

Installation guide

Versions

Installation guide for software version V1.3

(*You can find the installation guide in Spanish from the web: www.bitmetrics.es)

System requirements

Pick^[+] is currently compatible with the following hardware components:

Robots

- Universal Robots: models UR3e, UR5e, UR10e and UR16e

Camera

- Intel RealSense D435i

Client PC / operating system

- Ubuntu 20.04, Windows 10
- Minimum screen resolution: 1920x1080

⚠ WARNING: Besides the screen resolution it is important to set the display scale to 100%. By default, Windows sets the scale to 125%. It should be changed to 100% for a proper visualization of the client.

Pick^[+] components

Pick^[+] is served in two boxes: the **PC** box (**A**) and the **camera** box (**B**).

Box A

Box A contains the following elements:

- 1 PC with Pick^[+] server and client installed.
- 2 Ethernet cable for connection between PC and robot.

⚠ WARNING: Ethernet cable for connection between PC and external client is not included. Likewise, peripherals such as keyboard, mouse and screen for PC are not included.

Box B

Box B contains the following elements (see image below):

- 1 Camera Intel RealSense D435i mounted on LED case.
- 2 Camera adapter for eye-in-hand mode (camera in robot).
- 3 Camera adapter for hand-eye mode (external camera).
- 4 Calibration plate.

- 5 Scanning mat.
- 6 LED cable.
- 7 Camera-PC cable.
- 8 Tool adapter.
- 9 USB with Pick^[+] clients, URcap and user manuals.
- 10 Mounting screws.



Camera mounting (eye-in-hand)

Camera in robot (eye-in-hand)

2 Steps

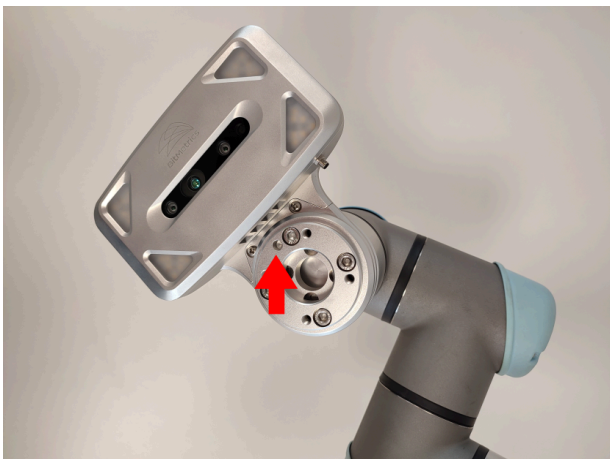
- 1 Mount camera case with robot adapter with the provided mounting screws (see images below).

⚠ WARNING: It is advisable to mount the camera case facing the UR tool connector above tool flange (see figure on the right).



2 Mount tool adapter on top of robot adapter with the provided mounting screws.

⚠ WARNING: Make sure the centering slot in the tool adapter matches that of the robot—i.e., aligned with the UR tool connector (see figure below).



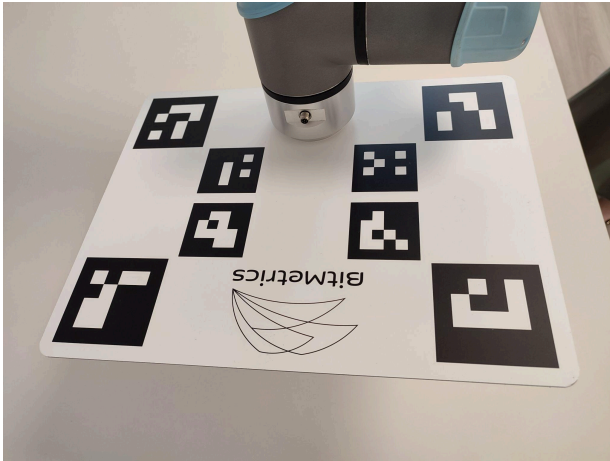
Calibration plate mounting (hand-eye)

External camera (i.e., away from robot).

In such cases the camera and robot are calibrated by mounting the calibration plate on the robot tool flange.

1 Step

1 Mount calibration plate using centering pin and provided mounting screws (see images below).



LED lights connection

2 Steps

- 1 Connect non-pinned end of the cable to the desired Digital Output connections rack: red cable in DO slot and white cable in corresponding 0V slot (see right image).
- 2 Connect the pinned end of the cable in the connection slot in the camera case (see left image).



Camera connection

The camera needs to be connected to a USB port of type **3.1Gen2** (i.e. **10GBps**).

