RoboDK for Fanuc Robots

https://robodk.com/
info@robodk.com
+1-855-692-7772

Contents

Fanuc robots

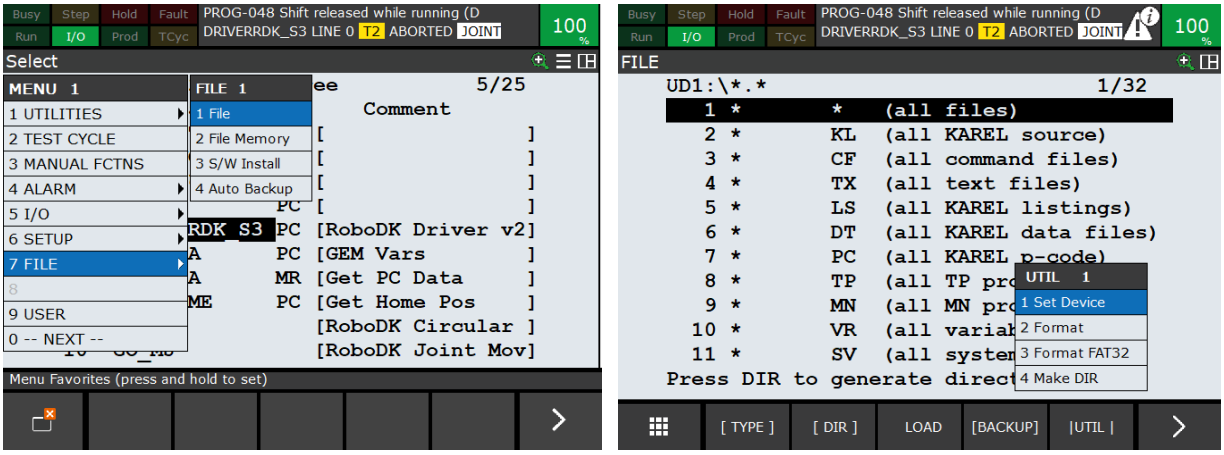
This section of the documentation provides an overview of typical operations using a Fanuc robot to prepare a new program in RoboDK and transfer it to the robot. RoboDK supports all Fanuc robot controllers since RJ2, including RJ3, R-30iA and R-30iB. This documentation is based on the R-30iA Fanuc controller.

Note: It is recommended to request the **ASCII Upload** option (R507) on the Fanuc robot controller to easily transfer LS program files generated offline without any issues, as explained in the section comparing LS and TP programs.

Transfer a robot program

We must follow these steps to load a program from a USB drive:

1. Plug the USB drive on the teach pendant
2. Select **Menu→File**
3. Select **Utilities→Set device→USB**
4. Select **DIR**
5. Select the TP or LS program file from the USB disk (BALLBARTEST.TP for example)
   This will automatically save the file to the **FR** memory of the controller
6. Select the program in the **FR** memory and select LOAD (screen button)



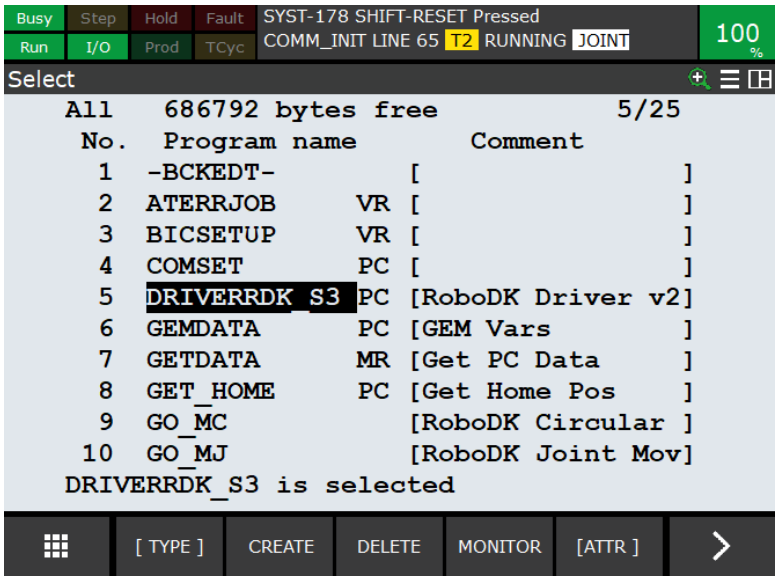
Important: The **ASCII Upload** option is required for offline programming. This allows loading LS files directly to the controller. Alternatively, LS programs (ASCII files) can be compiled to TP programs (binary files) from the PC using Fanuc's WinOLPC tools (MakeTP).

Important: The linear speed of programs created with RoboDK is defined by the register R[10] by default. If the speed is not set in the program it must be set manually. In that case:
Select: **DATA→Type→Register**, R[10]=50 (for a speed of 50 mm/s)

Start a robot program

Follow these steps to start a robot program on the Fanuc robot controller.

