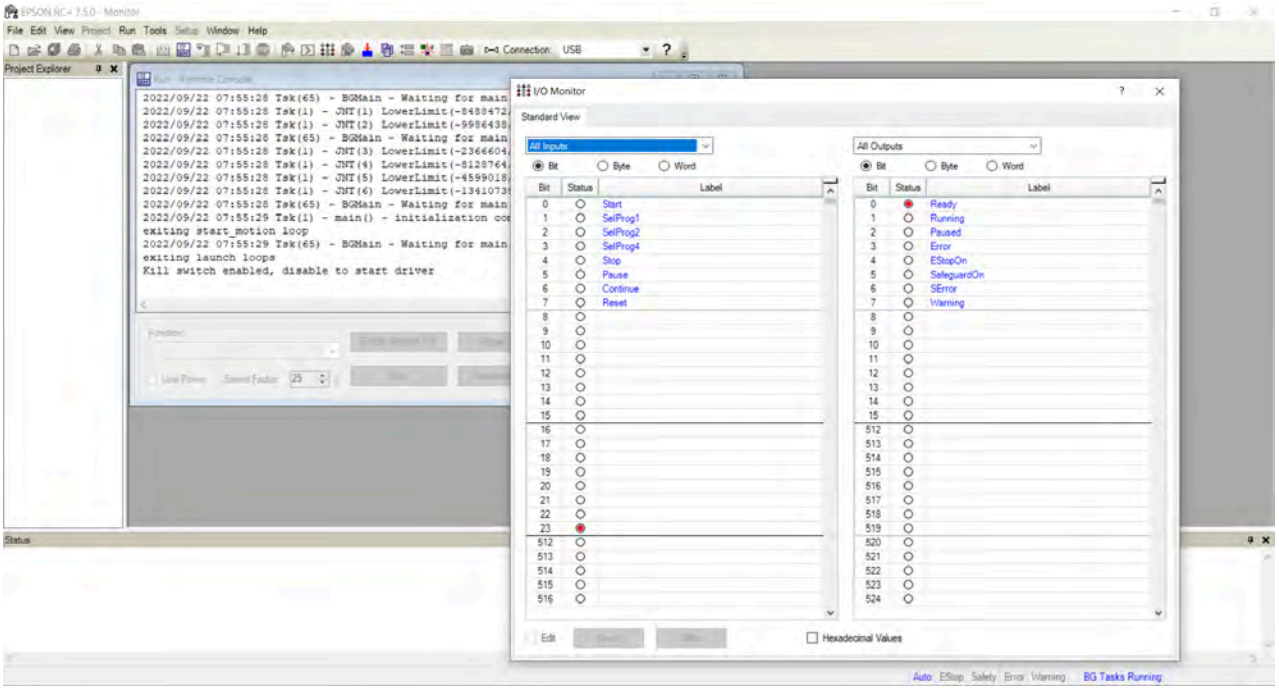
- 0V to Pin 14 (Input common)
- 24V to Pin 27 (Input No. 23)

Pin No.	Signal Name	Pin No.	Signal Name
1	Input No. 0 (Start)	15	Input No. 1 (SelProg1)
2	Input No. 2 (SelProg2)	16	Input No. 3 (SelProg4)
3	Input No. 4 (Stop)	17	Input No. 5 (Pause)
4	Input No. 6 (Continue)	18	Input No. 7 (Reset)
5	Input common No. 0 to 7	19	Input common No. 8 to 15
6	Input No. 8	20	Input No. 9
7	Input No. 10	21	Input No. 11
8	Input No. 12	22	Input No. 13
9	Input No. 14	23	Input No. 15
10	Input No. 16	24	Input No. 17
11	Input No. 18	25	Input No. 19
12	Input No. 20	26	Input No. 21
13	Input No. 22	27	Input No. 23
14	Input common No. 16 to 23	28	Not Used

Remote function inside ( ) in the table above is initially assigned to input from 0 to 7.
For further details, refer to *Setup & Operation 14. I/O Remote Settings*.

