FANUC R-30iB Plus Start Up Guide (FANUC Safety)

Contents

Chapter 1. Overview

Welcome to the FANUC Startup Guide. This guide covers the following hardware:

Robot Controller	R-30iB or R-30iB Plus (style A cabinet)
Safety Hardware	FANUC Safety I/O Board Kit (FANUC option) - integrates the READY pendant Key Switch, Enabling Switch, and Emergency Stop to the robot safety I/O.
READY Hardware	READY pendant and a non-READY industrial PC (IPC).

Here are the steps you will follow:

1. Prepare safety hardware.
2. Connect the READY pendant.
3. Connect the IPC.
4. Power on the system.
5. Configure your robot for ForgeOS.
6. Control your robot with ForgeOS!

Chapter 2. Hardware Requirements

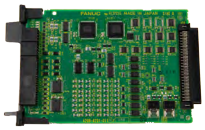
Image	Part Name	Description	Vendor	Part Number
	Industrial PC (IPC)	Hosts Forge/OS. **Note:** Refer to the Forge/OS 5 User Manual for IPC requirements.		
	READY pendant	The touch screen interface for Forge/OS.	READY Robotics	112563
	R-30iB or R-30iB Plus Robot Controller (A Cabinet)	Connects the robot arm to power and to other devices.	FANUC	
	Safety I/O Board	Required for pendant safety features and other safeguard devices (i.e. safety fence).	FANUC (included in MHIB-SAFETY-IO, Safe I/O PCB Kit)	A05B-2600-J131
	Safety I/O Conversion Unit, Mounting Hardware, and Screws/ Washers			A05B-2600-J132
	Safety I/O Board Cable - **Non-Collaborative robots only**			A05B-2602-J200
	Safety I/O Board Cable - **CR-Series only**			A05B-2604-J200

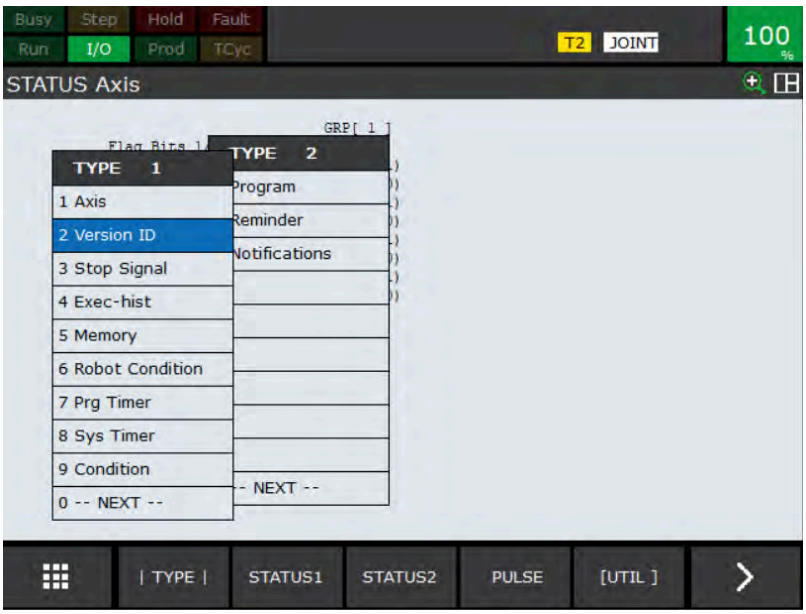
Image	Part Name	Description	Vendor	Part Number
	Conversion Unit Cable			A05B-2602-J201
	Conversion Unit Adapter			A05B-2605-J445
	FANUC Teach Pendant	Required for setup and error recovery.	FANUC	
	24V/2.5A Power Supply	Powers the READY pendant and more. Min./Max. current: 2.5/5.0 Amps.		e.g., Siemens 6EP1332-5BA00
	Polycarbonate Enclosure or Electrical Cabinet	Protects the electrical parts in an enclosure.		
	Cat5e Shielded Ethernet Cable (x2)	• Connects the robot controller to a IPC. • Connects the READY pendant to a IPC.		

Chapter 3. Software Requirements

This section explains how to check your FANUC software for these version and option requirements.

Required Option	Description
R-30iB Firmware: V8.10P/30 (05/2018), V8.20P/33 (07/2019), V8.30P/39 (05/2018) R-30iB Plus Firmware: V9.10P/33 (02/2021), V9.30P/15 (02/2021)	Minimum firmware version supported by Forge/OS.
RTL-R632 KAREL	Required for Forge programs to run on the robot controller.
RTL-R648 User Socket Messaging	
RTL-R859 Advanced DCS	Required to jog the robot with the READY pendant.

1. Plug the FANUC controller into a power source. Follow FANUC instructions for powering the controller.
2. Turn the power switch on the FANUC controller clockwise to power the controller on. Wait for the controller to boot up.
3. On the teach pendant keypad, press the **STATUS** button at the bottom.
4. In the STATUS menu, press **[TYPE] (F1)**, then press **Version ID (2)**.



5. Look for **Software Edition No.** and note the version number next to it. If your system version is older than the requirement, contact your FANUC distributor to upgrade.

6. Press the right arrow on the touchscreen menu bar, then press **ORDER FI**. The installed options appear with their part numbers.

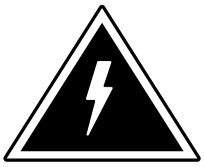
7. Look for the required options. Under "Continue displaying?", press **YES** to see more of the installed options. If any of your controller's required options are missing, contact your FANUC distributor to upgrade.

Chapter 4. Installing FANUC Safety Hardware

1. Install the FANUC controller and robot according to FANUC installation and safety guidance.

> **Note:**
> This guide assumes that you have installed the FANUC robot and controller, as well as FANUC's robot-specific software.

2. Turn off your FANUC Controller. Then disconnect it from its power supply. Follow your facility's lockout/tagout procedure.

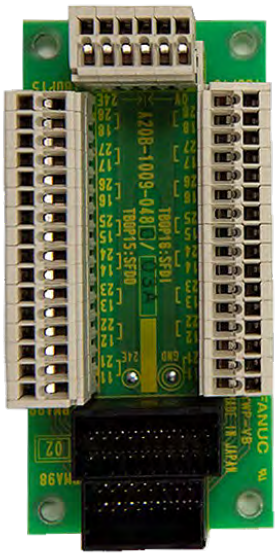


Electric Shock Warning: Disconnect all components from power sources before attempting this installation.

3. Open the FANUC controller.
    a. Use a flat head screwdriver to turn the lock below the power switch counterclockwise.
    b. Turn the power switch counterclockwise to release the door.
4. Install the Safety I/O Conversion Unit.

    a. Find the Conversion Unit Adapter bracket and its two screws. Use the screws to mount the bracket to the inside of the controller.

    b. Find the Safety I/O Conversion Unit kit, including the Mounting Bracket and circuit board shown below. Use four screws to mount the circuit board to the bracket. Then use the other two screws to mount this assembly to the bracket from the previous sub-step.

		
Mounting Bracket	Conversion Unit Board	Installation Result

5. Install the Safety I/O Board.

   a. Inside the FANUC Controller, the Main Board has several slots for additional boards. Remove the Mounting Bracket from slot JGP1. Grab the bottom plastic tab with your right hand and then place your left index finger on the left side of the top tab. With your right hand, pull the bracket out of its slot while applying pressure with your left index finger on the top tab.

   b. Slide the bracket over the A05B-2600-J131 Safety I/O board.

   > **Important:**
   > Do not touch the top or bottom faces of the board. Doing so may damage the board.

   c. Slide the Safety I/O Board into the Main Board until it is flush with the Main Board. You will hear a click when it pops in the correct position.

6. Connect the Safety I/O Board to Safety I/O Conversion Unit.

a. Insert the end of the A05B-2602-J201 Conversion Unit cable labeled **CRMA90** into port **CRMA90** on the Safety I/O board.

b. Plug the two connector ends of the cable into the **CRMA98** and **CRMA99** ports on the Safety I/O Conversion Unit that you installed.

7. Replace the existing cable that goes from JRS20 to JRS19 with a three-way cable (that goes from those spots to the Safety IO Board).

a. On the E-stop unit, remove the existing connector **JRS20** from its plug.

b. On the Main board, remove the existing connector **JRS19** from its plug.

c. Attach the **CRS38B** connector on the Safety I/O cable to the **CRS38B** port on the Safety I/O Board.

d. Plug the new connector labeled **JRS19** into the **JRS19** plug on the Main Board below the Safety I/O board.

e. Plug the new connector labeled **JRS20** into the **JRS20** plug on the E-stop unit.

Chapter 5. 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.

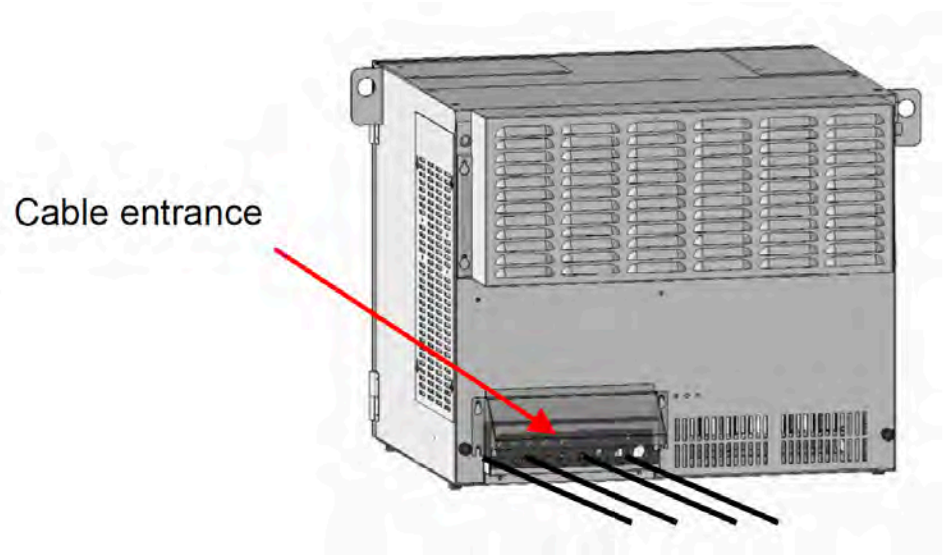
1. Follow these sub-steps to connect the READY pendant communication, power, and safety wiring.

   When connecting the READY pendant flying leads, refer to the destinations in this table.

Pendant Flying Leads	Function	Destination
Brown	Three-Position Enabling Switch Circuit 1	TBOP17 - 1
Yellow	Three-Position Enabling Switch Circuit 1	TBOP16 - 11
Green	Three-Position Enabling Switch Circuit 2	TBOP17 - 4
Grey	Three-Position Enabling Switch Circuit 2	TBOP16 - 21
Pink	24V DC	External Power Supply
Green/Brown	Emergency Stop Circuit 1	TBOP11/13 - EES1
White/Green	Emergency Stop Circuit 1	TBOP11/13 - EES11
Grey/Pink	Emergency Stop Circuit 2	TBOP11/13 - EES2
Red/Blue	Emergency Stop Circuit 2	TBOP11/13 - EES21
Black	0V DC	External Power Supply
Violet	Key Switch Circuit 1	TBOP17 - 2
White/Pink	Key Switch Circuit 1	TBOP16 - 12
White	Key Switch Circuit 2	TBOP17 - 5
Blue	Key Switch Circuit 2	TBOP16 - 22
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. Include ferrules at the end of your wiring to insert in the terminal blocks.

2. Create a new cable entrance hole for the flying leads in the foam panel on the FANUC controller. Refer to FANUC instructions for proper cable sealing.