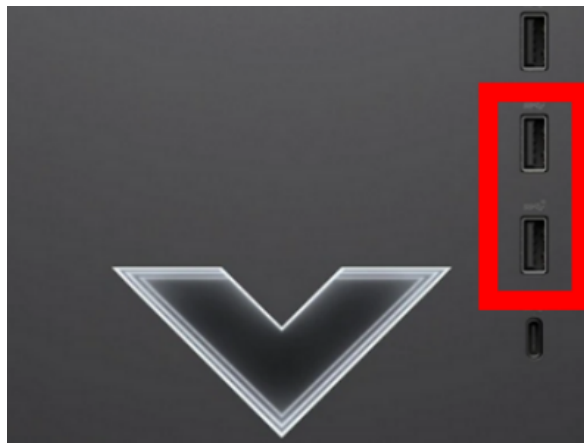
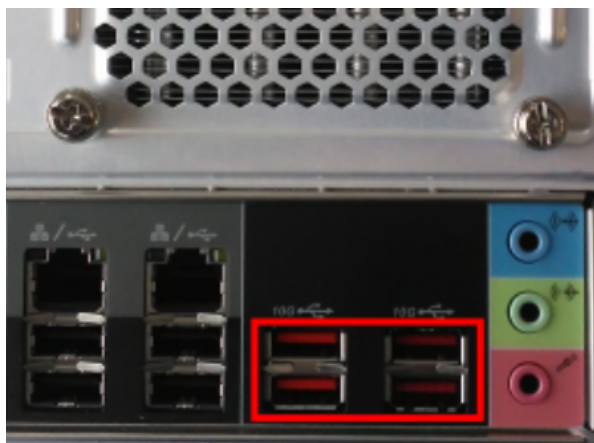
⚠ WARNING: The camera will not connect through a USB of type 2.0. In USB 3.0 or USB 3.1Gen1 connectivity will be shown but only the RGB sensor will work. Depth requires a USB of type 3.1Gen2 or higher.

2 Steps

- 1 Connect USB C end of cable to the camera (see image below).



- 2 Connect USB A3 end of the cable to one of the 3.1Gen2 or 3.2 USB ports in the PC (see the highlighted region on left image for the Shuttle PC and on the right image for the HP Victus PC)



URcap installation

Pick^[+] comes with a URcap with program nodes that help in the preparation of the robot routine.

⚠ WARNING: The URcap has been tested for Polyscope software versions ranging from 5.8 to 5.11.

4 Steps

Proceed as it is usual to install URcaps in UR PolyScope:

- 1 Mount pen drive in UR PolyScope with a copy of the URcap (named *PickPlus-1.0.SNAPSHOT.urcap*). A copy of this file can be found in the provided pendrive or else it can be downloaded from the Pick^[+] repository in cloud (see **Downloads** section).
- 2 Move to Settings > System > URcaps on the hamburger menu in UR polyscope.
- 3 Click on the add button ('+' sign) and select the URcap from the pen drive.
- 4 Restart PolyScope to complete installation.

Client installation / upgrade

Two possible Pick^[+] client installations: *standalone* (i.e., in server PC) or *external*.

Requirements (see **System requirements** above):

Operating system: **Windows 10** or **Ubuntu 20.04**.
Minimum screen resolution: **1920x1080**.

2 Steps

1. Move/download file *pickplus.zip* to your PC, either from the installation USB or from the Pick^[+] repository in cloud (see **Downloads** section).
2. Uncompress file and save in corresponding folder. Make sure the pickplus folder contains the following files and subfolders:

Ubuntu 20.04

- 2.1. pickplus subfolder with client application packaged
- 2.2. *logo.ico*
- 2.3. *install_pickplus.sh* to build desktop icon

Windows 10

- 2.4. pickplus subfolder with client application packaged
- 2.5. *logo.ico*

Standalone version is already pre-installed in all Shuttle PCs (in subdirectory *pickplus_client*).

To upgrade:

Save the `pickplus` folder with the new client application in directory `/home/pickplus/pickplus_client`

Client desktop icon

Ubuntu 20.04

To create a desktop icon for the client application you need to execute the bash script contained in the `pickplus` client folder (named `install_pickplus.sh`, see above).

2 steps

1. Open terminal in client directory where the file `install_pickplus.sh` is located.
2. Execute bash script from the terminal:

```
bash install_pickplus.sh
```
3. Place the mouse on top of the desktop icon (named `pickplus.desktop`) once created and, if necessary, click right button in mouse and enable launching. Double click on left button to open client application.

⚠ WARNING: You may be asked for the user password in order to execute some bits of the bash script. This password is provided together with the license of use of Pick^[+].

Windows 10

Look for the `pickplus` script inside the `pickplus` client folder. Place mouse on top and click on right button to look for the 'create shortcut' option.