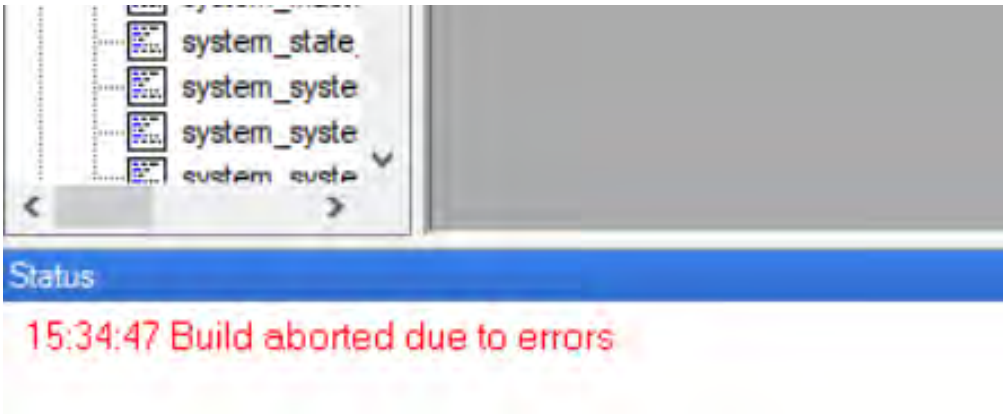
Tip: *To check if IO23 is set to HIGH, open the* ***I/O Monitor*** *from the* ***Tools*** *menu. In the pop-up, select* ***All Inputs****. Check if there's a red dot next to input* ***23****.*

While IO23 is set to HIGH, restart the robot. This setting prevents the driver from launching when the robot powers up, allowing you to reconfigure the robot. The Runtime Controls window reads "Kill switch enabled, disable to start driver" until you set **IO23** back to **LOW** (turning the red dot off).



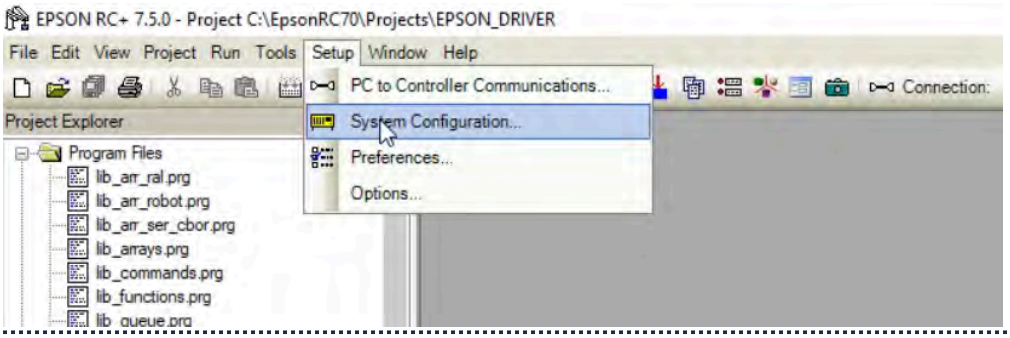
INITIAL DEVICE CONFIGURATION ERROR

When you set up your robot for the first time, you may see build errors.

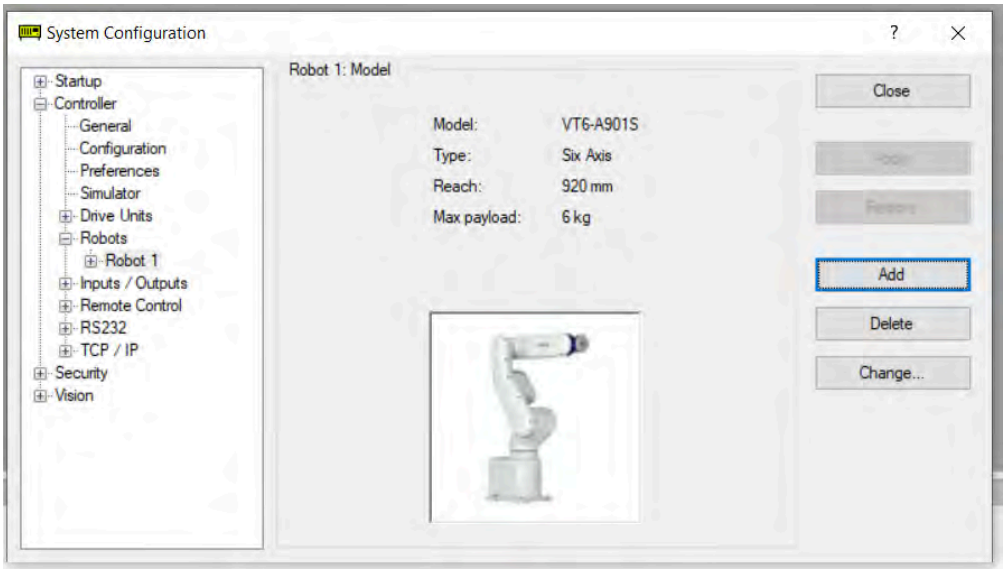


Try deleting and re-adding the robot in System Configuration.