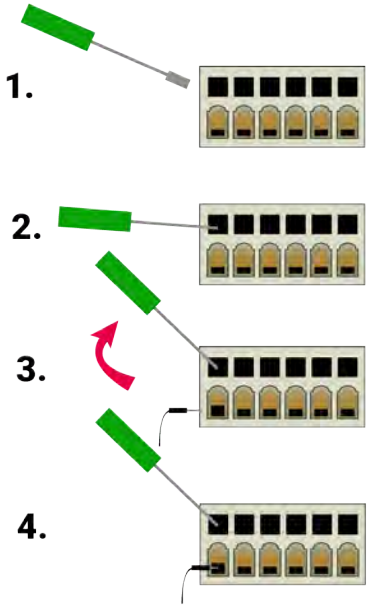


3. Feed the flying leads through the new hole created in the foam panel. These wires will go to the terminal blocks on the Emergency Stop Board and conversion I/O board.
4. Read this information on terminal block connectors before moving on.

a. **Terminal block connectors** are electrical connectors with ports for attaching individual wires. Each block has multiple ports that can detach from the terminal block headers on the circuit boards.

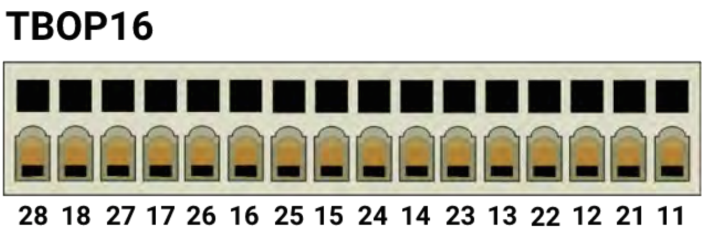
b. Before inserting wires, remove the terminal block by pulling the connector out of its header on the circuit board.

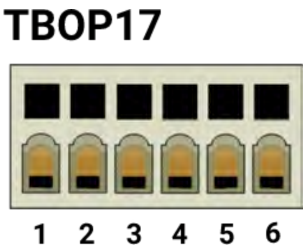
c. You must hold a port open while you insert a wire into it. To open a port on the terminal block, place your terminal block screwdriver into the hole above the wire port and pry up. While applying pressure, slide a wire into the port. Once the wire is in, remove pressure to close the port.



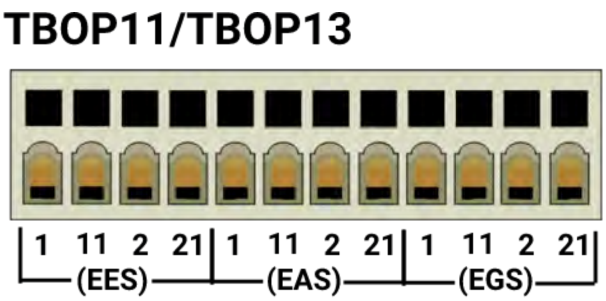
d. Pull gently on the lead to make sure it's secure in the terminal block. After inserting all the leads, fit the connector back onto its header.

5. Remove the **TBOP16** and **TBOP17** terminal block connectors from the Safety I/O Conversion Unit and set them aside. The terminal blocks are labeled on the circuit board.
6. If you have the A-Cabinet, remove and set aside **TBOP13** from the Emergency Stop Board. If you have the B-Cabinet, remove and set aside **TBOP11** from the Emergency Stop Board.
7. Wire the terminal blocks according to the destinations listed on the table in Step 1. The terminal blocks are labeled for reference.





Note:
If you are using the A-Cabinet you will wire TBOP13, if you are using the B-Cabinet you will wire TBOP11.



8. Wire the external safety fencing or another safeguarding device.

   a. **If you are using safety fencing or another safeguard device**, connect it to the Safety I/O Conversion board: On the E-Stop board terminal block **TBOP11/TBOP13**, use jumpers to bridge **EAS1** and **EAS11**. Then bridge **EAS2** and **EAS21**. Wire the fencing as shown in the table below.

Function	Destination
Fence Contact 11 (Circuit 1)	TBOP17 - 3 (+24E)
Fence Contact 12 (Circuit 1)	TBOP16 - 13
Fence Contact 21 (Circuit 2)	TBOP17 - 6 (0V)
Fence Contact 22 (Circuit 2)	TBOP16 - 23

   b. **If you choose to NOT use a safeguard device**, jumper the safety fencing circuits: On the E-Stop board terminal block **TBOP11/TBOP13**, use jumpers to bridge **EAS1** and **EAS11**. Then bridge **EAS2** and **EAS21**. On the Safety I/O Conversion board, use jumpers to connect **TBOP17-3** and **TBOP16-13**, and connect **TBOP17-6** and **TBOP16-23**.

9. After connecting the wires, insert the terminal block connectors back into their respective headers.

> **Note:**
> You can only insert the terminal block connectors one way. Match the connector to the header's orientation.

Chapter 6. Connecting the Robot and IPC

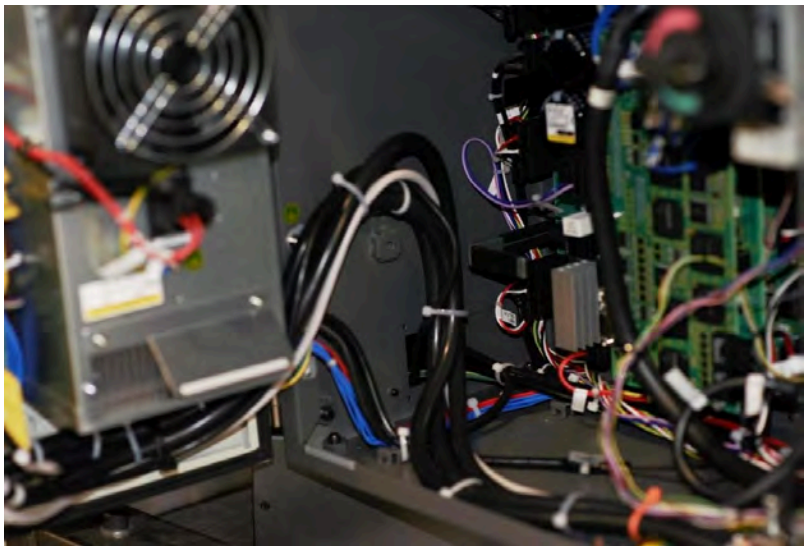
Forge/OS must be able to communicate with the FANUC robot controller. This section will help you connect the IPC and robot controller using a Cat5e STP Ethernet cable.

1. Find a Cat5e STP Ethernet cable long enough to reach from the IPC to inside the FANUC controller.
2. Plug one end of the Ethernet cable into a **LAN** port on the IPC device (or a network switch connected to the IPC).
3. Inside the FANUC controller, remove one of the knockouts on the foam cable panel. Feed the Ethernet cable through it.
4. Plug the cable into LAN Port 1 (**CD38A**) on the Main Board.
5. Manage the cables.

    a. Use zip ties to bind cables at the top and bottom of the controller enclosure.

    > **Important:**
    > Ensure that there is enough slack for the door to open and close without creating tension.

    b. Cut the zip ties so that the cut-ends are flush with the connectors.



6. Close the controller door. Lock it using a flat head screwdriver.

Chapter 7. Powering On

In this section, you power on the system and prepare the FANUC teach pendant.

1. Reconnect the FANUC controller to power and power it on. Consult your Manufacturer's manual for instructions on powering the FANUC controller.
2. Power on your IPC device and other devices.
3. If there are issues, power off each device, disconnect from power supplies, and check your wiring.
4. Turn the switch on the front panel of the FANUC controller to **T1** mode.
5. Turn the switch on the FANUC teach pendant to **ON**.

Chapter 8. Initializing FANUC Safety

In these steps, you initialize the FANUC Safety I/O board and set the robot's IP address for Forge/OS.

1. Initialize the FANUC Safety I/O board.
    a. On the FANUC Teach Pendant, go to the DCS screen by pressing the **MENU** button, **NEXT (0)**, **SYSTEM (6)**, then **DCS**.
    b. Press **PREV** to ensure you are on the main DCS screen. There should be items named Safe I/O Status, Safe I/O connect, etc.
    c. Use the arrow keys to select the **Safe I/O device** setting. Press **Enter**.
    d. Press **INIT (F2)**, then **YES (F4)**. Do this process twice.
    e. The **Safe I/O Board** appears under one of the device headings. Scroll down with the arrow keys and make sure it's there. A new FANUC warning related to new DCS parameters may appear at the top of the FANUC Teach Pendant.
    f. If the device does not appear, turn the FANUC controller off and check the wiring to the Safety I/O Board and the Conversion Unit. Then reboot the controller and try again.
2. On the FANUC teach pendant, set the robot's Port 1 IP address for Forge/OS:

    a. On the FANUC teach pendant, go to the Host Communication screen: Press the **MENU** button, then scroll down to **SETUP (6).** Then scroll right to **Host Comm (8)**, which is on the second menu (titled "SETUP 2"). Press **ENTER.**

    > **Tip:**
    > Or on the **SETUP** screen, press **[TYPE] (F1)**, select **NEXT**, then select **Host Comm**.

    b. On the list of Protocols, select **TCP/IP** and press **ENTER**.

c. For Port 1, select the line that reads **Port#1 IP addr...** and press **ENTER**.

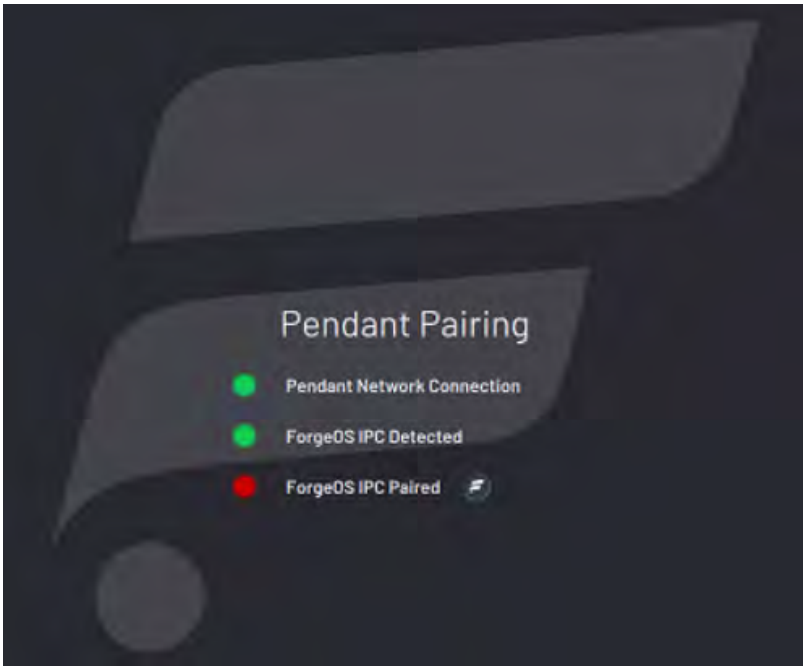
d. Set the **IP Address** to **192.168.1.20** and set the **Subnet Mask** to **255.255.255.0**.

Chapter 9. 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 34)*, 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.

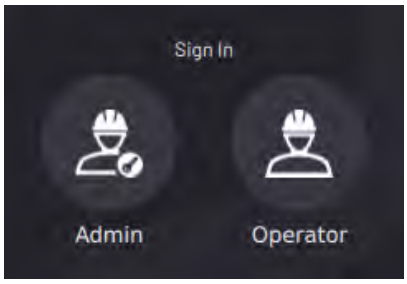


    The UI shows the real-time state of each step. For example, if the pendant loses its network connection during pairing, all steps become undone.

