2205, TFDEN-912-012, 001

NACHI

Simulation tool for FD/CFD controller
FD on Desk II
Light/ Regular/ Pro
OPERATION MANUAL

12th edition

POINT

<For people using FD on Desk II for the first time> Please refer to Chapter 9 first. This chapter describes how to setup this software and how to use the basic functions of the FD/CFD controller.

IMPORTANT

This document is for FD on Desk II. For the older versions, please refer to the operation manual for FD on Desk.

NACHI-FUJIKOSHI CORP.

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NOTE

Chapter 1 FD on Desk II

This chapter describes the method for introducing the simplified simulation tool "FD on Desk II", and the precautions for its operation. Please start operating after having had a thorough knowledge of this manual.
And, this document does not mention about the operation of the FD/CFD controller itself. Concerning the FD/CFD controller operation, refer to the online help of FD on Desk etc.

1.1 Outline

FD on Desk II is software for operating the software of FD/CFD controller on a PC to conduct operation training and offline teaching. The distinctive features are as follows:

Table 1.1.1 Distinctive Features of FD on Desk II

1	It can be used anywhere, since an OS on the market can be operated. It does not require any special hardware. For PC operating environments, see the next section.
2	It is the most appropriate for operational training before introduction of a robot. Teaching can be provided in the exact same operation as FD/CFD Controller.
3	By importing 3D model data in a file format such as IGES and STEP, it is possible to perform offline teaching for a program while checking interference from the surrounding environment and interlocking.
4	Provided with the same motion engine as that of FD/CFD controller, it can run a high-accuracy cycle-time simulation.
5	By connecting with the control device , you can monitor the robot's driving condition from a distance.
6	By connecting the PC to the FD/CFD controller, it becomes possible to make the detailed setting of the FD/CFD controller without a teach pendant.
7	Off-line programming (teaching) of a working program while confirming a robot posture or I/O signal is possible.
8	It is possible to make the settings of the PLC program, Weld conditions, IFP designs, etc.
9	Setting up of various parameters for PLC programs, welding conditions and interface-panel design are possible as well as for working programs. All files are fully compatible with FD/CFD Controller, which therefore enables an easy playback of operational states of actual units on the desk.
10	Its editor function makes it easy to create and modify a robot language program, global variable (PUBLIC.INC), and global function (USRPROC.INC). In addition, created or modified code can be complied on the spot and uploaded or downloaded as-is through an Ethernet connection to the FD/CFD controller.
11	The operation of a cell using multiple controllers can be simulated (Only for the conventional mode and "Pro").

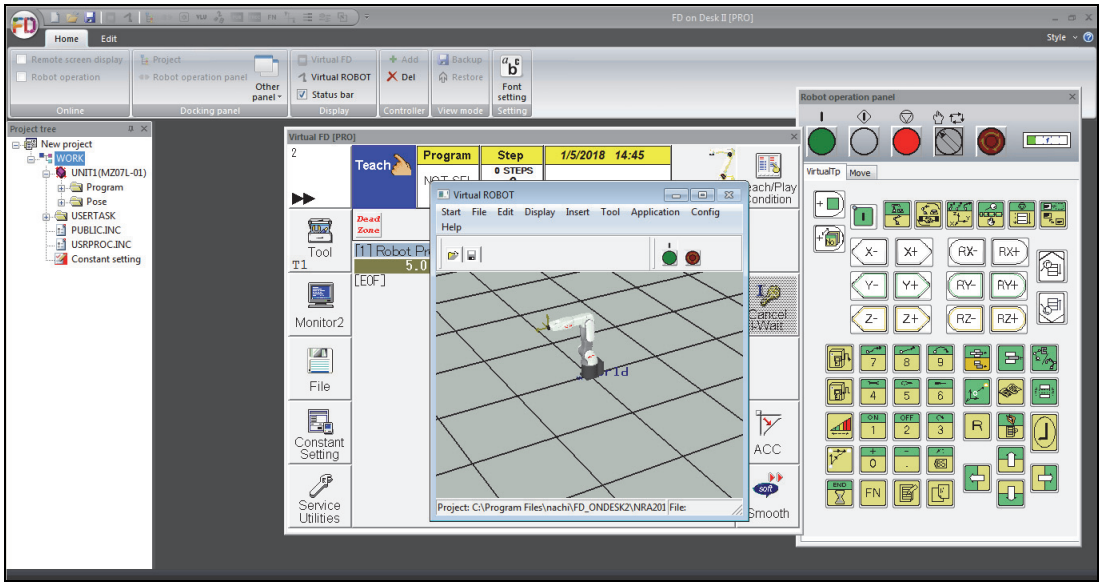


Fig. 1.1 Example of FD on Desk II screen display

1.1.1 FD on Desk Operational Environments

Before installing FD on DESK, please check that your PC satisfies the following conditions.