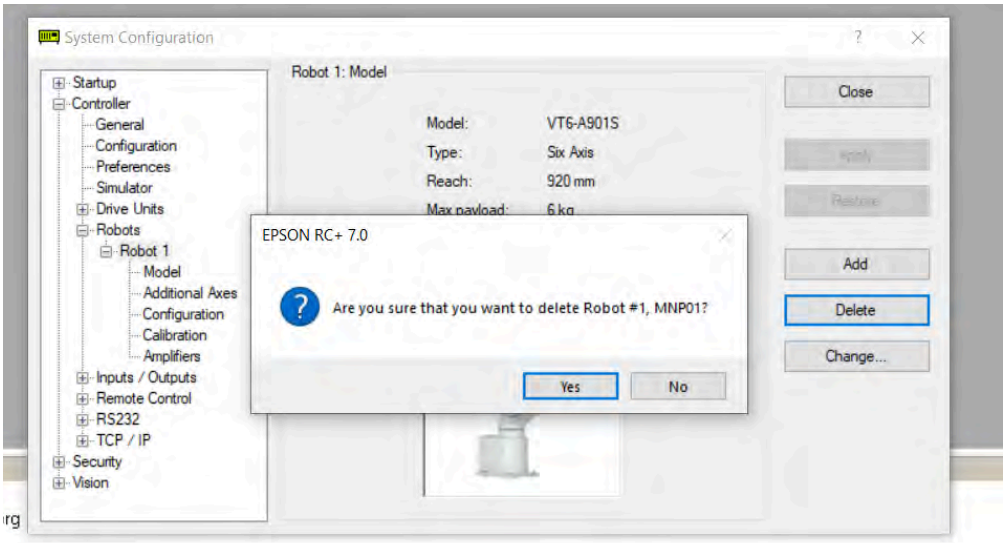
1 In the top menu bar, select **Setup**. Go into **System Configuration**.



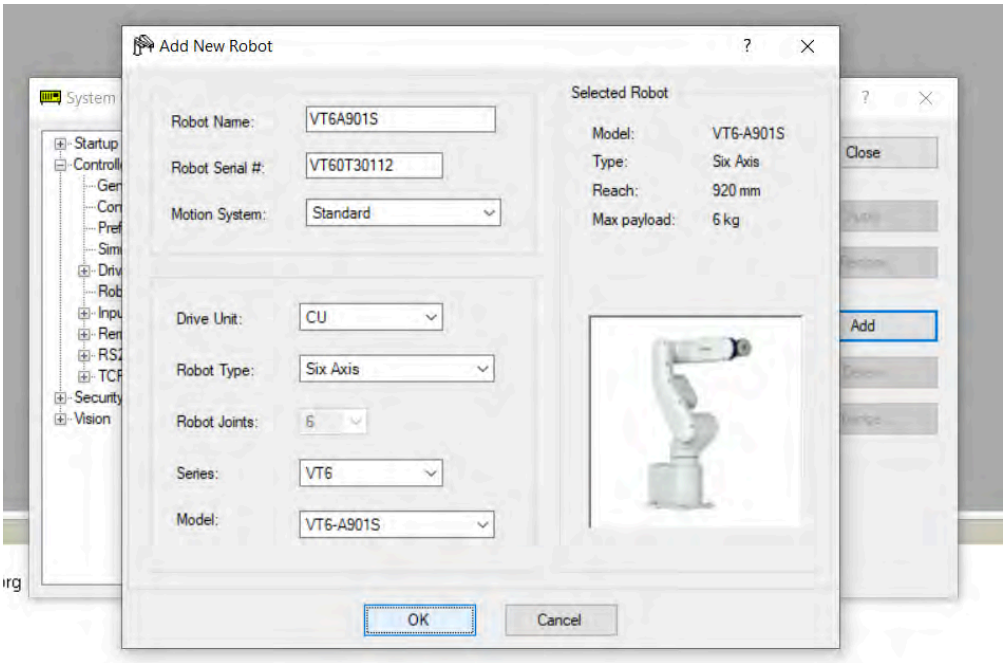
2 Expand the **Controller** menu. Open **Robot 1**. Note what the settings of the configured robot are. If they don't match your robot model, make a note of that.



3 Click **Delete** and **Yes** to re-configure the Robot 1 file.



4 Click **Add**. Enter the robot's information. Then click **OK**.



5 **Close** out of the System Configuration menu.