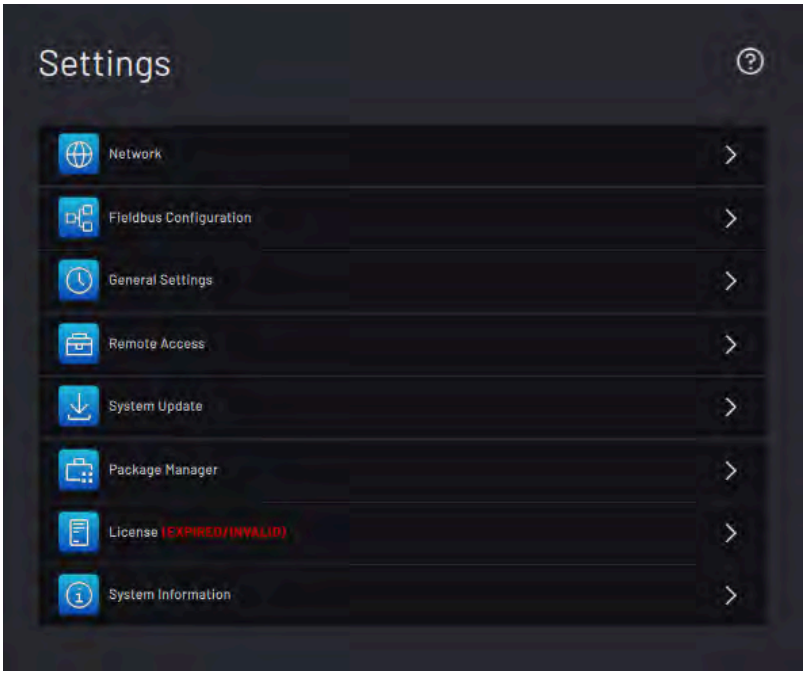
    If the READY pendant spends more than 60 seconds on any step, troubleshooting text displays. Common things to check are if the READY pendant network cable is plugged in, if the IPC is powered on, if the READY pendant and IPC are connected to the same network, and if there's only one READY pendant and 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 42)* in Appendix A.



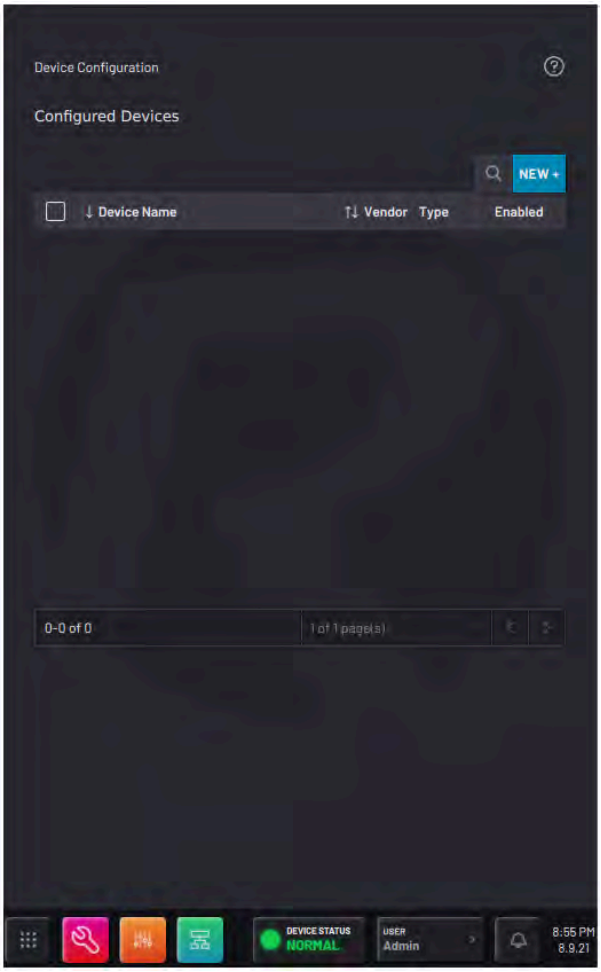
5. With Forge/OS active, move on to the next section.

Chapter 10. Configuring the Robot for Forge/OS

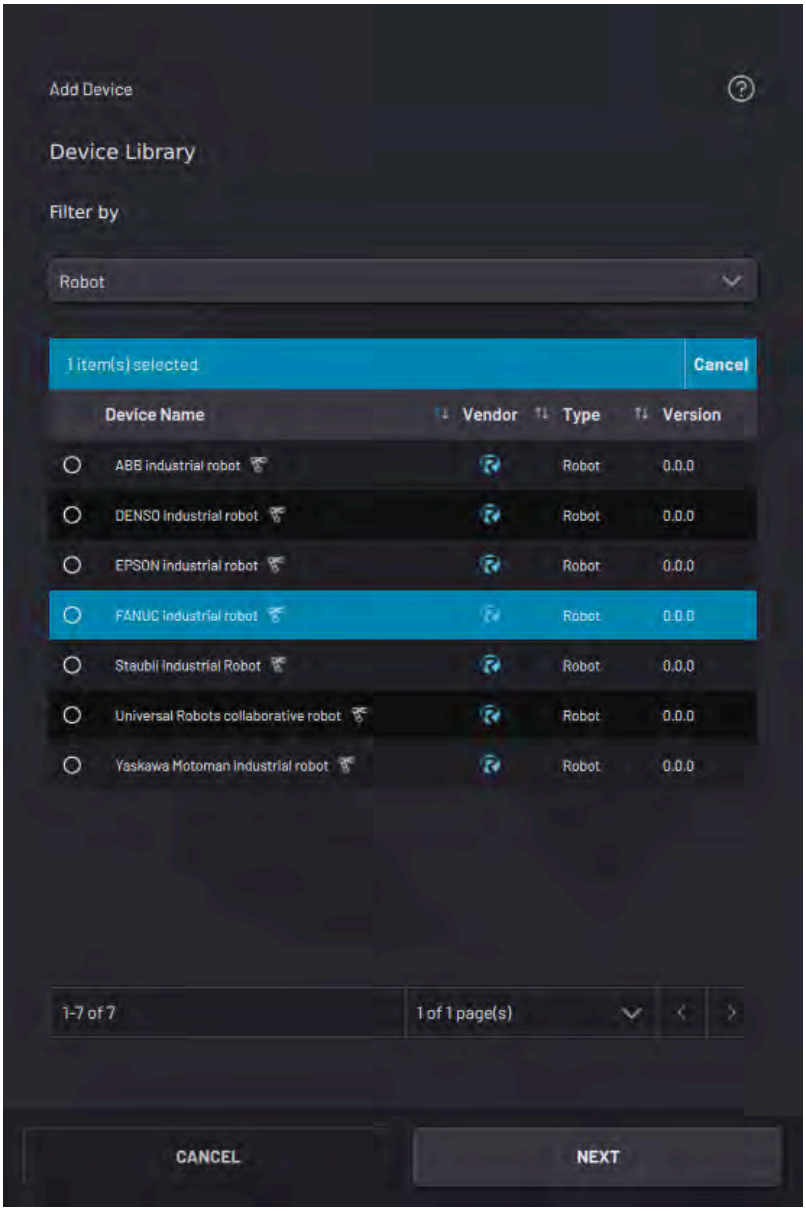
This section shows you how to add a robot in the Forge/OS Device Configuration app and configure the FANUC controller. Make sure the FANUC controller and Forge/OS devices are powered on.

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

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



3. Select the **FANUC Robot** option. You can use the **Filter by** dropdown to show robot options. Tap **NEXT** to continue.

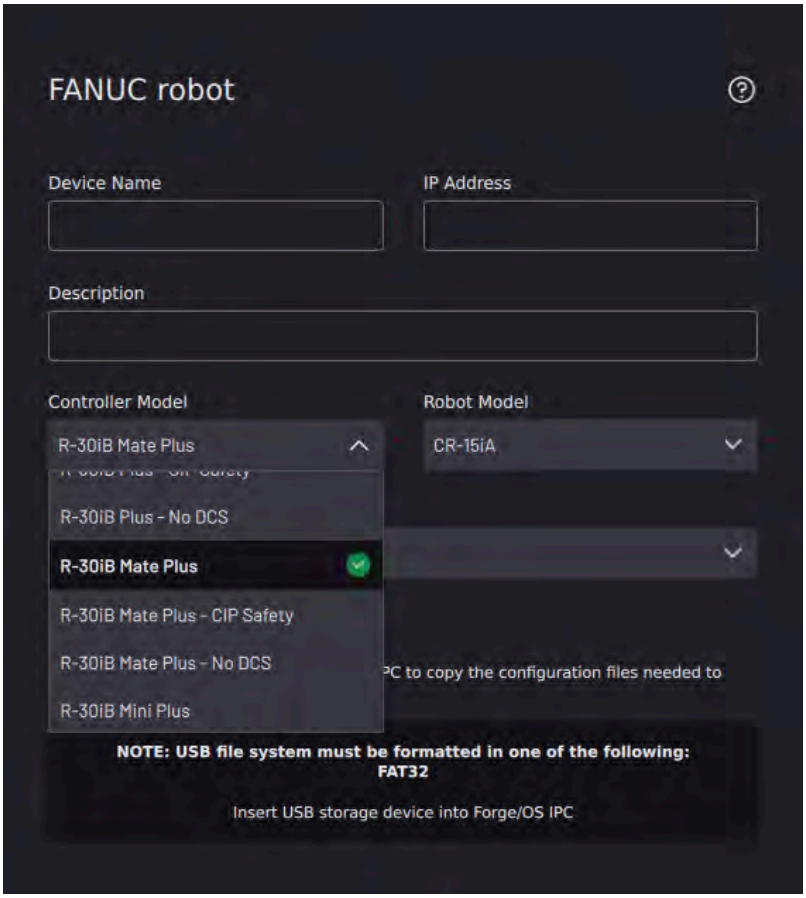


4. Give the robot a **Device Name** and enter the **IP Address**.

> **Note:**
> Enter the same IP address that you set on the FANUC controller.

5. Select the robot **Controller Model** and **Robot Model** in the dropdown menus.

> **Tip:**
> Some FANUC controllers have multiple hardware options for connecting the READY pendant safety devices. Select the one that matches your setup:
>
> - **"CIP Safety"** - You are using a CIP Safety PLC instead of the FANUC Safety I/O Board.
> - **"No DCS"** - You are using Forge/OS software-driven safety instead of DCS.
> - **Neither** - You installed the FANUC Safety I/O add-ons (except for the CRX, R-30iB Mini Plus).



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.
9. Insert the USB drive into the USB slot on the FANUC controller.
10. Complete these substeps to stop currently-running programs (so that you can later run the ForgeOS installation script):

    a. Press the **SELECT** button. A list of programs appears.

    b. Press **MONITOR (F4)** to show the list of running programs. If any programs appear, press the **FCTN** button. Then press **1** to **ABORT (ALL)**. Press **1** and **ABORT (ALL)** at least one more time to make sure that all running programs stop.

> **Note:**
> If you do not abort all running programs, you may have issues with the Forge installation process (such as a "Specified program is in use" message).