Table 1.1.2 FD on Desk II operational environments

<table>
<tr><th>Principal bases</th><th>Specifications</th></tr>
<tr><td>Basic software</td><td>
<table>
<tr><th rowspan="2"></th><th colspan="3">OS</th></tr>
<tr><th>Windows7</th><th>Windows8</th><th>Windows10</th></tr>
<tr><td>32bit</td><td>O</td><td></td><td></td></tr>
<tr><td>64bit</td><td>O</td><td>O</td><td>O</td></tr>
</table>
Note3
</td></tr>
<tr><td>CPU</td><td>More than 1.0GHz. CPU clock</td></tr>
<tr><td>Memory</td><td>More than 1GB</td></tr>
<tr><td>Hard-disk capacity</td><td>More than 70MB spare capacity to be required</td></tr>
<tr><td>Graphic resolution</td><td>More than 1024 X 768 dots</td></tr>
<tr><td>Others</td><td>- The following is necessary for license check:
Standard specifications : Ethernet LAN adaptor
Dongle specifications : USB port
- To install VC2005 run time is necessary.
- Do not use simultaneously with other application software when cycle time is inspected.</td></tr>
</table>

Note 1: Windows is a trademark of Microsoft Corporation registered in the US and other countries.
Note 2: The movie function of FD on Desk II does not support the Aero theme of Windows 7 or later. For Windows 7, please use Classic Theme, and for Windows 8 and10, please use the standard movie function or a movie function available in the market. Please note that some edition of Windows 10 does not have a movie function as a standard function.
Note 3: "O": Operability confirmed (as of October 2017)

1.1.2 Supported controllers

・FD on Desk II supports the FD/CFD controller.
・The following functions are supported by software version 4.37 or later of FD / CFD control unit.
- Data transmission function

・Features and Limitations of the “Online mode (Remote function)” of the FD on Desk II

	Online mode (Remote function)		
	Remote display	**Remote operation**	**Remote playback**
Features	-It is possible to see/edit the constant setting parameters etc. of the actual controller that is connected with the FD on DESK II. -The content of the actual Teach Pendant display is displayed in the FD on DESK II screen in real-time. - It is possible to operate the robot manually using the Teach Pendant.	-It is possible to operate the robot using the “Robot operation panel” of the FD on DESK II. -The content of the actual Teach Pendant display is displayed in the FD on DESK II screen in real-time.	-It is possible to playback a work-program of the robot using the “Robot operation panel” of the FD on DESK II. -The content of the actual Teach Pendant display is displayed in the FD on DESK II screen in real-time.
Limitations	It is not possible to operate the robot using the “Robot operation panel” of the FD on DESK II.	It is not possible to playback a robot work-program.	The software version of the CFD software is V4.67 or later. The operation test has been done using the following robots. -EC06 series -MZ07L-01

(NOTE) TP : Operation and Display from the Teach Pendant of the robot
(NOTE) When trying to use the online mode, please carefully read and understand the all precautions of the respective functions written in this document.

1.1.3 Grades

FD on Desk II has different grade depending on its license style.

Table 1.1.3 License styles of FD on Desk II

Grade	Product number	License style	CFD			FD		
			OFFLINE MODE	MONITOR MODE	VIEW MODE	OFFLINE MODE	MONITOR MODE	VIEW MODE
Pro	FDONDESK2-PRO	License file	○	○	○	○	○	○
	FDONDESK2-PRO-D	USB dongle						
Regular	FDONDESK2-REG	License file	○	○	○	○	○	○
	FDONDESK2-REG-D	USB dongle						
Light	–	Connected to a controller (FD or CFD) before	○	○	○	△	△	△
No license	–	Other than above	△	×	×	△	×	×

	Program generation from the CAD file	Multi controller	Model file save
Pro	○	○ (Previous FD on Desk modes)	○
Regular	×	×	○
Light	×	×	○
No license	×	×	×

○ : Available
△ : Available only when the operator level is ***BEGINNER*** (Supported mechanism ; MZ(01,03EL,04,07,10,12),ES and EZ)
× : Not available

For Pro and Regular, the license style can be selected between the license file and the USB dongle. To purchase the license, please contact our sales department. And, the license files and the USB dongles are different each other between the Pro and the Regular.