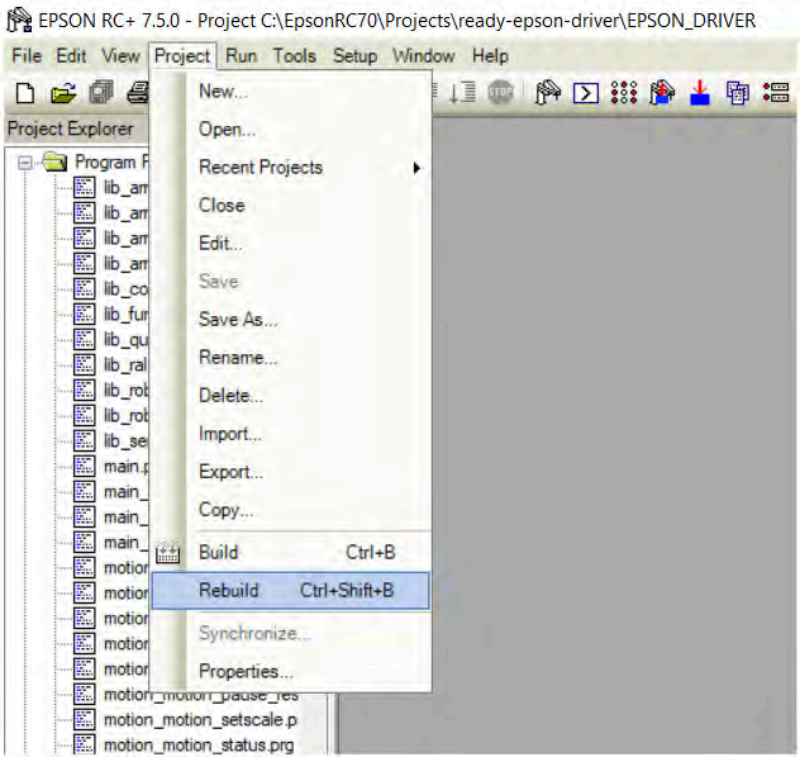
6 **Rebuild** the project (as outlined in the next section).

REBUILDING THE SOURCE CODE

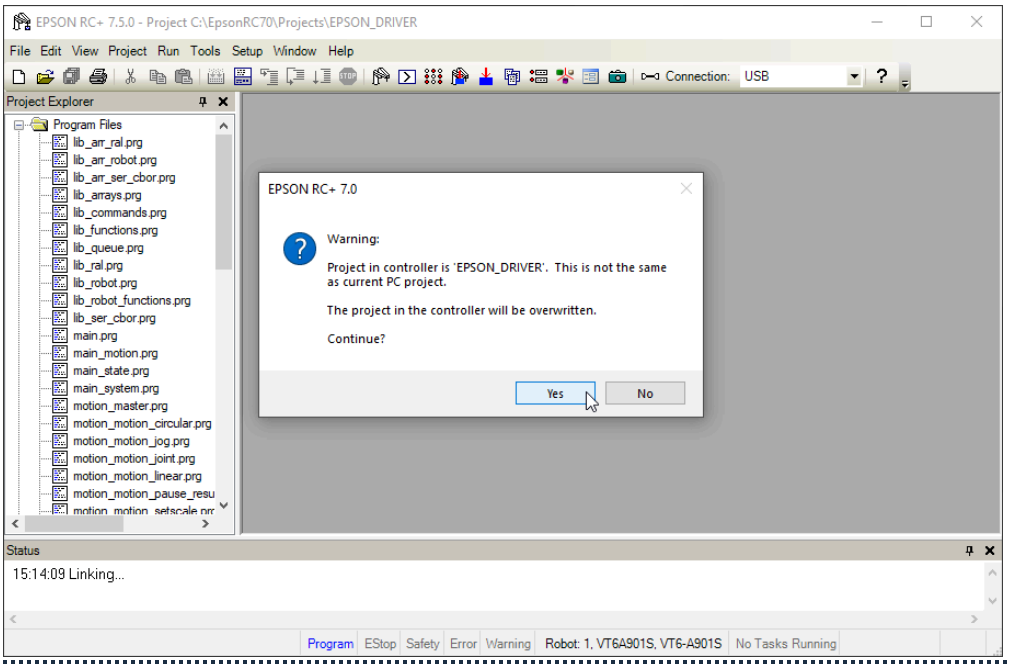
You need to rebuild the source code:

- after you resolve a build error.
- if the Epson encounters a stack error in the Epson logs while you are running a task. When this happens, you will receive a Forge/OS message asking you to rebuild.