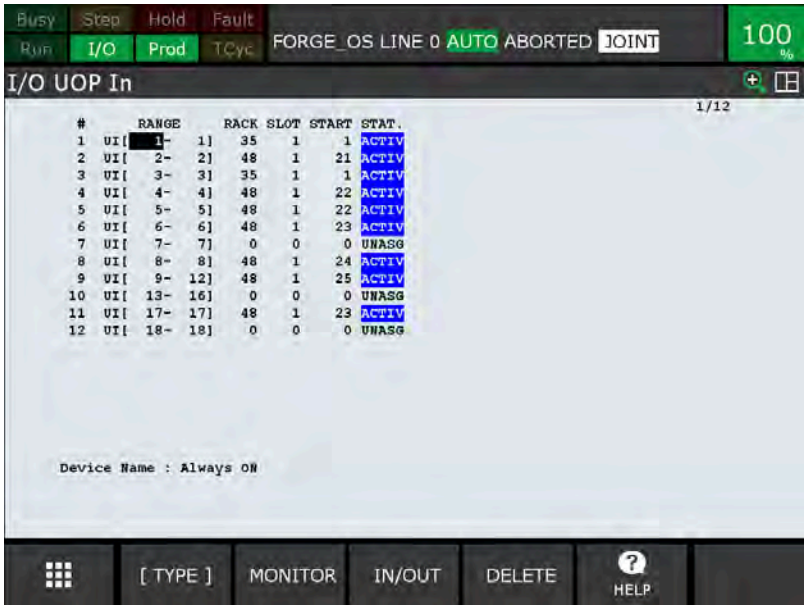
11. (**OPTIONAL**): If you are setting up a FANUC controller that was using remote control through a User Operator Panel (UOP), complete these substeps. Otherwise, you may have issues with the Forge installation process:

    a. Press the **MENU** button on the FANUC teach pendant

    b. Press **IO**.

    c. Press **TYPE (F1)** then **UOP**.

    d. Press **CONFIG (F2)**. If the **STAT** field is **ACTIV** for any entry, set the **RACK**, **SLOT**, and **START** fields to zero.



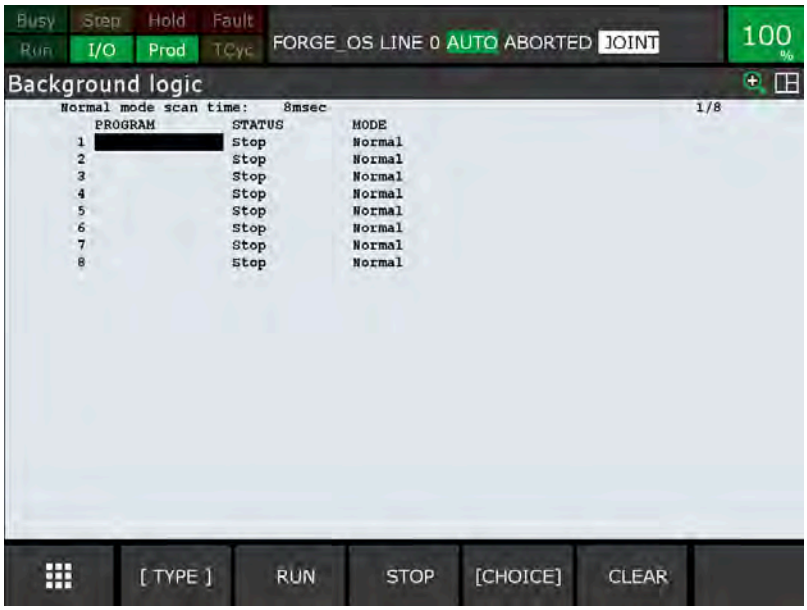
    e. Press **IN/OUT** to repeat the above substep with other signals.

f. Press the **MENU** button on the FANUC teach pendant.

g. Press **SETUP**.

h. Press **TYPE (F1)** then **BG LOGIC**. If this option is not visible, press **NEXT (0)**.

i. If the status of any task is RUN, change it to **STOP**.

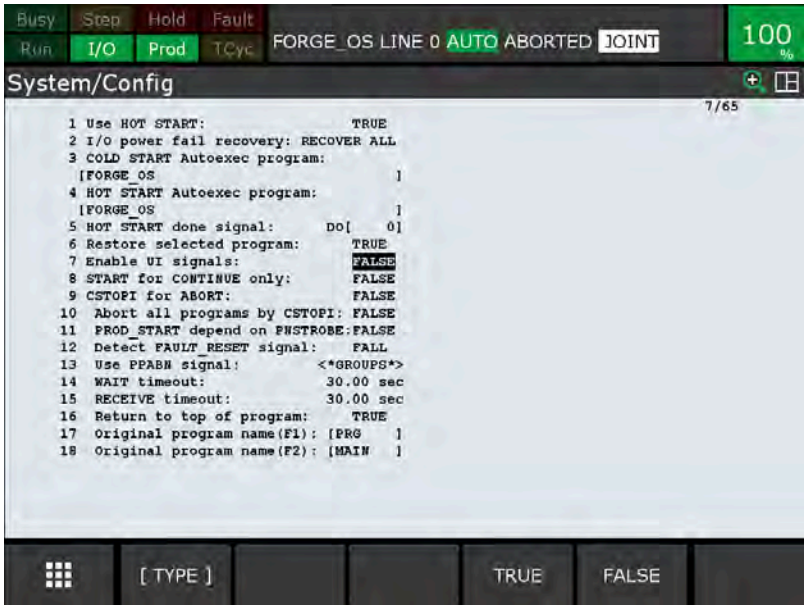


j. Press the **MENU** button on the FANUC teach pendant.

k. Press **NEXT (0)** then **SYSTEM**.

l. Press **TYPE (F1)** then **CONFIG**.

m. Change "**Enable UI Signals**" to **FALSE**.



n. Change "**Remote/Local Setup**" to **LOCAL**.

o. Restart the FANUC controller to apply these new settings.

12. Complete these substeps to install the configuration files on the FANUC controller:

a. Press the **MENU** button on the FANUC teach pendant.

b. Press **FILE (7)**, then **FILE (1)**.

c. Press **UTIL (F5)**, highlight the **Set Device (1)** option, and press the **ENTER** button.

d. Choose the **USB Disk (UD1:)** option.

> **Note:**
> If you inserted the USB drive into the teach pendant, choose the **UT1:** option.

e. Highlight the **All Files** option by using the arrow keys and press **ENTER**.

> **Note:**
> If you have trouble accessing the contents of the USB drive, try unplugging the USB and re-inserting it.

f. The contents of the USB drive will appear. Use the arrow keys and the **ENTER** key to find and highlight **FORGE-OS** > **READY-FANUC-DRIVER** > **FORGE_INSTALL,** then press **ENTER.**

> **Note:**
> The menu may sometimes already display the correct folder in the USB file structure. Check the “UT1:” file path displayed at the top of the FANUC pendant screen.

g. Press **Yes (F4)** for the prompt asking if you want to execute the file.

h. The FANUC Controller first displays **# Backing Up Controller Config #**. Wait for the FANUC Controller to say **Execution is completed successfully**. At a later time, you may copy the backup files in the FANUC Backup folder off of the USB drive.

> **Tip:**
> If you get a "Specified program is in use" message instead of "Execution is completed successfully", try aborting all programs again. Press **FCTN** then **1** for **ABORT (ALL)**.

> **Tip:**
> If running **FORGE_INSTALL.CM** fails in the backup step, reboot the controller and run **FORGE_INST_NOBACK.CM** instead. This install file doesn't include the backup step, allowing you to bypass the failure.

i. Press **OK (F4)** and remove the USB drive from the FANUC controller.

13. Apply changes to the FANUC DCS settings:

a. Go to the DCS screen by pressing the **MENU** button, **NEXT (0)**, **SYSTEM (6)**, then **DCS**.

> **Tip:**
> Or on the **SYSTEM** screen, press **[TYPE] (F1)**, then select **DCS**.

b. Press **PREV** to ensure you are on the main DCS screen.

c. Press **APPLY (F2)** to confirm the settings. If you installed Forge/OS files onto the FANUC controller before, there may not be changes to apply.

d. Enter the password (default: **1111**). Confirm the settings by pressing **OK (F4)**.

14. Restart the FANUC controller to apply the settings (power the controller off, then power it on). While the controller is restarting, set the switch on the front panel of the FANUC controller to **AUTO** mode. Turn the switch on the FANUC pendant to **OFF**.
15. For a **collaborative** robot, follow these sub-steps to confirm the payload each time the controller boots up and each time a READY pendant notification tells you to.

    a. Go to the Collaborative Robot DCS screen by pressing the **MENU** button, **NEXT (0)**, then **SYSTEM (6)**. If available, select the **DCS** option in the secondary menu; otherwise, press **TYPE (F1)** and select the **DCS** option.

    b. Ensure nothing is contacting the robot.

    c. Press **PREV**, highlight the **Collaborative Robot** option, and press **ENTER**.

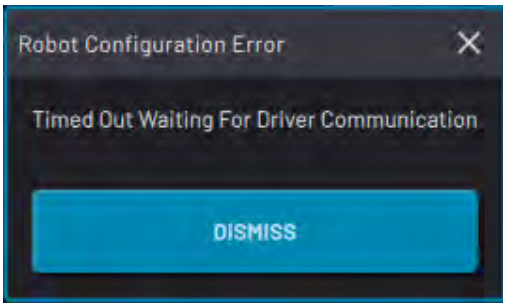
    d. Press **CONFIRM (F2)**. Enter the password (default **1111**) and follow the prompts by answering **YES (F4)**.

    > **Note:**
    > Each time a FANUC collaborative robot is turned off and then on again, the payload must be confirmed. If possible, wait for 30 minutes after booting. It can take up to 30 minutes for the Force Sensor to calibrate.

16. Confirm that the Forge/OS programs are running on the FANUC teach pendant. Press the **SELECT** button. A list of programs appears.
17. Press **MONITOR (F4)** to show the list of running programs. There should be three "FOS" programs running. If nothing happens when you press **MONITOR (F4)** or you see fewer than three "FOS" programs on the monitor, follow these sub-steps.
    a. Turn the switch on the FANUC teach pendant back to **ON**.
    b. On the FANUC teach pendant, press the **PREV** button to return to the list of saved programs.
    c. Use the arrow keys to highlight the program labeled **Forge_OS.**
    d. Hold down one of the three-position enabling switches on the back of the FANUC pendant to the middle position.
    e. While holding down the enabling switch, press and hold the **SHIFT** button and then press the **FWD** button once. Then release **SHIFT** and the enabling switch.
    f. Check the monitor again. Press **MONITOR (F4)**. There should be three programs listed.
    g. Set the switch on the front panel of the FANUC controller to **AUTO** mode. Switch the FANUC teach pendant to **OFF**.
18. 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.