POINT "Light" is a grade that is included only in the CFD controller.
This grade is not sold itself.

POINT A license before the license for FD on Desk Ver07.01 is equal in level to the license for the grade "Pro". Use it as-is.

POINT License files and USB dongles for the previous FD on Desk can be used as-is.

1.1.4 FD on Desk II Regular / Pro / Authentication by license file

This software operates as "FD on Desk II Regular" or "FD on Desk II Pro" if you have a license file "license.dat" officially issued by our company located in the specified folder.

※ Please inform your requirement, which license of “Regular” or “Pro” is necessary, to our company sales representative in advance.

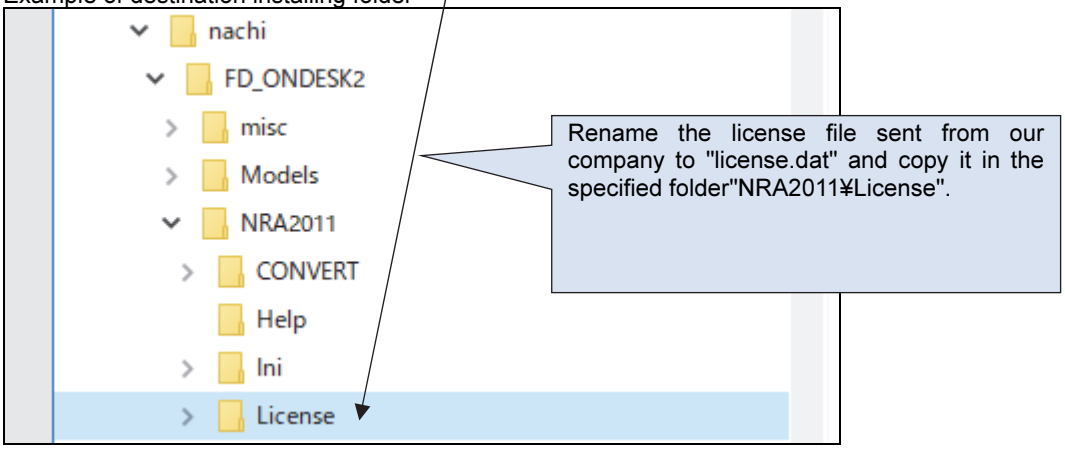
To operate FD on Desk II as “REGULAR” or “PRO”

By storing the license file "license.dat" issued by our company in the specified folder (the "NRA2011¥License" folder in the installation folder), FD on Desk II can operate as "REGULAR" or "PRO."

Example of operation to store the file

Rename the license file (Example: license _ 0010C0F6B7E9.dat) sent by e-mail, etc., from our company to "license.dat" and save it in the specified folder.

Example of destination installing folder



POINT

If the IP address entry screen appears after you copy the license file to the specified location, check the following points.

- Is the file name correct? (The correct name is license.dat.)
- Is the destination folder correct? ("NRA2011 ¥License")

POINT

If you copy a license file issued by our company to the specified location and the software still displays the trial version (demo version), the following are possible causes:.

- Using a license file for another PC (MAC address mismatch)
- The trial license has expired.
- You are using a temporary license file instead of an issued license file. (Here is an example of a temporary license file)

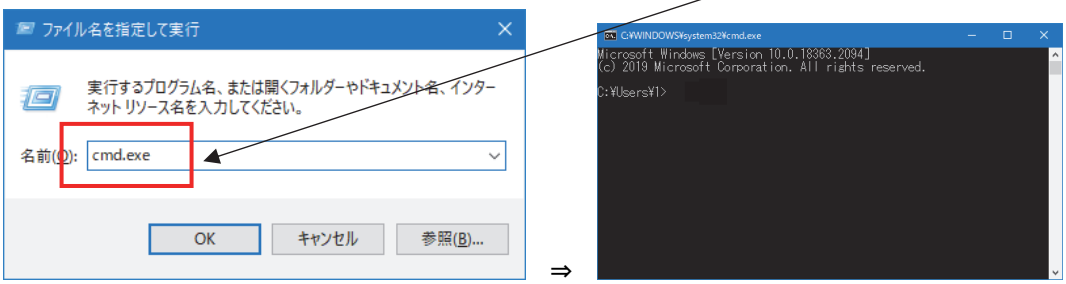
How to get the license file

Use the method below to find the "MAC address" of your PC and inform it to our company representative. We will issue the license file back to you. The license file is only available on the PC you contact.