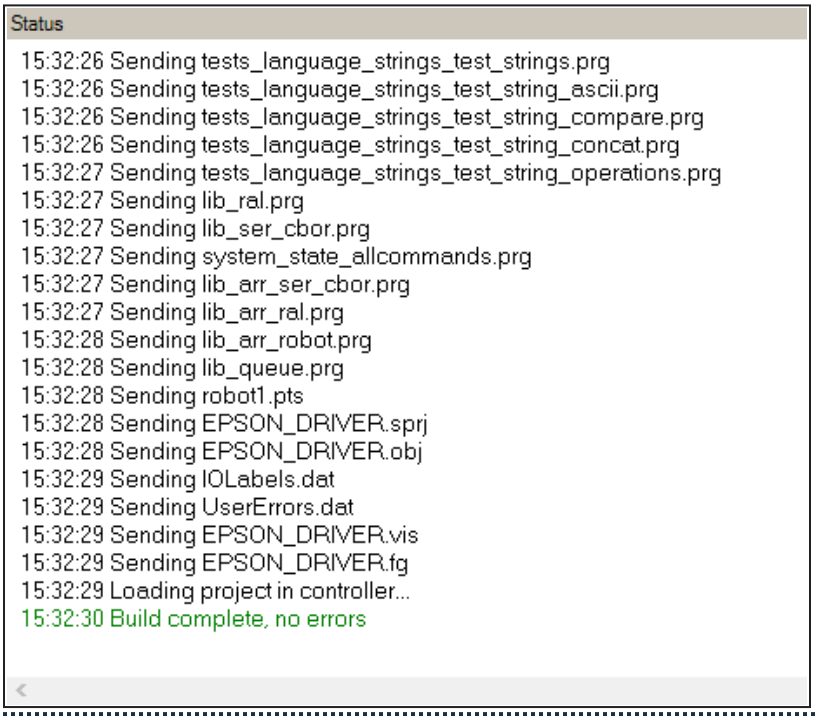
1 In the top menu bar, open the **Project** dropdown. Click **Rebuild**.



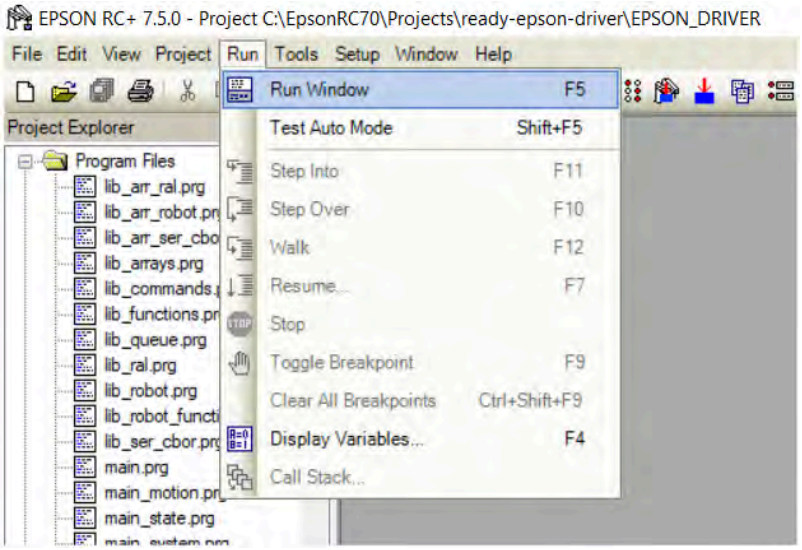
2 If you see the prompt below, select **Yes** to overwrite the project on the controller.