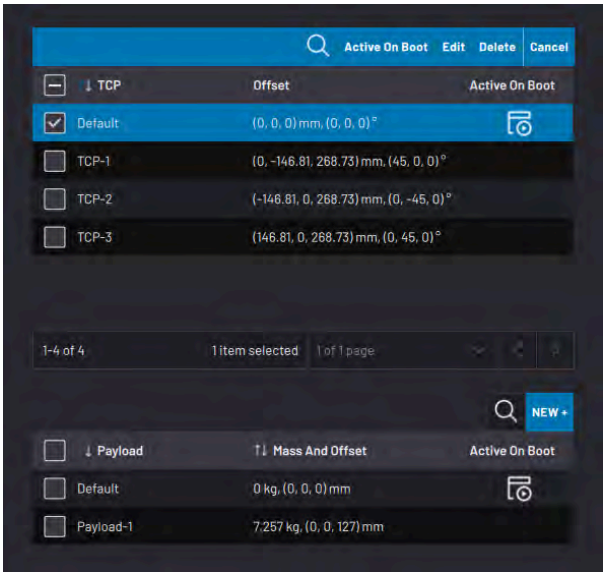


Click **DISMISS**, do the following, then try to tap **SAVE** again:

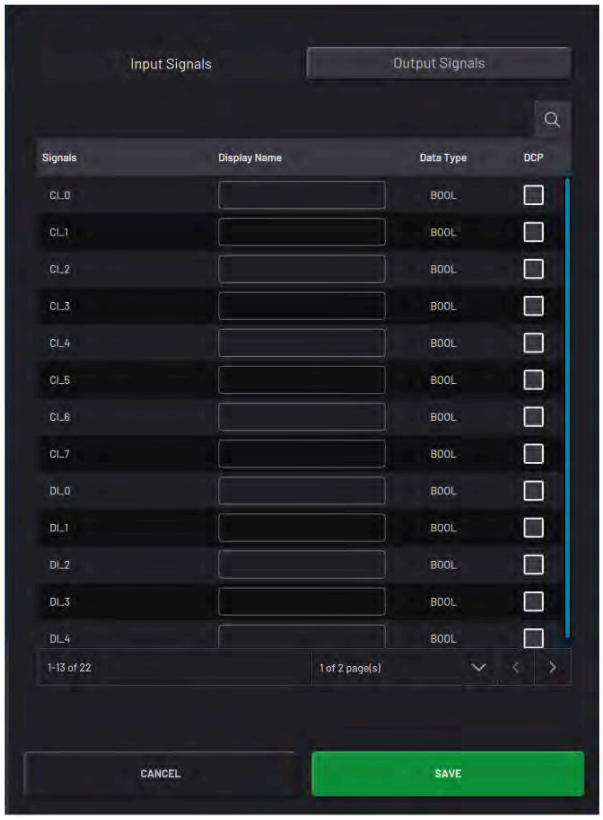
- Check the Ethernet connection between the robot controller and IPC.
- Check the network settings on the robot controller.
- Check if the robot controller is on and in the correct operating mode (in auto or remote mode).
- Select the correct robot controller and robot models in Device Configuration.

19. 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.



20. *(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.

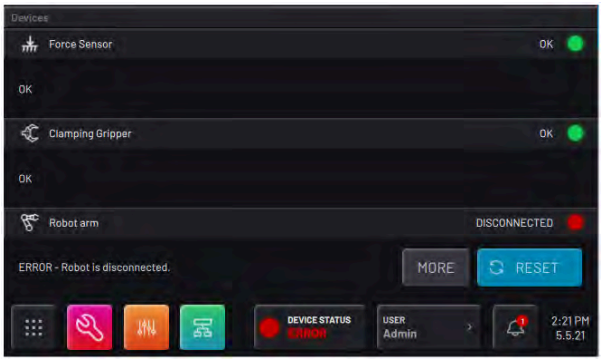
> **Note:**
> To use these I/O signals, integrate your I/O devices with the robot controller.

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.

21. 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.

22. If you added TCPs/payloads, follow the FANUC Tool Loading Steps in Appendix B *(on page 47)*. You need to perform the Tool Loading Steps each time you add TCPs and/or payloads.

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.

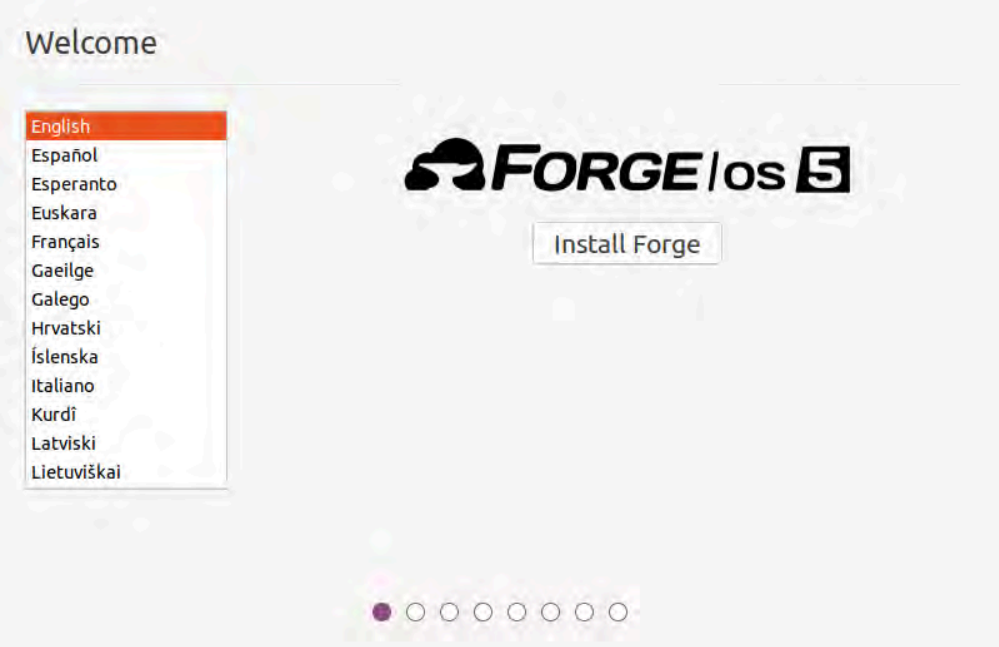
   c. Restart the IPC. While the IPC is powering on, press the keyboard hotkey that takes you to the Boot Menu.

   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.

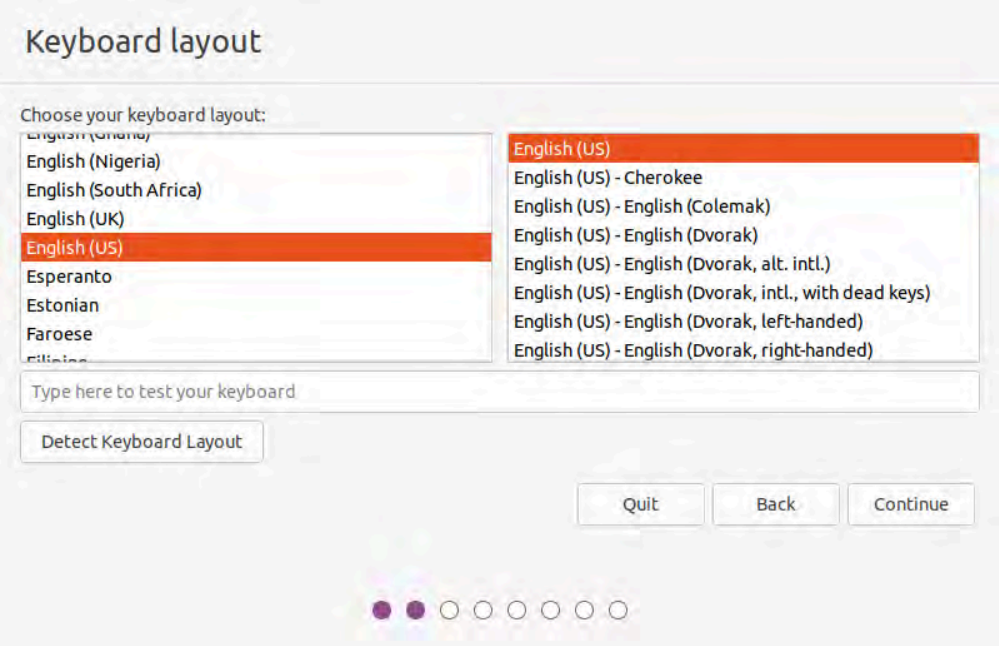
   d. From the boot options, select **Install ForgeOS** to boot from the installation USB flash drive.

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

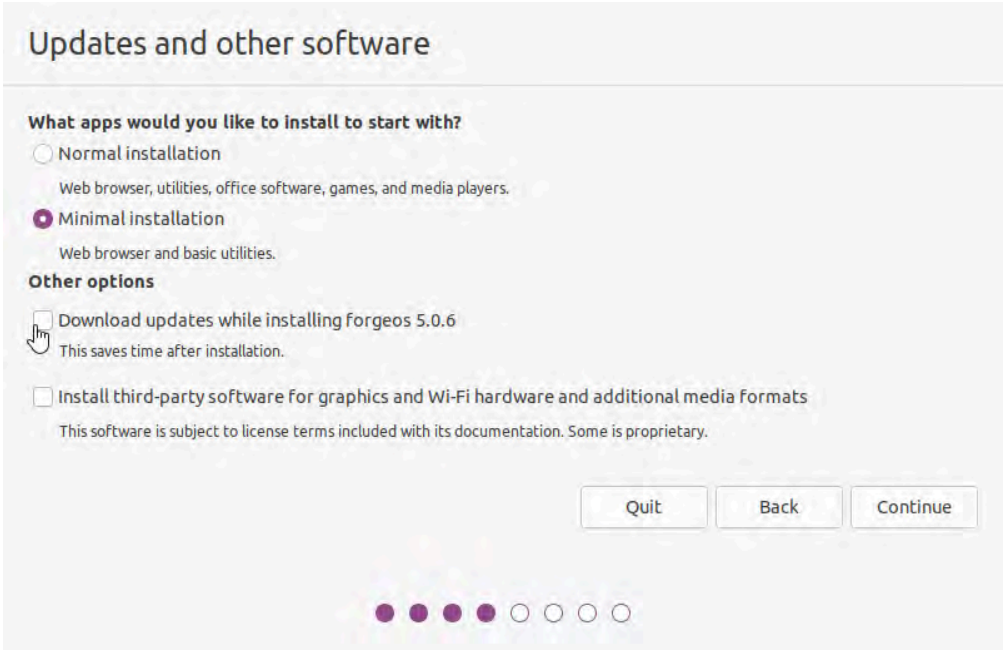
   f. Select your language. Then click **Install Forge**.



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

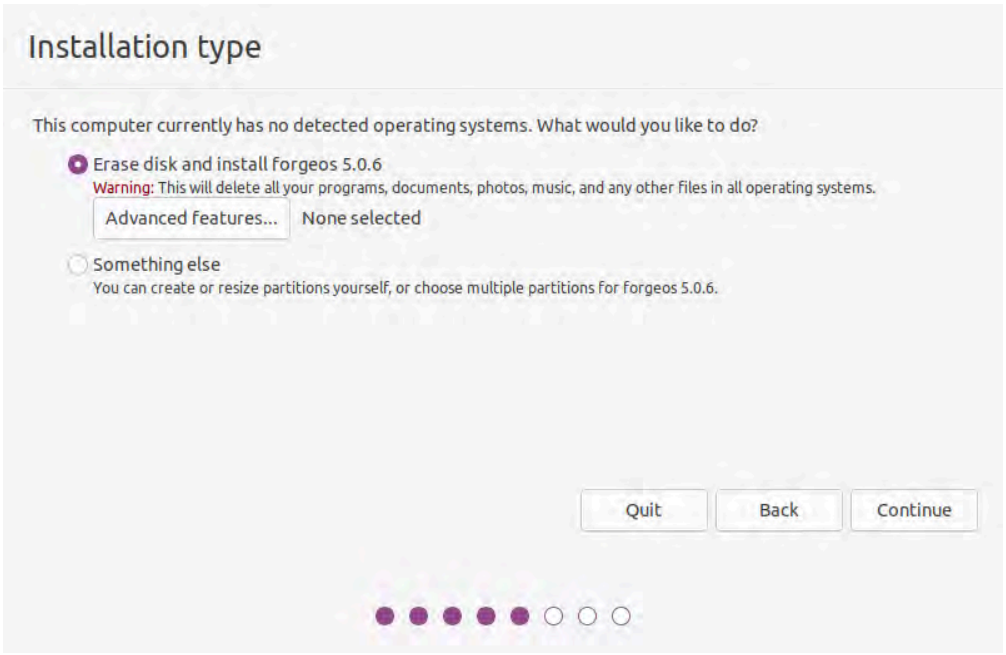


h. Select **Minimal installation**. Uncheck **Download updates while installing forgeos**. Then click **Continue**.