How to find the MAC address of your PC

(NOTES)
The following procedure and details of the displayed information may vary slightly depending on your environment and Windows OS. We appreciate your understanding.

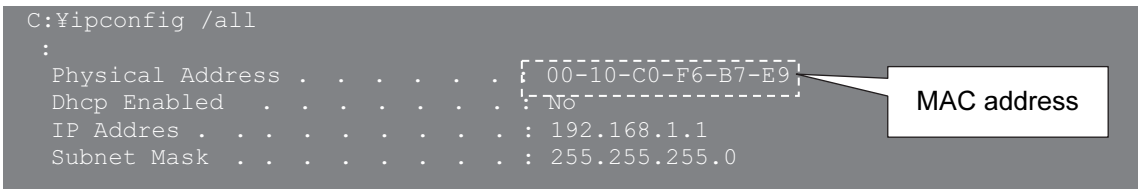
(1) Press [Windows] key + [R] key to open the following windows. Input "`cmd.exe`" and click [OK] to display the command prompt.



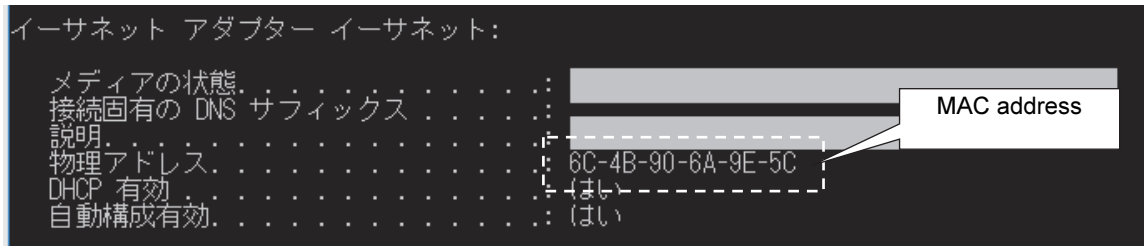
(2) In command prompt, input "`ipconfig /all`".

(3) Ethernet-related information is displayed. Check "Physical Address" in it. **This is the MAC address**. Copy this text and email it to our company representative. No other information (such as IP address) is required.

(Example 1) MAC address ＝ **`00-10-C0-F6-B7-E9`**



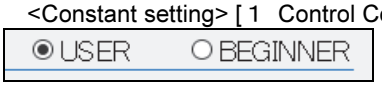
(Example 2) MAC address＝ **`6C-4B-90-6A-9E-5C`**



Supplementary information

・Even when Regular/Pro, operator class (protecting level) of robot controller itself may be ***BEGINNER*** at start up. This is depending on the setting of robot controller. If this setting needs to be changed, please utilize the following menu. Operator class (protecting level) at start up can be selected either ***USER*** or ***BEGINNER***.

<Constant setting> [1 Control Constants] [8 Protecting level selection]



・In order to change the operator class (protecting level), shortcut command R314 is available.
Please refer to the following instruction manual.

FD11 controller

“FD11 controller instruction manual SETUP (TFDEN-001)”

⇒ ”4.7 Operator class”

CFD controller

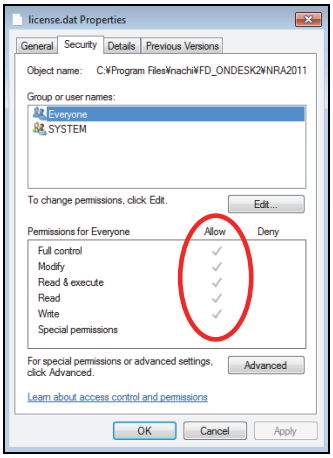
“CFD/CFDL controller instruction manual SETUP (TCFJP-159)”

⇒ ”3.7 Operator class”

・If more than 2 physical address are displayed when inputted “`ipconfig /all`”, please inform us all of them when requesting us the license file.