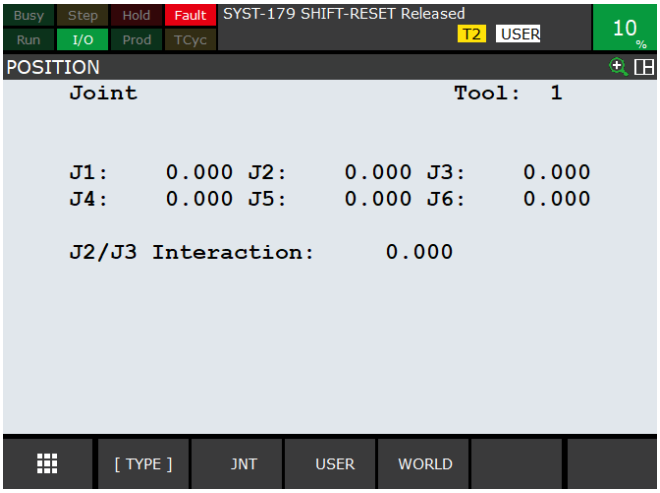
1. Select **FCN** (teach pendant button)→**Abort all**
2. Select **SELECT** (teach pendant button)
3. Select the program (BALLBARTEST for example)
4. Press and hold the Deadman switch
5. Select **RESET**. All alarms should disappear.
6. Select and hold the **SHIFT** button of the teach
7. Select **FWD** (button on the teach pendant)



Retrieve robot joints

Follow these steps on the Fanuc teach pendant to retrieve the robot joints of your real robot.

1. Select **POSN** (button in the teach pendant) to see the current robot position
2. Select **JNT** on the screen or select **COORD** (button in the teach pendant) to select the joins mode.

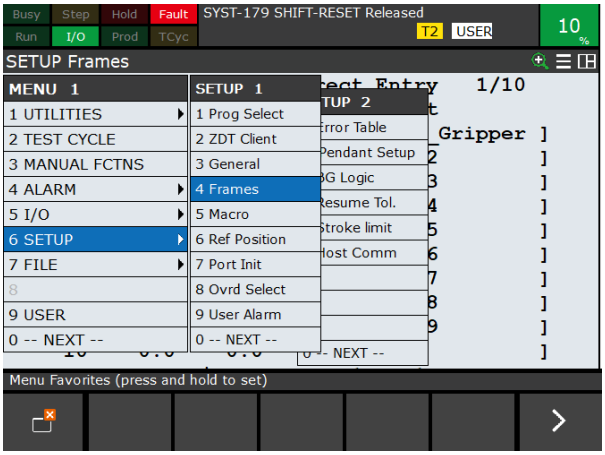


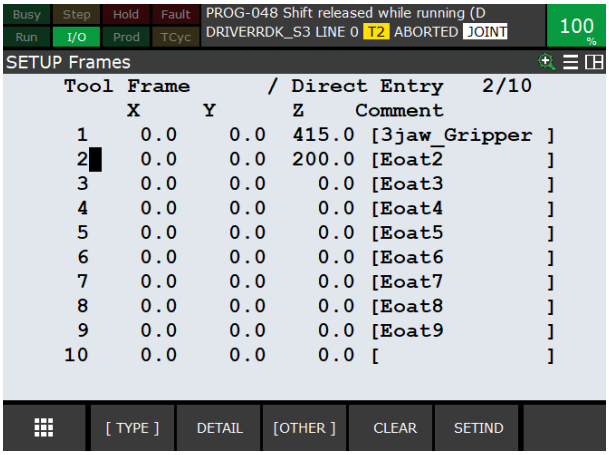
Retrieve the Robot Tool (TCP)

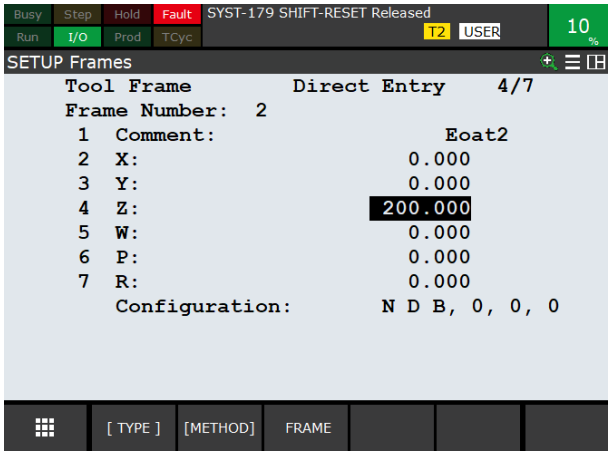
Robot tools are stored as registers on Fanuc controllers (UTOOL). These steps allow you to create or modify robot tools (TCP, also known as **UTOOL** in Fanuc robot programming).

1. Select **MENU→Setup→Frames**
2. Select a tool using the arrows or the touch screen and select **ENTER**.
3. Modify the X,Y,Z,W,P,R values as required.

Note: A program generated from RoboDK may set up the tool on the robot controller as you defined it in your RoboDK simulation. This behavior depends on what post processor you use and how you generate programs in RoboDK.