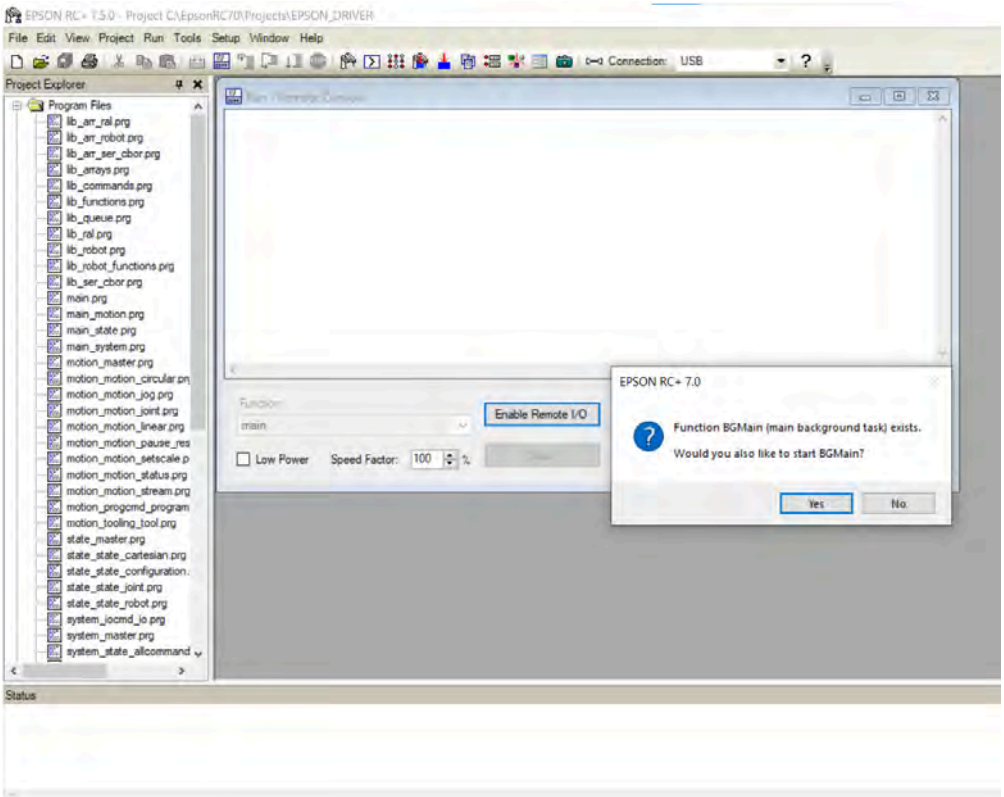
3 Verify that you have a successful rebuild by looking for "**Build complete, no errors**" in the **Status** window.



4 Start the updated driver. Navigate to the top menu bar, open the **Run** dropdown, and click **Run Window**.



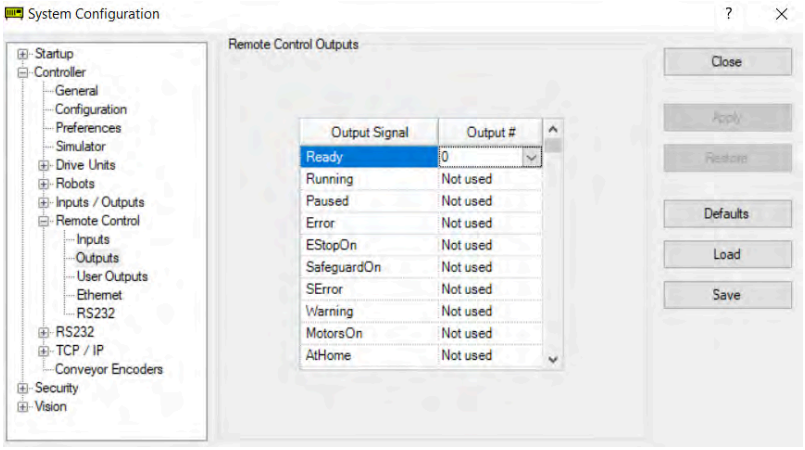
5 To start the driver in Remote I/O mode, click the **Enable Remote I/O** button. Click **Yes** in the pop-up window.



DIGITAL OUTPUT CONFIGURED AS SYSTEM OUTPUT ERROR

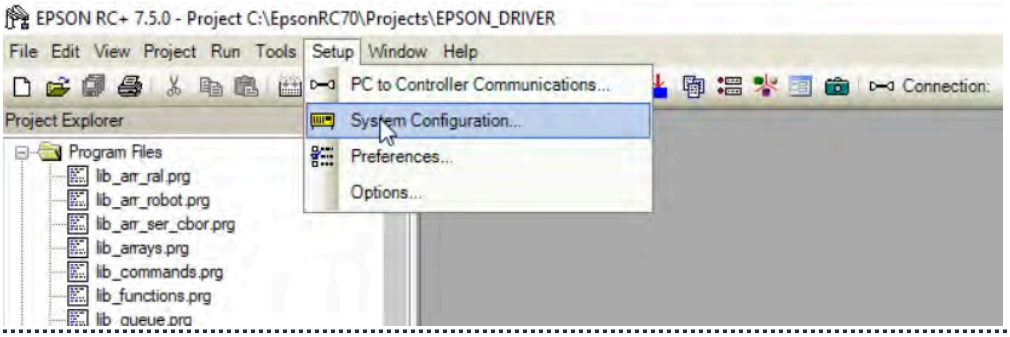
You may see a "**Digital Output Configured as System Output**" error in Forge/OS or an "**Error 2342: Cannot change the status for output bit configured as remote output**" in RC+.