・If you copy the license file to the correct location but still get license check errors, check the following:.

1. Make sure that the file name is “license.dat”. Also note the extension.
2. Check if the “dongle.dat” file exists in the "NRA2011¥License" folder. Your license will not be activated without “dongle.dat.”
3. Make sure that all security attributes in the license file are allowed.



・MAC-specific used for create your license key is hardware specific information and will change if you replace hardware on that PC (for example, if it is damaged or if you replace the old or new PC). In such a case, the license file you have been using will no longer be available. Contact our company with the MAC address of the original PC and the MAC address of the new PC, and request that the license file be reissued. In addition, for the purpose of managing the license file issuance history, if there are multiple combinations of PCs to be disposed of and new PCs to replace them (PCs for which license files are to be reissued), please submit the following list so that the correspondence of each combination can be understood.

(Example)

No.	MAC address of old PC to be discarded (Destroy the license file)	MAC address of new PC after update (Reissue License File)
1	00-10-C0-F6-B7-E9	6C-4B-90-6A-9E-5C
2	00-10-C0-F6-B7-EA	6C-4B-90-6A-9E-5D
3	00-10-C0-F6-B7-EB	6C-4B-90-6A-9E-5E

・If the license file is reissued due to damage or replacement of the PC, you are responsible for discarding the old license file.

・In your network environment, if the MAC address used to create a license file is changed to "Invalid" (for example, because of a security policy change by the network administrator), FD on Desk II will not be able to activate on that PC. This occurs because the MAC address cannot be read during the process of matching the license file to the MAC address when starting FD on Desk II.

1.1.5 FD on Desk II Regular / Pro / Authentication by USB dongle

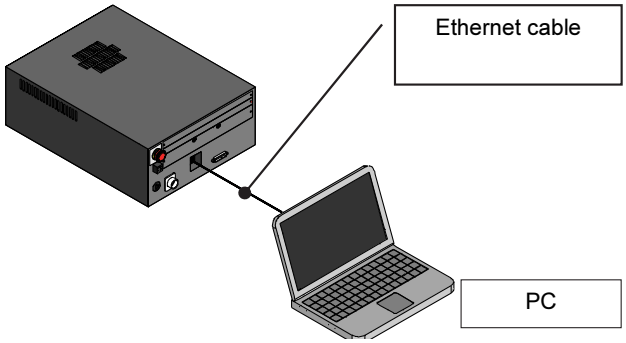
This software will operate as "FD on Desk II Regular" or "FD on Desk II Pro" when the USB dongle supplied by our company (hardware key) is connected to the USB port. This USB dongle will work with any PC with FD on Desk II installed. However, you cannot remove the dongle while using it.

If you contact our company sales, we will send you the USB dongle.
Dongles are manufactured by Japan SafeNet Co., Ltd. (formerly Aladdin Japan Co., Ltd.).
Run HASPUserSetup.exe in the DongleDriver folder of the installer.

If you do not have an installer, please visit the following site.
https://sentinelcustomer.gemalto.com/
Search and download Sentinel HASP / LDK - Windows GUI Run - time Installer in this.
If you are using FD on Desk and you need to update the driver with Windows 10 update please go to the above site and download and install it.

Check that the LED light of a dongle is switched on after supply of power source to PC. Insert again a dongle if it is not switched on. License check cannot be made, since a dongle cannot be identified if it is not inserted properly.

1.1.6 FD on Desk II Light / Authentication by connection with robot controller

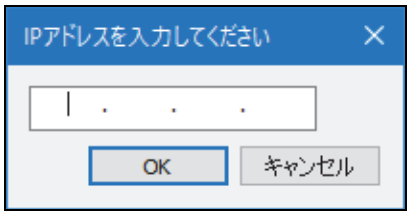


If you have an actual CFD controller, you can use this software as a **"FD on Desk II Light"** (free to use) by simply performing the operation described in this section.

"FD on Desk II Light" has limited functions such as importing from CAD and robot models. However, it can be used to create work programs, create and save workcells, etc., so CFD controller users can use it for application study and offline teaching.

To operate FD on Desk II as "Light"

Make sure that "license.dat" is not located in the "NRA2011¥License" folder of the installation folder.
If this file cannot be found when you start FD on Desk II, the following screen appears:. When you enter the IP address of robot controller (connected via the Ethernet cable), the authentication process is executed and software operates as "FD on Desk II Light."