Setup Fanuc's FTP Server

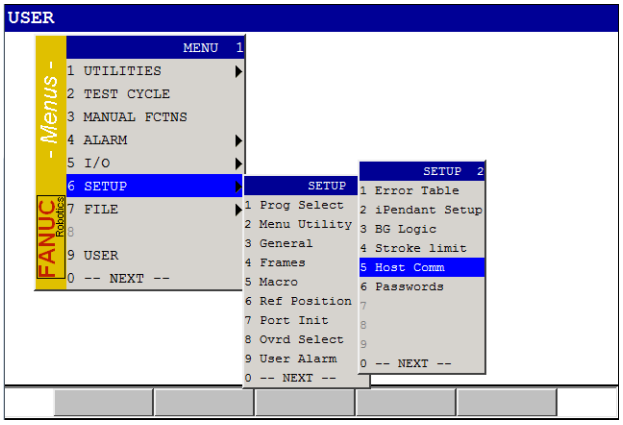
Fanuc's FTP server is enabled on recent Fanuc controllers by default.

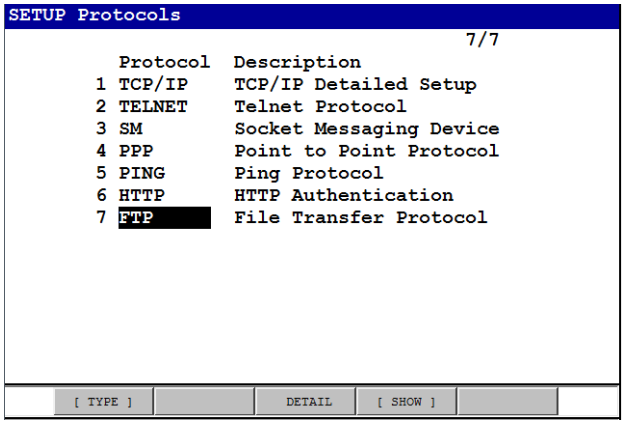
You can validate FTP credentials in the menu:

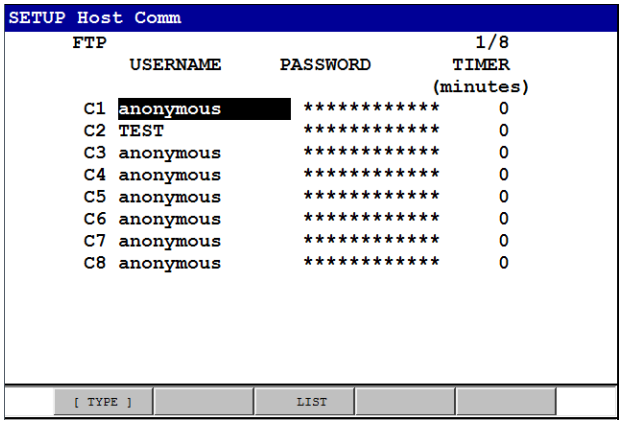
1. Setup→Host Comm
2. Select FTP

If you see an anonymous username you may be able to connect through FTP without credentials.

Tip: If you use FileZilla client or other FTP client to connect to the Fanuc robot make sure to provide a / (forward slash) as the default remote address. Alternatively, you can provide the path of the folder you are willing to access (for example :md). Otherwise, the controller will not list available folders.







RoboDK driver for Fanuc

Robot drivers provide an alternative to Offline Programming (where a program is generated, then, transferred to the robot and executed). With robot drivers, it is possible to run a simulation directly on the robot (Online Programming). More information available in the Robot Drivers section.

A connection between RoboDK and the Fanuc robot can be established to move the robot automatically from a connected PC using RoboDK. This allows using the RoboDK **Run on robot** option for online programming and debugging. The connection can be established through a standard Ethernet connection (TCP/IP).

Important: The driver will use and override **UTOOL 1** and **UFRAME 1** registers. **Registers** 50, 51 and 52 and **Position Registers** 50, 51 and 52 are also used by the driver. All values in these registers will be overridden when the driver program is started. It is recommended to perform a backup before running the driver.

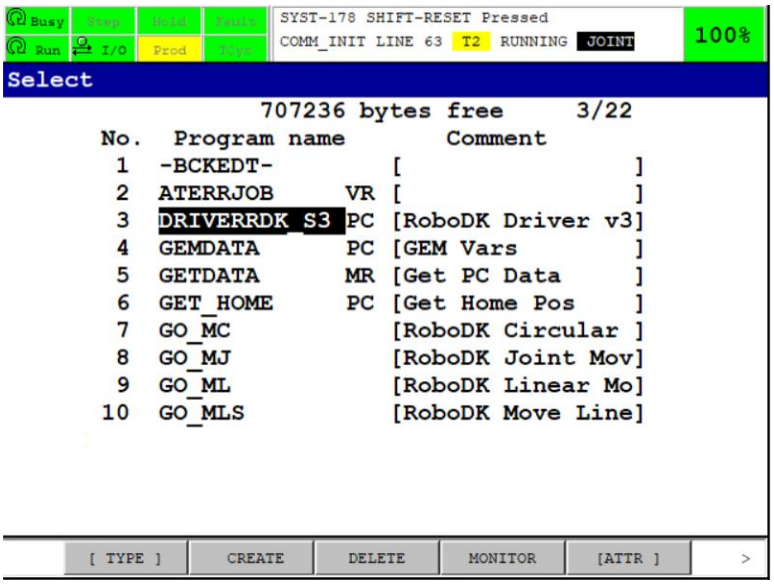
Note: This mode of operation requires the Fanuc software option **User Socket Messaging** (R636 or R648, depending on the controller) and **PC Interface** (R641)**.** The **Karel** option is also required to run PC files (R632). Alternatively, it is also possible to use the **PCDK** option (make sure to select the FanucPCDK driver).