Server installation / upgrade

6 Steps + environment update

- 1 Download server file (named `pickplus.zip`) from the Pick^[+] repository in cloud (see **Downloads** section).
- 2 Save file in pendrive.
- 3 In server PC navigate to the home directory: `/home/pickplus`.

- 4 Remove folder `pickplus` (`/home/pickplus/pickplus`). Note that this will also remove the `data` folder due to incompatibility between this version and the previous ones.
- 5 Save file `pickplus.zip` in this directory (`/home/pickplus`) and uncompress with the following command from terminal:

```
pickplus@pickplus-BM:~/pickplus$ unzip pickplus.zip
```

- 6 Make sure that the directory `/home/pickplus/pickplus` contains the following files and directories:
 - 6.1. `pickplus.py`
 - 6.2. `execution_server.py`
 - 6.3. `credentials.txt`
 - 6.4. `upgrade.sh`
 - 6.5. `yolov8n.pt`
 - 6.6. `data` folder
 - 6.7. `application` folder
- 7 * If `upgrade.sh` is in the downloaded folder an upgrade of the Python environment will be required. To proceed first make sure that you are **connected to the internet**.

⚠ WARNING: You may use any of the network cards available in the PC to connect to the internet (ethernet or wireless). Just make sure that, after finishing the upgrade, the two ethernet connections are properly set to communicate to robot and external client (as described in this guide) and that there are no network conflicts between connections (to play safe, disable wireless connectivity when finishing upgrade).

⚠ WARNING: You may be asked for the user password in order to make `upgrade.sh` executable and install. This password is provided together with the license of use of Pick[+] .. You may also be asked to confirm by terminal that you indeed want to install a particular library: type 'Y' in terminal and click on the return key to continue.

We first make sure that the file is executable:

```
pickplus@pickplus-BM:~/pickplus$ sudo chmod +x upgrade.sh
```

We execute:

```
pickplus@pickplus-BM:~/pickplus$ ./upgrade.sh
```

⚠ WARNING: The new version 1.3 (v1.3) introduces changes in the data types and structures that are generated throughout the application. Thus, the folder `data` is reset (i.e., replaced by a new folder with no user data stored).

Client connectivity and execution

Two ways to execute the Pick^[+] client: *standalone* (i.e., from server PC) and *external*.

Standalone

Client installed and executed from server PC. To open, click on the Pick^[+] icon in desktop to start client. If there is no icon you can create one (see section above). Else, follow the steps below to start client.

2 Steps

- 1 Move to the Pick^[+] client directory in terminal
- 2 Execute client: in terminal execute the command `./pickplus.sh`

For model Shuttle

Open terminal and move to `/home/pickplus/pickplus_client/pickplus`:

```
pickplus@pickplus-BM:~$ cd pickplus_client/pickplus
```

Execute client:

```
pickplus@pickplus-BM:~/pickplus_client/pickplus$: ./pickplus.sh
```

External

Client installed on independent PC.

4 Steps

- 1 Connect ethernet cable to the corresponding port in Pick^[+] server. Make sure server is ON before attempting to connect client (see arrow on left image for Shuttle PC and on right image for HP Victus)



2 Configure ethernet connection manually as follows on external PC:

- IP: **200.200.1.1** (or any other within the net 200.200.1 not in use)
- Network mask: **255.255.255.0**
- Gateway: **200.200.1.100** (Pick^[+] server listens on this IP)

⚠ WARNING: In older settings of the Pick[+] server the IP set to communicate with the client may be set to 192.168.1.100. If so, change the server IP to 200.200.1.100.

3 If you have no desktop icon, move to the pickplus directory: the directory where you saved the client folder pickplus (once unzipped) that contains the client executable.

4 Once in the client folder execute:

pickplus.sh in Ubuntu (by writing in terminal `./pickplus.sh`)

pickplus.exe in Windows (by writing in terminal `pickplus.exe`)

Robot connection

2 Steps

1 Connect ethernet cable to the corresponding port in Pick^[+] server/PC (see images below for the models *Shuttle* and *HP Victus* on left and right respectively).



2 Configure network connection in UR Polyscope as follows:

- IP: **200.200.2.2**
- Network mask: **255.255.255.0**
- Gateway: **200.200.2.1** (Pick^[+] server listens to robot on this IP)

Downloads

⚠ WARNING: In older settings of the Pick^[+] server the IP set to communicate with the robot may be set to 200.200.2.1. If so, change the server IP to 200.200.2.1.

All Pick^[+] code can be downloaded from the Pick^[+] repository:

<http://www.bitmetrics-downloads.es>

⚠ WARNING: When downloading code, make sure about the compatibility of all the code components. To play safe, stay on the same version for all components.