For example, suppose you have Output 0 linked to the "Ready" signal. In the **I/O Monitor**, output bit #0 has the label "Ready". On the READY Pendant, if you select the **DCP** checkbox next to Output 0 in the robot's device configuration and then try to change the state of Output 0 in the robot's **Signals** tab in the Device Controls app, you will get an error.

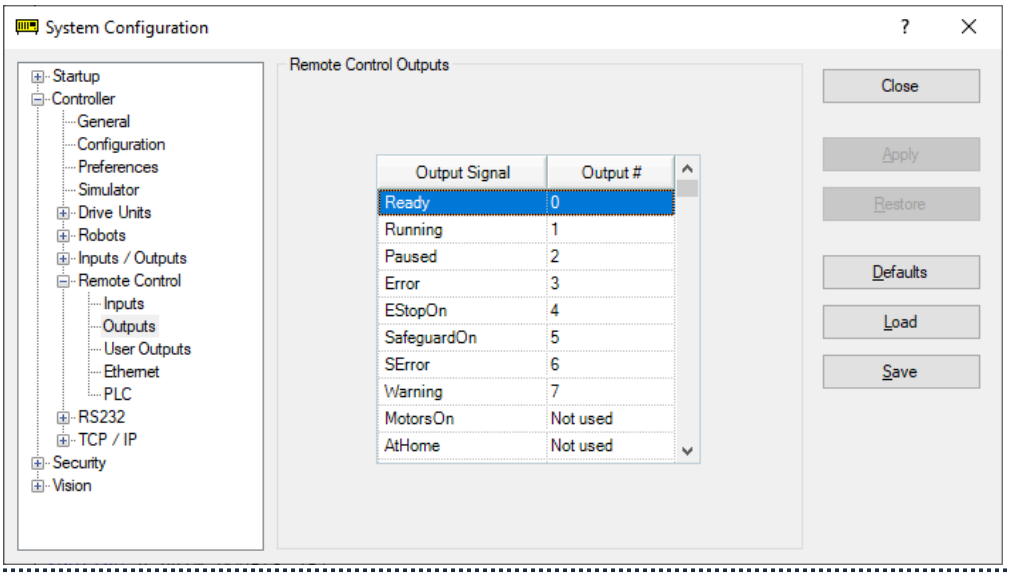


Follow these steps to unlink Output 0 (or other outputs) in RC+.

1 In the top menu bar, click **Setup**. Go into **System Configuration**.



2 In the **Controller** menu, select **Remote Control** and then **Outputs**.



3 Configure the output signals to an output bit (or select "Not used").

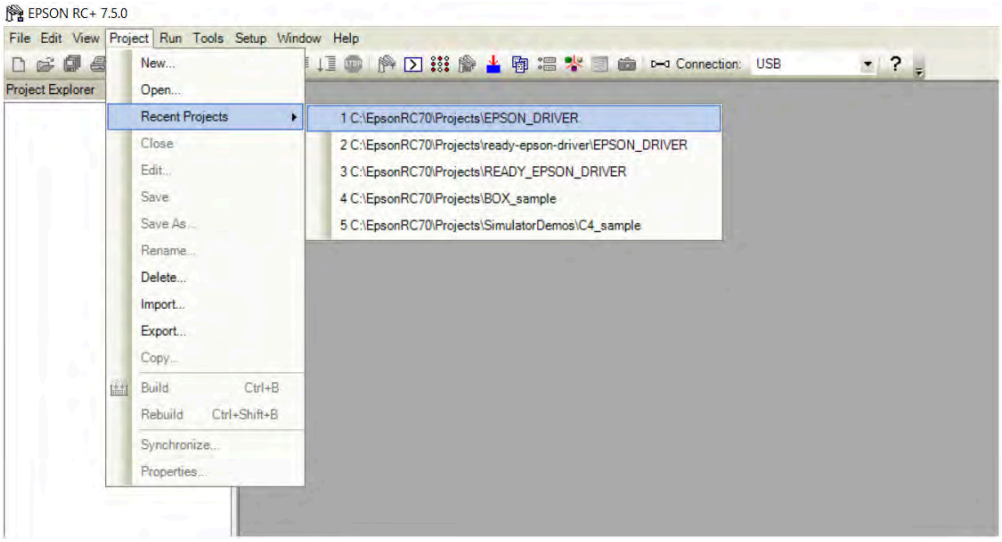
Note: *You cannot select Output #8 or #9. These outputs are reserved by Forge/OS.*

APPENDIX D: ERROR RECOVERY

Some errors are not recoverable from Forge/OS. One such error is Error 4066: "Motion Command was attempted in the prohibited area depended on joint combination." This error occurs when you move the robot outside of its joint limits.