Follow these steps to set up the RoboDK driver for Fanuc:

1. Download the Fanuc driver program files and transfer the following robot programs to the robot controller:
    a. RDK_S3.PC→ This is the main program that manages the communication through S3 (socket communication port number 3 – S3). Make sure to select the correct version (latest Fanuc robot controllers require using the version under the V9 folder).
    b. GO_MJ.TP
    c. GO_ML.TP
    d. GO_MC.TP
    e. GO_PROG.TP

Follow these steps on the robot teach pendant to prepare the communication between your Fanuc robot and RoboDK:

1. Select **Menu-(Next)-System-[TYPE]-Variables**.
    a. Select **$HOSTS_CFG** (holding shift while selecting key down will help you scroll down faster)
    b. Select Number 3
    c. Set **$SERVER_PORT** to 2000
    (**$HOSTS_CFG[3].$SERVER_PORT** = 2000)
2. Select **Menu-Setup**
3. Select **[TYPE]-Host comm**
4. Select **[SHOW]-Servers**
5. Select **“S3”-Enter**.
    a. Set **Protocol Name** to **SM**
    b. In **Port Name**, if multiple ports are available: Set Port to **P3** (or the corresponding port).
    c. Set Inactivity **Timeout** to **9999**
    d. Set Startup state to **[CHOICE] START**
    e. Set Current state to **STARTED**:
    To do so, select **[ACTION]-DEFINE**, then **[ACTION]-START**
6. Start the program **RDK_S3:**
    a. Select the **Select** button from the teach pendant.
    b. Scroll down towards the RDK_S3 program
    c. Select Enter (button from the teach pendant)
    d. Select Shift-Reset and Shift-Forward to start the program
    You should see the RUNNING message on the teach pendant. If the program failed to run it is likely that you don’t have a robot option (**PC Interface** or **User Socket Messaging**) or you did not take the correct version of the PC program.



Note: If you see an error message such as “Undefined built-in” on line 72 it means your robot controller does not have the User Socket Msg option.

7. In RoboDK, provide the IP of the robot and select Connect to connect to the robot.

Note: If the communication fails or the robot enters in error mode you should restart the program **RDK_S3** and reconnect from RoboDK.

Note: The port 2000 is used as default for both RoboDK and Fanuc. The port in section 1.c can be different but the same port needs to be specified in RoboDK (“Robot port” section of the robot connection menu).

Important: If the program does not show as running it means that a controller option is missing. In this case you must contact Fanuc to activate the User Socket Messaging option.

Note: The program RDK_S3 must be selected and running for the robot communication to work properly. If the S3 register can’t be used for the robot driver you can load another PC file (such as RDK_S4) that uses another S register.

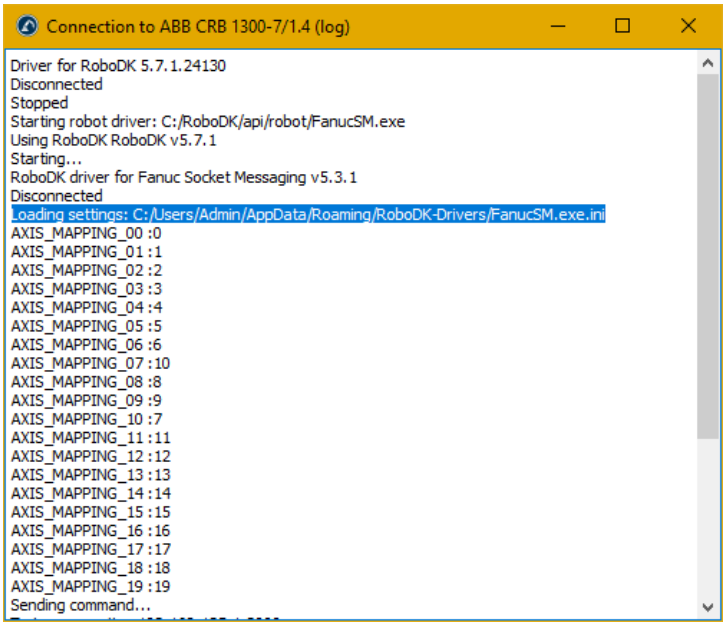
Note: If you have a position or additional exes, or the default axis mapping in RoboDK does not reflect the axis mapping of the real robot, you can modify the mapping for the driver by editing the file located in %appdata%\RoboDK-Drivers\ FanucSM.exe.ini. For additional information see the advanced section at the end

Driver Configuration

You can configure additional settings of the driver using the INI file. This allows you to configure how you map external axes.

When you run the driver for the first time, it will generate a file containing flags for configuring advanced parameters of the driver such as external axes mapping. The location of this settings file can be found at the beginning of the driver's log on the line that starts with **Loading settings**.

Tip: If multiple custom configurations are required, simply make a copy of the driver with a unique name.