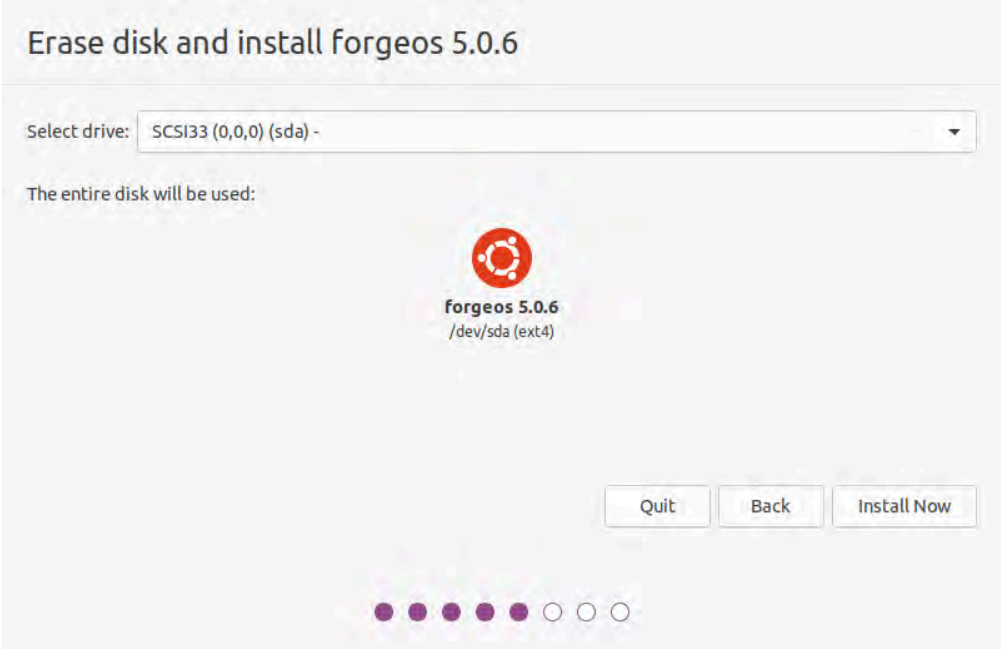


i. Select **Erase disk and install forgeos**. Then click **Continue**.

> **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.

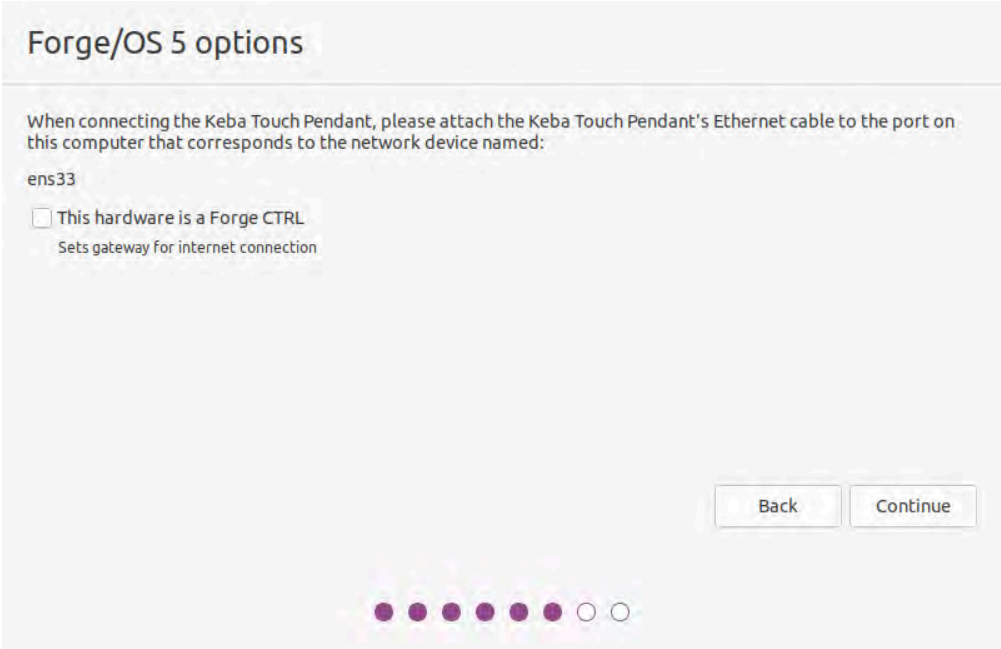


j. Select the IPC hard drive for ForgeOS and click **Install Now**.

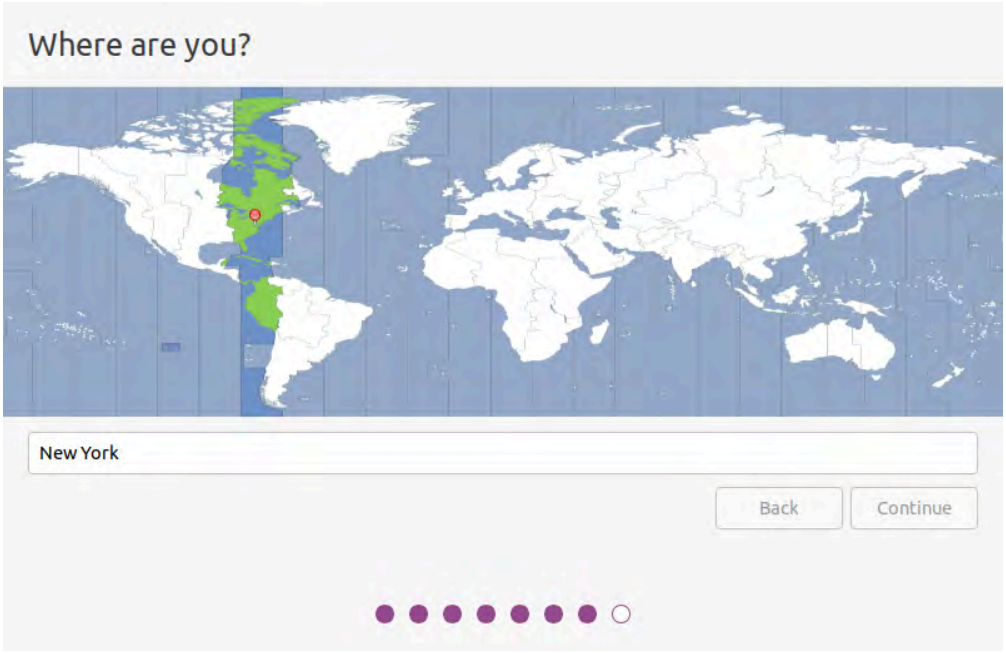


k. Confirm that you want to erase the entire disk by clicking **Continue**.

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**.

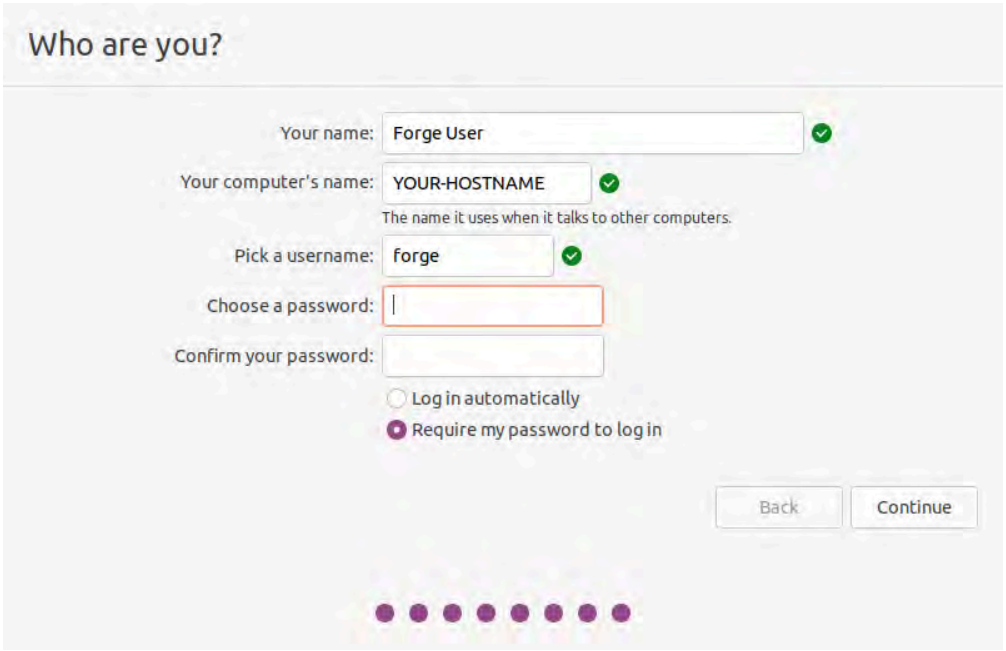


m. Choose your timezone. Then click **Continue**.



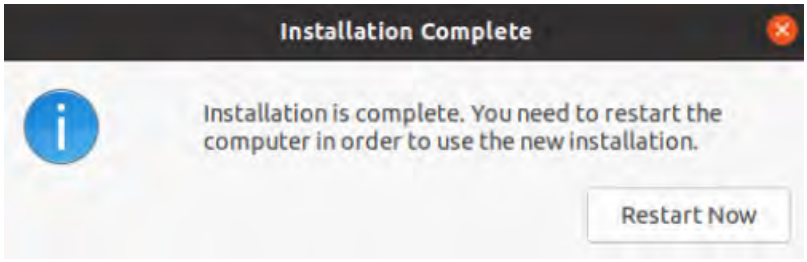
n. Choose your IPC's host name. The host name identifies the IPC on the network. Pick a username and password. Then click **Continue.**

> **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.

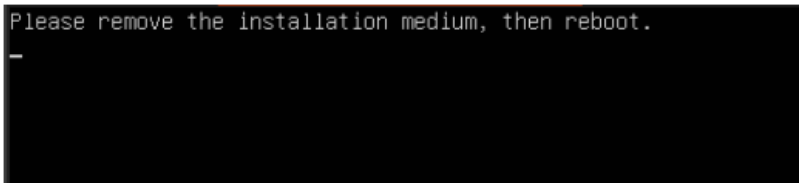


o. Wait for the installer to copy and install ForgeOS.

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

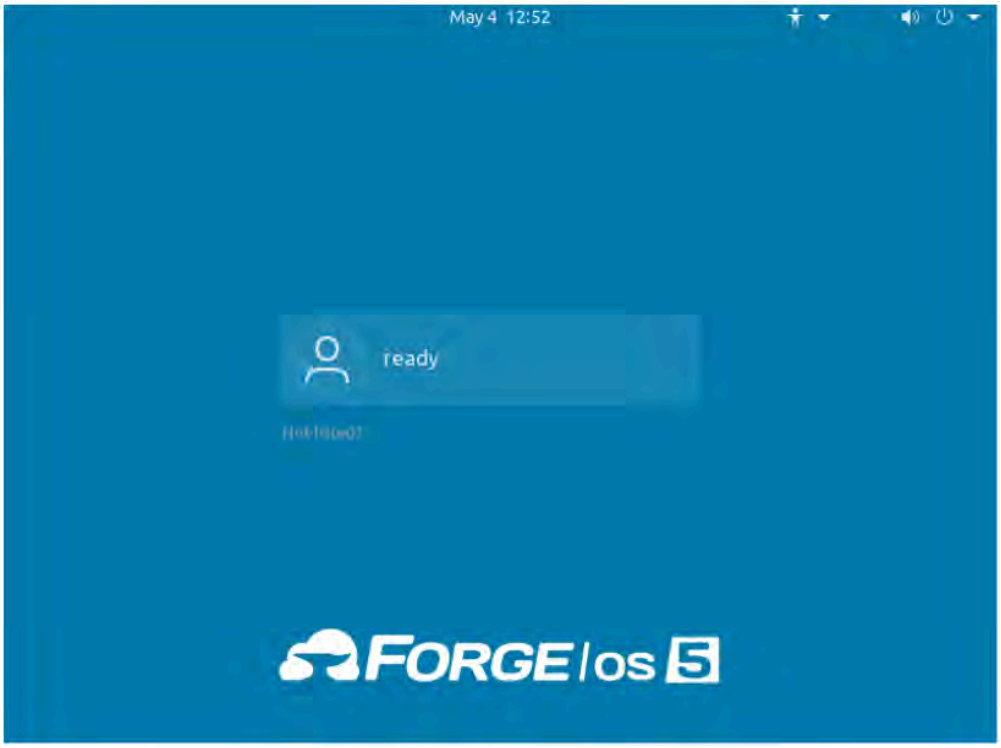


q. When prompted, remove the installation flash drive. Then reboot.