In these situations, the robot is not movable in Forge/OS or in the EPSON RC+ Robot Manager. In this case, use the instructions below to recover your robot to an operable state.

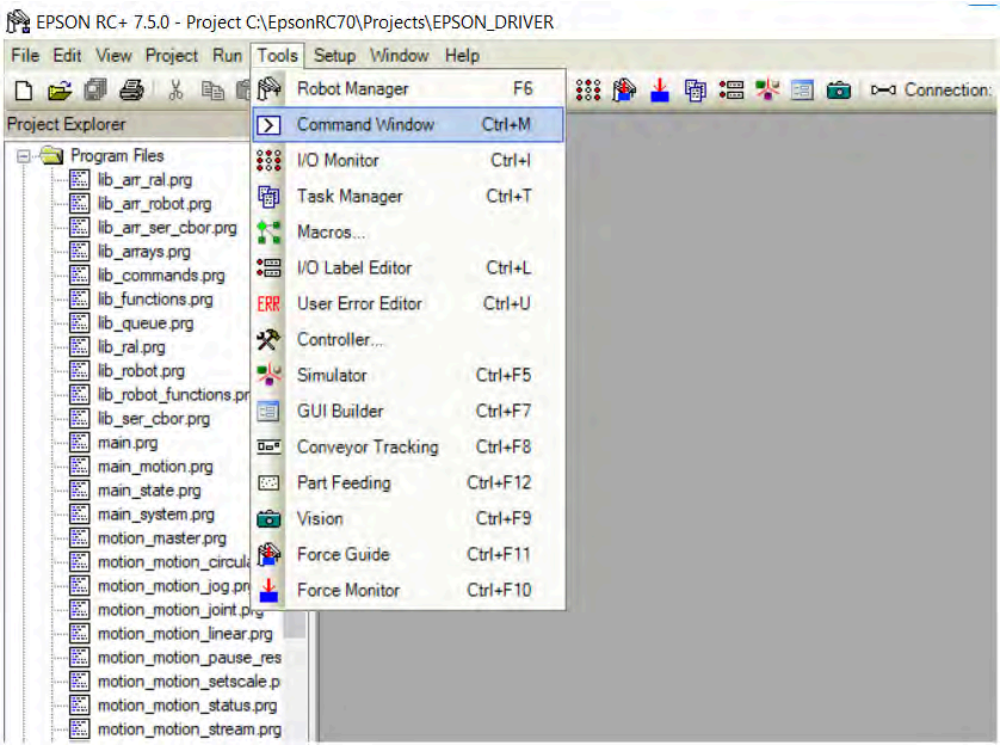
1. Restart RC+ by closing out of it and re-opening it in **Program Mode**.
2. If necessary, reload your project:



   a. In the top menu bar, open the **Project** dropdown.
   b. Expand the **Recent Projects** menu.
   c. Select the EPSON_DRIVER file.

3. If you see a pop-up asking if you want to disconnect from the controller, click **No**.

4 In the top menu, go to the **Tools** menu. Open the **Command Window**.



5 Turn motors off.

a In the Command Window, type “Motor Off”, then hit **Enter**.

```
> Motor Off
>
```

6 Turn a joint brake off.

a Check which joint is out of the movable zone or in a state that it cannot move.

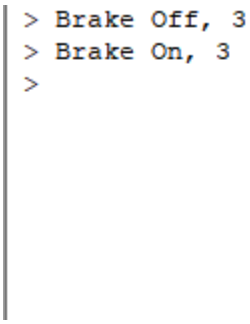
b In the Command Window, type "Brake Off, [JOINT#]", then hit **Enter**. For example, to release the joint 3 brake:

> ***Note:*** *Depending on which joint that you are releasing the brake for and what position that joint is in, you may need to catch the robot as it falls. Avoid damage to the robot and any nearby objects that it might collide with.*

7 Move the joint and turn its brake back on.

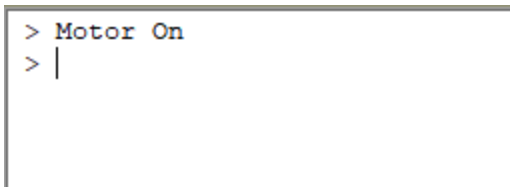
a Use your hands to move the joint back within the movable zone.

b In the Command Window, type "Brake On, [JOINT#]", then hit **Enter**.



8 Turn motors on.

a In the Command Window, type "Motor On", then hit **Enter**.



9 Restart the driver in **Auto Mode**.

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