You can open this file with any text editor, and you'll find a list of axes used by RoboDK and the corresponding axes on the Fanuc robot controller side. Additionally, you can enable extra debug printing and change the number of motion groups that will be used.

If, for example axis 8 in RoboDK corresponds to axis 9 on the robot controller you would simply change the number on the right-hand side to the correct value, you can see the configured mapping in the startup message below the Loading settings message.

Axes 0-9 are Motion group 1 and Axes 10-17 are motion group 2, thus if your external axis is in the second motion group, it corresponds to axes 10 in the configuration file.

Program Compilation (LS vs. TP)

This section explains the difference between Fanuc LS and TP program files and how to automatically compile programs for Fanuc robots using RoboDK.

A binary file is required to run robot programs on Fanuc robots (TP, also known as TPP). Programs for Fanuc robots generated by offline programming software (such as RoboDK) are in LS format (ASCII, text-readable and not compiled). There are two options to convert LS robot programs to TP programs:

1. Have the **ASCII Upload** software option on the robot. This option might be available on the robot already. The best way to check if this option is available is to provide an LS file to the robot and it should be automatically converted to a TP file. For example, place the file on the FR disk and select **LOAD** on the teach pendant.
2. Compile the program using the WinOLPC tools from Roboguide. In this case, the same computer where RoboDK is installed can compile the LS program automatically using the "maketp.exe" compiler tool from Fanuc. This command requires a « **robot.ini** » file. This file can be generated with the **setrobot.exe** utility from WinOLPC if Roboguide was installed and a work station was saved on the computer ("**Work Cell**").

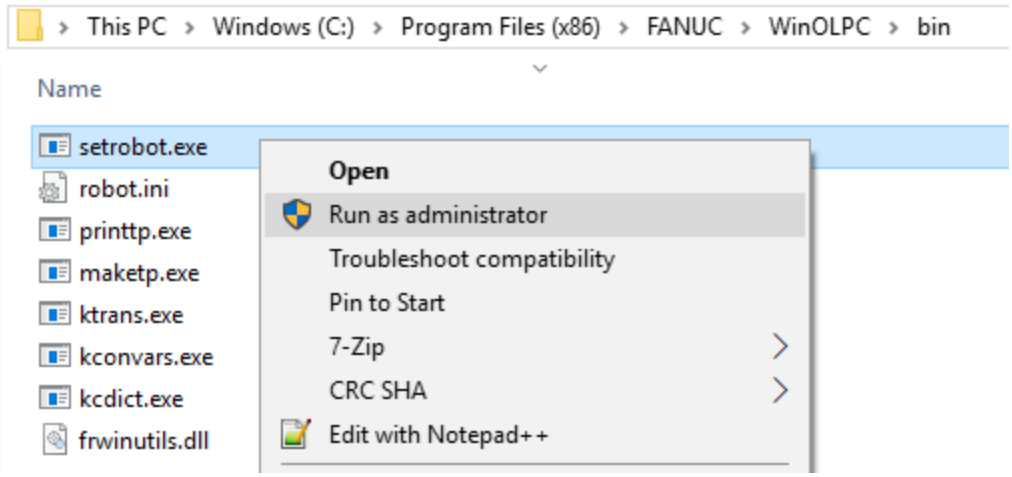
If you have Roboguide WinOLPC tools installed in the default location, RoboDK automatically TP programs automatically right after an LS program is generated.

Make sure you have selected a robot using the setrobot executable file. If the TP file is not generated and you have Roboguide WinOLPC installed, you may need to follow these steps:

1. Open windows explorer and navigate to the WinOLPC installation folder:

```
C:\Program Files (x86)\FANUC\WinOLPC\bin
```

2. Right click the setrobot.exe file and select **Run as administrator**
3. Select the robot Work Cell (a Roboguide **WorkCell** is required)



Alternatively, the contents on the following folder can be copied from the default folder:

```
C:\Program Files (x86)\FANUC\WinOLPC\bin
```

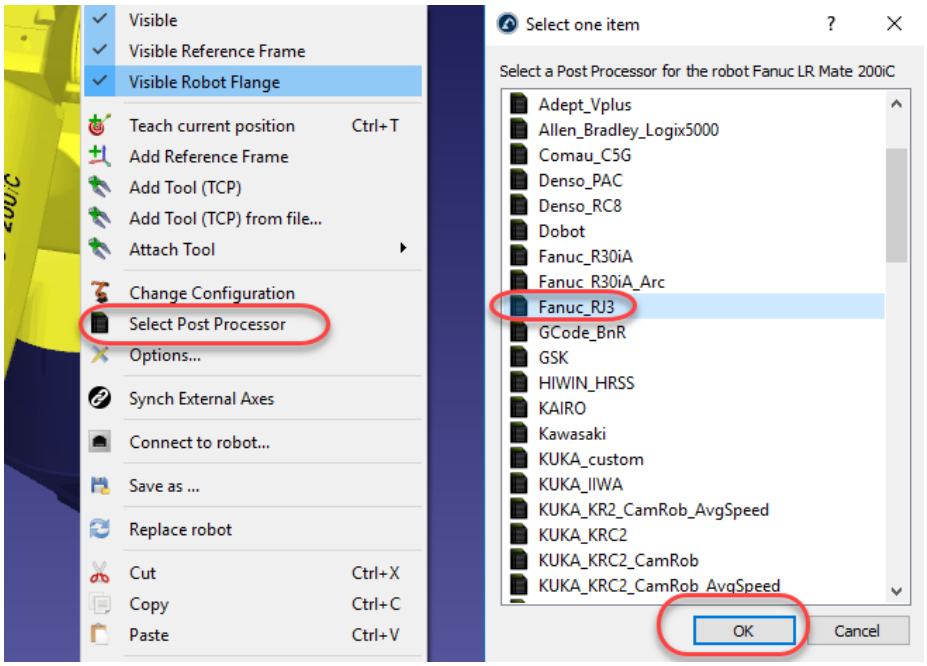
to the folder:

```
C:\RoboDK\api\Fanuc
```