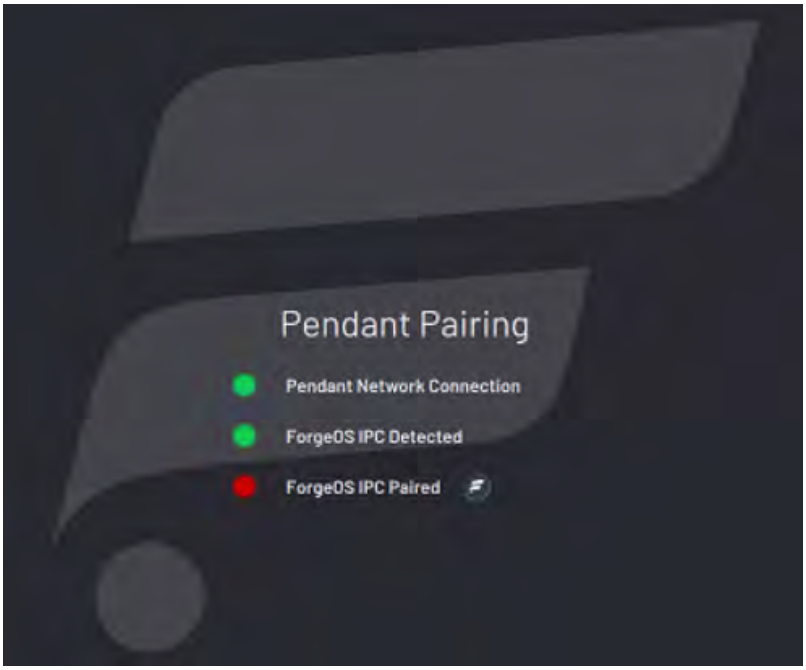
r. Wait for ForgeOS to finish booting.

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.

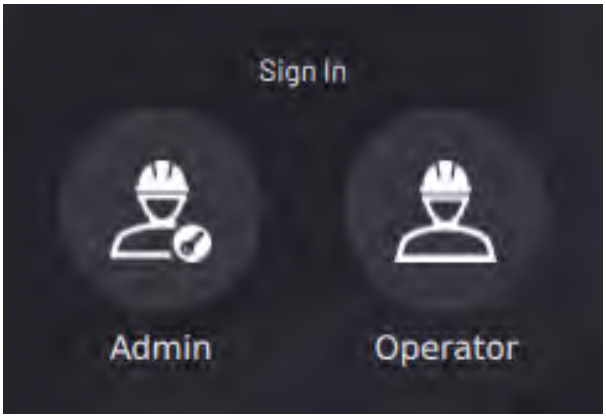
    When a condition is not satisfied, the LED is red. When a condition is in progress of becoming satisfied, a spinner around a READY logo appears to the right of the text. When a condition becomes satisfied, the LED turns green.



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 42)*.

Activating ForgeOS with a License Code

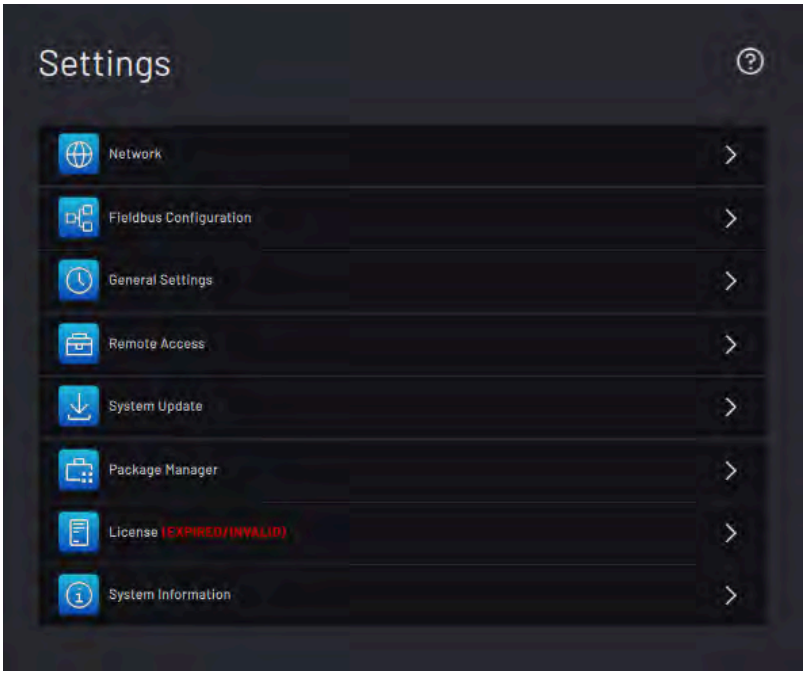
There are two methods to activate ForgeOS: **Online license activation** and **offline license activation**.

The table below lists the requirements for each method.

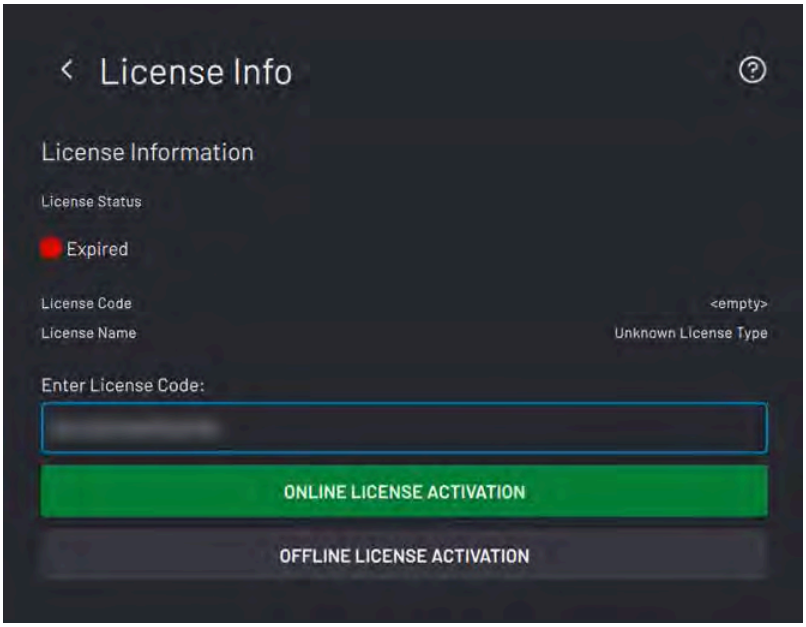
Online License Activation	Offline License Activation
• An internet-connected ForgeOS • A valid ForgeOS license code	• A 2GB or larger USB flash drive • An internet-connected PC • A valid ForgeOS license code

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**.

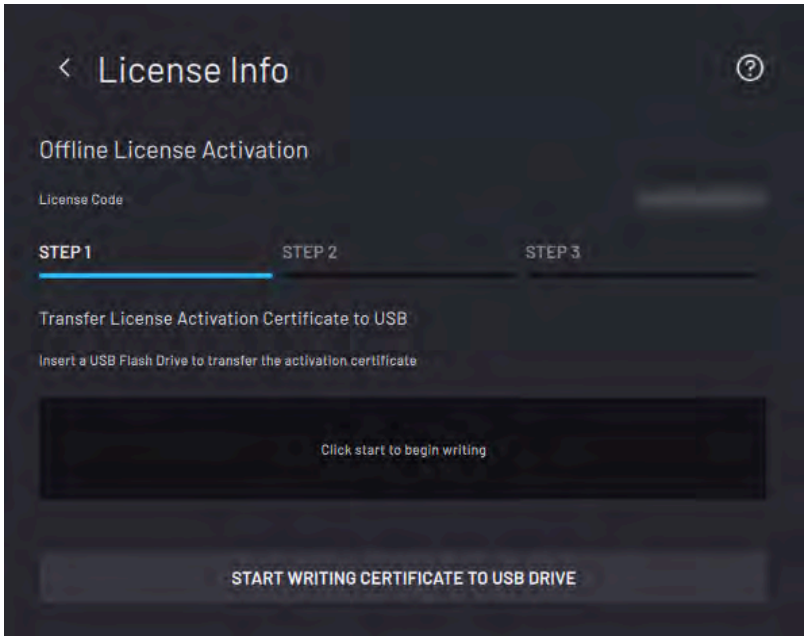


2. Type in your license code.
3. Choose **ONLINE LICENSE ACTIVATION** if ForgeOS is connected to the internet. If not, choose **OFFLINE LICENSE ACTIVATION**.

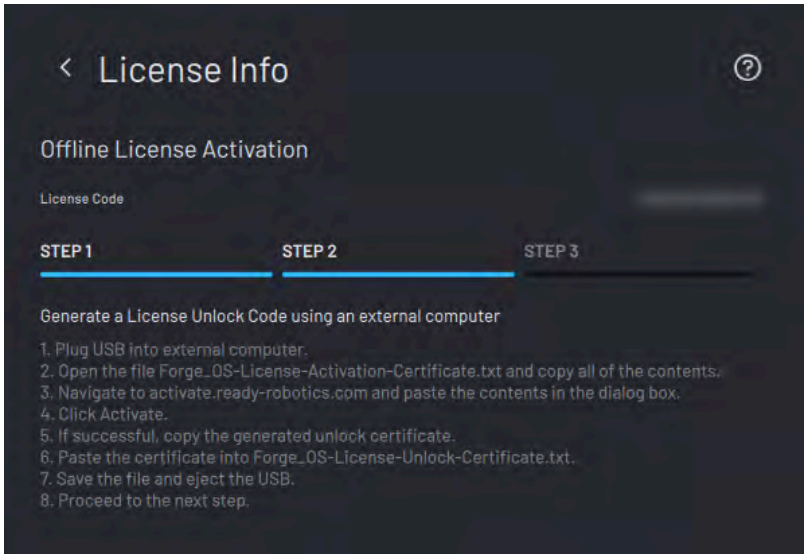


4. If you chose online license activation, you're done!
5. If you chose offline license activation, follow these substeps:

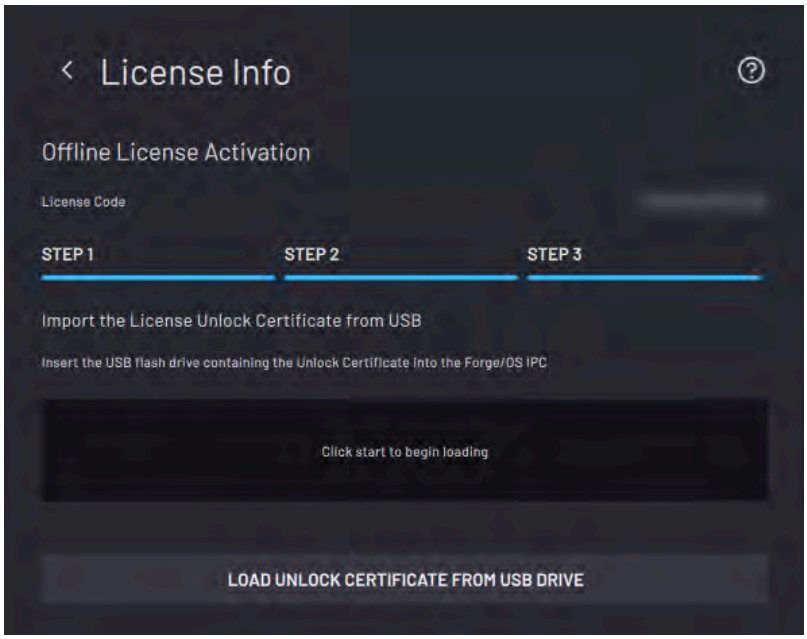
    a. Insert the USB flash drive into your IPC. Tap **START WRITING CERTIFICATE TO USB DRIVE**.