Note: It is preferable to respect the compilator version but not mandatory. The compilation should work if the virtual **WorkCell** robot and the real robot have the same number of axes and same configuration in terms of options. Once you have a **robot.ini** file it is possible to use maketp.exe without the need of using **setrobot.exe** every time you change your robot.

Follow these steps to select a post processor compatible with Fanuc RJ3 controllers:

1. Right click the robot
2. Select **Select Post Processor**
3. Select **Fanuc RJ3**
4. Generate your program (F6)



Tip: More information available in the Post Processors section.

Follow these steps if you did not install Roboguide WinOLPC in the default location and you want to obtain a TP file automatically when you generate a program from RoboDK:

1. Select **Program→Add/Edit post processor**
2. Select **Fanuc RJ3** (or the post processor you would like to use). All post processors are also accessible via the folder: C:/RoboDK/Posts/. Also, make sure you are not using a compiled post processor.
3. Locate the variable PATH_MAKE_TP (around line 103) and enter the path where the maketp executable is located.

RoboDK post processors for Fanuc robots support using 6 axis robots synchronized with external axes such as turntables or linear axes.

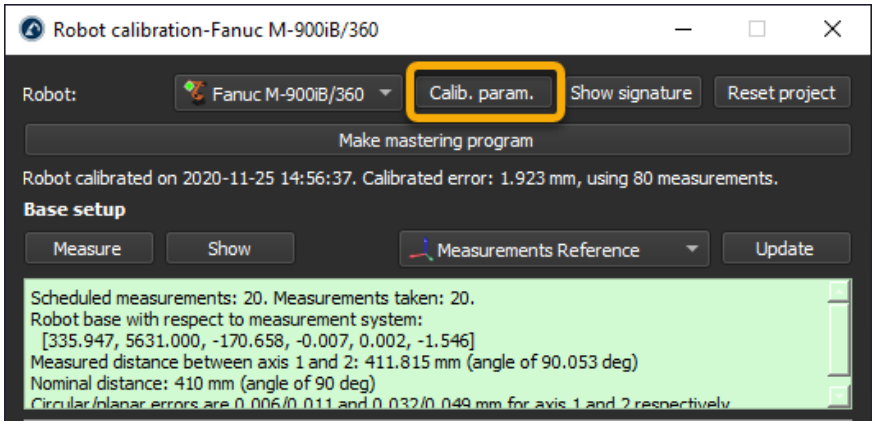
Note: More information about customizing post processors is available in the Post Processors section.

Updating controller kinematic parameters

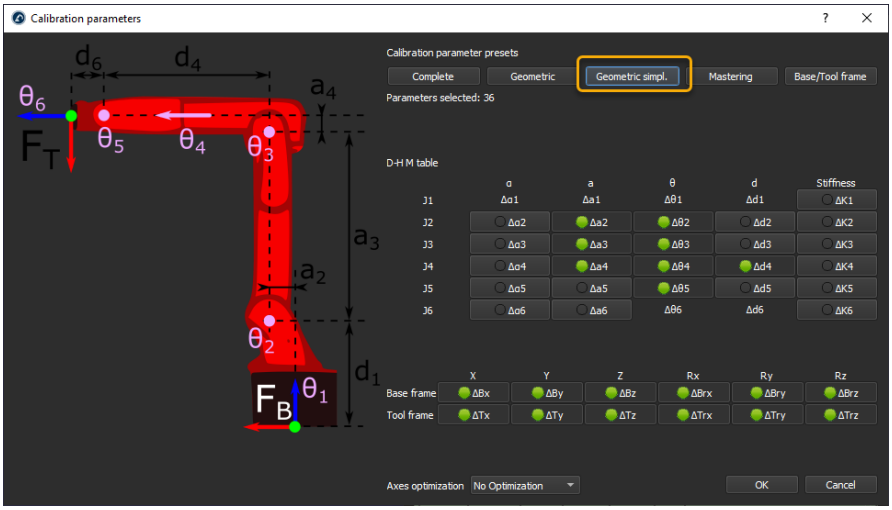
This section explains how you can update the kinematic parameters (DH table) on the robot controller after calibrating the robot using RoboDK's **Calibration and Performance package.**

Modifying the controller DH parameters will impact all programs manually created on the controller. Keep a copy of the original DH parameters in case you would like to revert back to the controller factory settings.

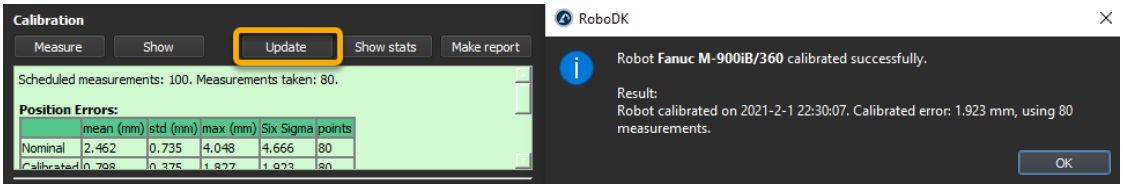
1. In the calibration window, open the **Calibration parameters**.



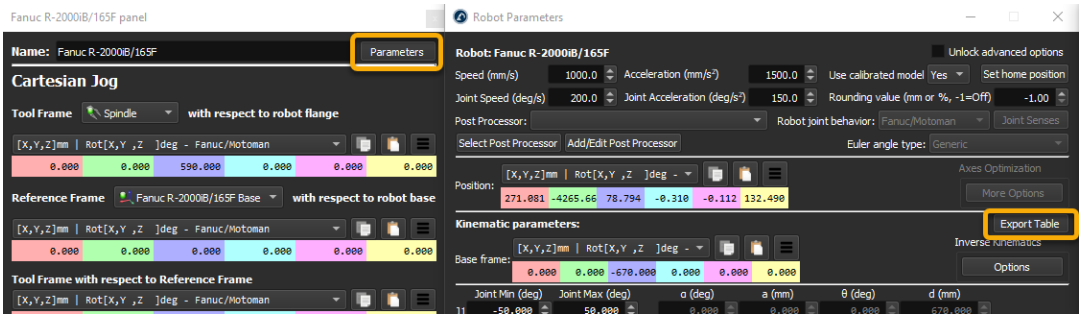
2. Select Geometric simplified.