    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

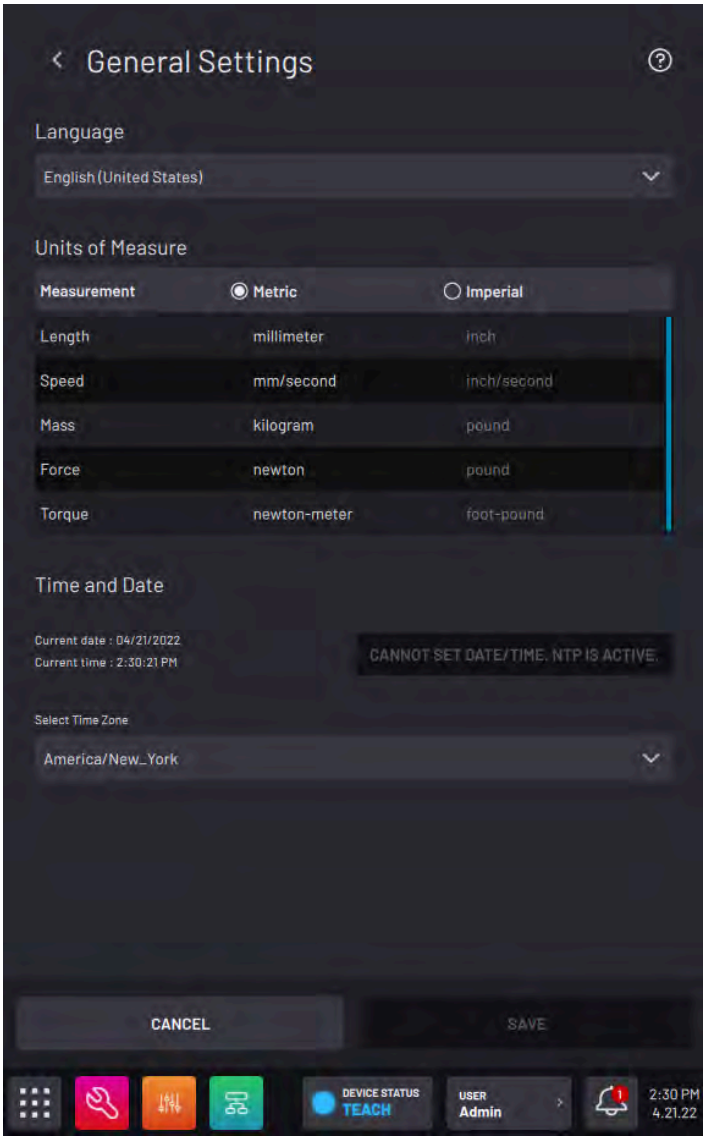
These steps help you choose system preferences, including language, units, time, and network settings.

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.

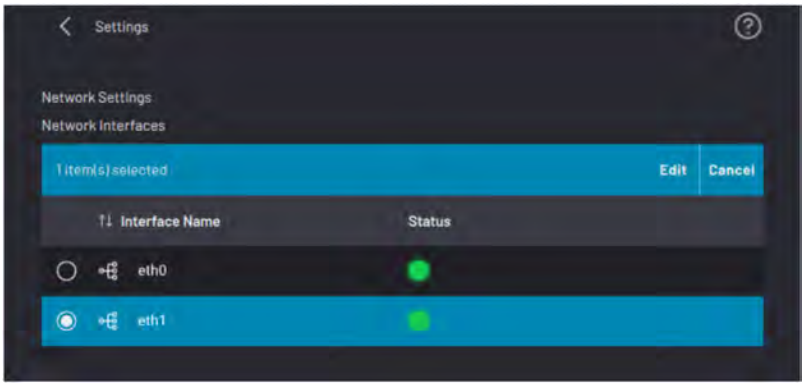


    c. Tap **SAVE** to save changes and exit the General Settings menu.

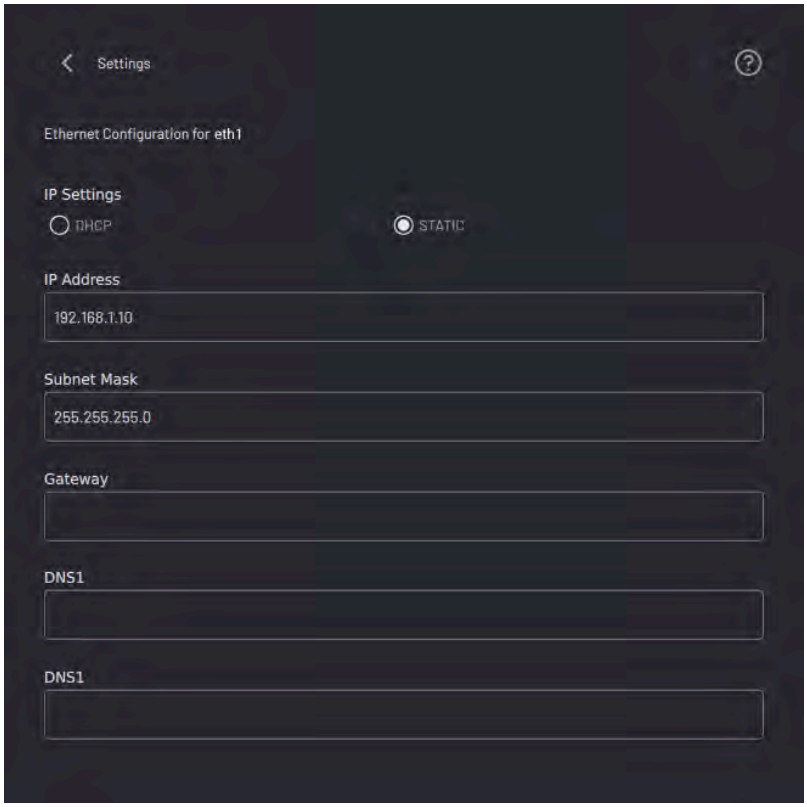
2. Check the Network settings in Forge/OS and set them as you want.

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**.

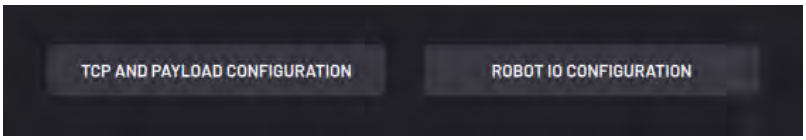
Chapter 12. Appendix B: Tool Loading Steps

Follow these steps to add new TCPs/Payloads in Forge/OS and update the configuration on the FANUC controller.

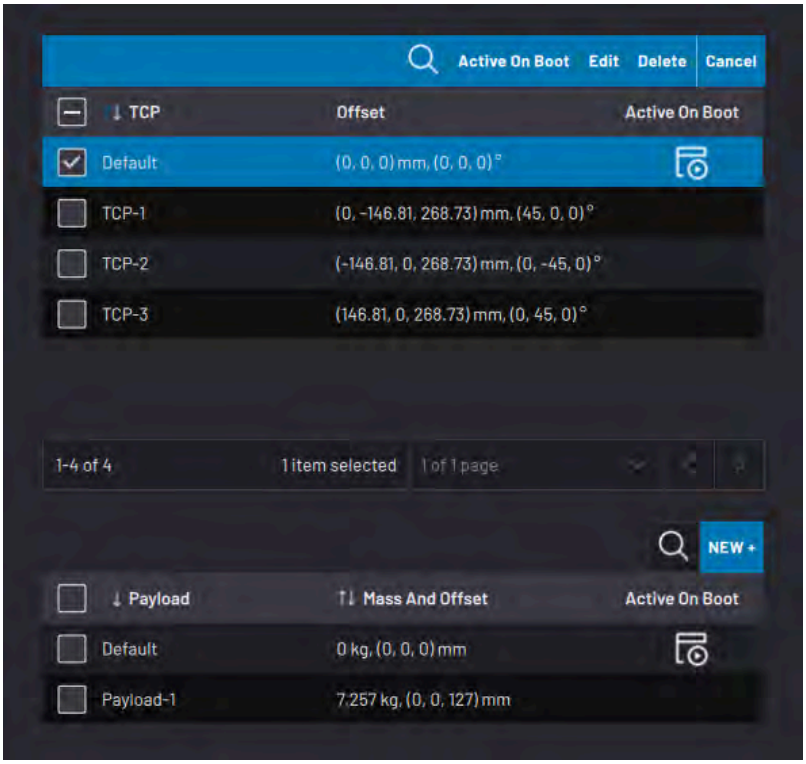
Here is an outline of the tool loading process:

- Add TCPs/Payloads to the robot's configuration in Forge/OS and save.
- Apply DCS parameters.
- Restart the FANUC controller.
- Confirm the Collaborative DCS settings (collaborative only).
- Reset the controller from Forge/OS.

1. In Forge/OS, go to the Device Configuration app and find the FANUC robot under Configured Devices. Select the device and tap **Edit** to open the robot configuration.
2. Tap **TCP AND PAYLOAD CONFIGURATION**.



3. Add all the TCPs and Payloads you need for your workcell and tap **SAVE**.



4. Tap **SAVE** to exit the robot configuration. Forge/OS uploads the tool data to the FANUC controller. Forge/OS shows an error for the robot: *FANUC Error SYST-212: DCS settings not applied*.
5. Install your end of arm tooling on the robot.
6. Apply changes to the FANUC DCS settings:

a. Go to the DCS screen by pressing the **MENU** button, **NEXT (0)**, **SYSTEM (6)**, then **DCS**.

> **Tip:**
> Or on the **SYSTEM** screen, press **[TYPE] (F1)**, then select **DCS**.

b. Press **PREV** to ensure you are on the main DCS screen.

c. Press **APPLY (F2)** to confirm the settings. If you installed Forge/OS files onto the FANUC controller before, there may not be changes to apply.

d. Enter the password (default: **1111**). Confirm the settings by pressing **OK (F4)**.

7. For a **collaborative** robot, the controller will boot to the DCS **Collaborative robot** screen. Follow these sub-steps to confirm the collaborative DCS settings:
   a. Press **CONFIRM (F2)**.
   b. Enter the password (default: **1111**) and follow the prompts by answering **YES (F4)**.
8. On the READY pendant, tap the **Device Status** button to expand the Device Status Panel, then tap the **RESET** button on the list next to the robot. This clears the faults on the robot and gives you control of it.

Chapter 13. Contacting READY

Visit 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