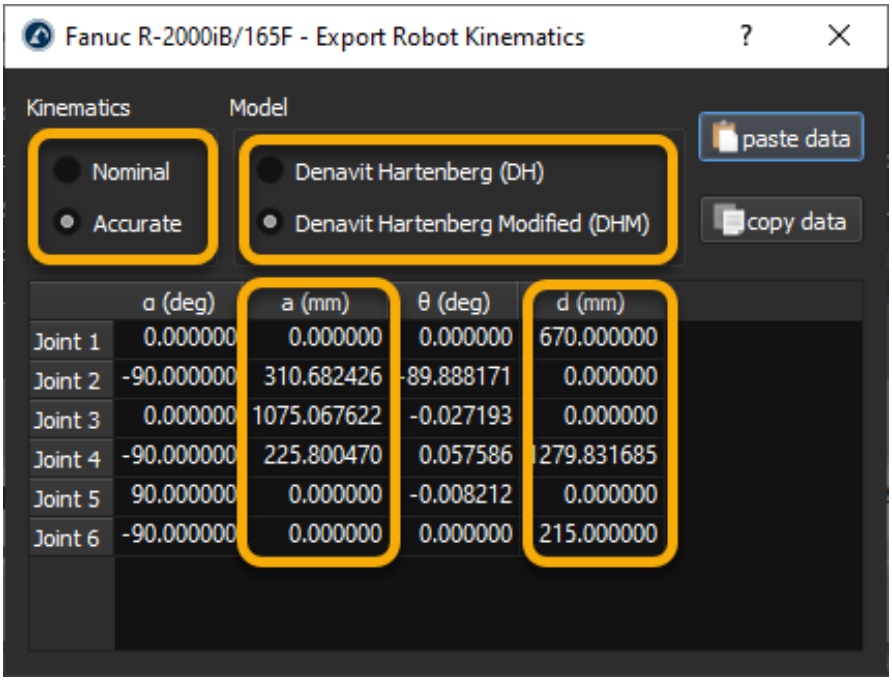


3. Run a calibration sequence or **Update** an existing one.

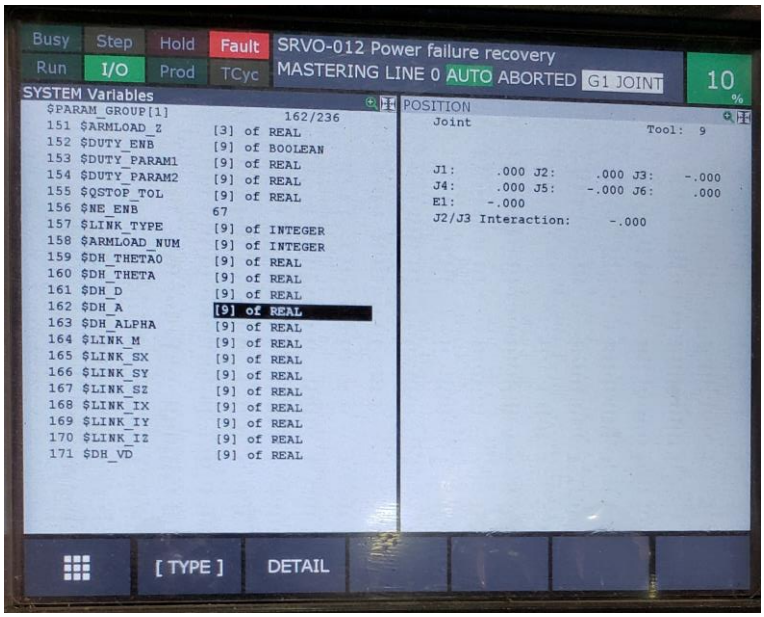


4. Retrieve the robot calibrated DH parameters. In the Robot panel and select Parameters. Then select Export Table.

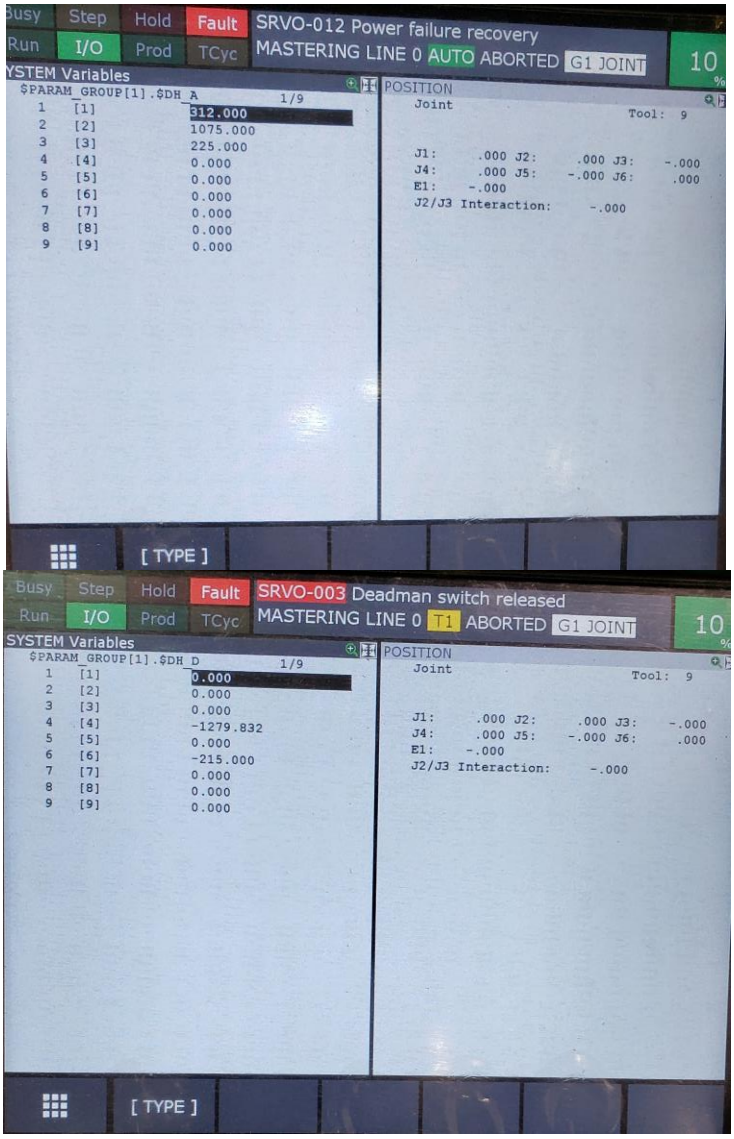




5. Make sure to use the **Accurate** kinematics. The **Nominal** one can be used to compare with the controller default DH parameters.
6. Use the **Danavit Hartenberg Modified** model to modify your controller parameters.
7. On the robot **teach pendant**, open the **System variables** -> **$PARAM_GROUP[1]**.
8. Find the **$DH_A** and **$DH_D** parameters.



9. Modify the DH values with the **a** and **d** values from the **Export Robot Kinematics** window.


Busy
Step
Hold
Fault
SRVO-012 Power failure recovery
Run
I/O
Prod
TCyc
MASTERING LINE 0 AUTO ABORTED G1 JOINT
10
%
YSTEM Variables
$PARAM_GROUP[1].$DH_A 1/9
1 [1] 312.000
2 [2] 1075.000
3 [3] 225.000
4 [4] 0.000
5 [5] 0.000
6 [6] 0.000
7 [7] 0.000
8 [8] 0.000
9 [9] 0.000
POSITION
Joint
Tool: 9
J1: .000 J2: .000 J3: -.000
J4: .000 J5: -.000 J6: .000
E1: -.000
J2/J3 Interaction: -.000
[TYPE]
Busy
Step
Hold
Fault
SRVO-003 Deadman switch released
Run
I/O
Prod
TCyc
MASTERING LINE 0 T1 ABORTED G1 JOINT
10
%
SYSTEM Variables
$PARAM_GROUP[1].$DH_D 1/9
1 [1] 0.000
2 [2] 0.000
3 [3] 0.000
4 [4] -1279.832
5 [5] 0.000
6 [6] -215.000
7 [7] 0.000
8 [8] 0.000
9 [9] 0.000
POSITION
Joint
Tool: 9
J1: .000 J2: .000 J3: -.000
J4: .000 J5: -.000 J6: .000
E1: -.000
J2/J3 Interaction: -.000
[TYPE]