Please input the IP address

As for the example of IP address setting, please refer to "1.3 Communication setting for the robot controller".

IMPORTANT

To use this software as a "FD on Desk II Light," you must perform this authentication operation by connecting it to an actual controller unit at least once.
If the connection is not possible (for example, because controller is built into an enclosed cabinet), Light is not available.
If you use FD on Desk II Light, be sure to complete the connection before you lose access to controller LAN ports.

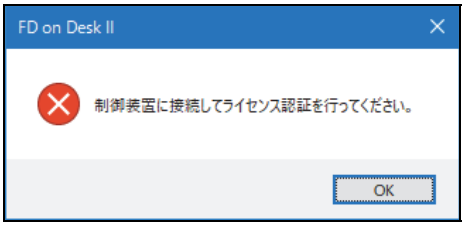
IMPORTANT

The FD on Desk II Light is intended for use with the CFD controller and the following compact robot models:. No other robot is supported.
MZ Series (MZ01/MZ03EL/MZ04/MZ07/MZ10/MZ12)
EZ03-04 Series (* Single robot Specification)
ES Series

Supplementary information

・Note that if the "license.dat" file is found, "FD on Desk II" will operate according to its contents at a grade other than Light.

・If you do not enter an IP address, the following message appears and FD on Desk II shuts down.



Connect the actual robot controller for authentication.

・If you wish to examine the application or conduct a preliminary teasing before the actual product is delivered, we will issue a "test license" for a limited period. This License is valid for 3 months and issued once. For details, please contact our company office.

・After the expiration of "test license", you may use FD on Desk II as a "Light" version (free version) when actual controller is delivered or may consider to purchase a "Pro" version (not free).

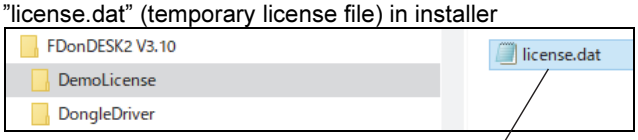
1.1.7 Trial (Demo) / Authentication by the temporary license file provided

FD on Desk II works as a **trial (demo version)** when using the temporary license "license.dat" file included with the installer. You can experience the basic operation of axis on robot.

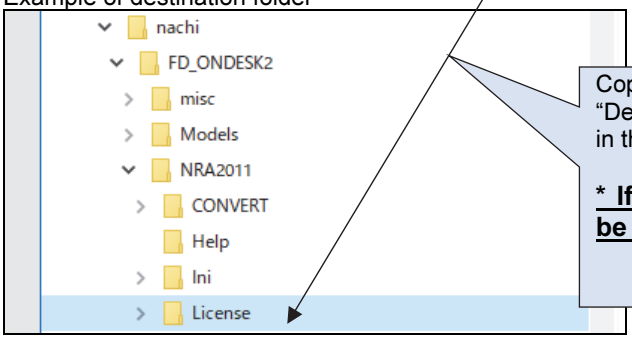
To operate FD on Desk II as “Trial (DEMO version)”

Copy the temporary license file "license.dat" from the installer's “DemoLicense” folder to “NRA2011¥License” folder in the installation folder. Starting in this state allows FD on Desk II to operate as a trial (demo version).

”license.dat” (temporary license file) in installer



Example of destination folder



Copy the temporary license file “license.dat” in “DemoLicense” folder to NRA2011¥License” folder in the installation folder.

*** If the official license file already exists, be careful not to overwrite it by mistake.**

POINT

- In Trial (DEMO version), operator class is fixed to ***BEGINNER***.
- ***BEGINNER*** has operation limitation such as not allowed to create / modify program.
- Refer to the following instruction manual for detail of operator class.

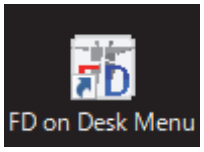
FD11 controller
“FD11 controller instruction manual SETUP (TFDJP-001)”
⇒”4.7 Operator class”
CFD controller
“CFD/CFDL controller instruction manual SETUP (TCFJP-159)”
⇒”3.7 Operator class”

POINT

- If you want to try out other functions or operations such as creating programs or saving workcells, you can also issue a “test license” with a limited period of use (a PRO grade license for a limited period of time). For details, please contact our company office.

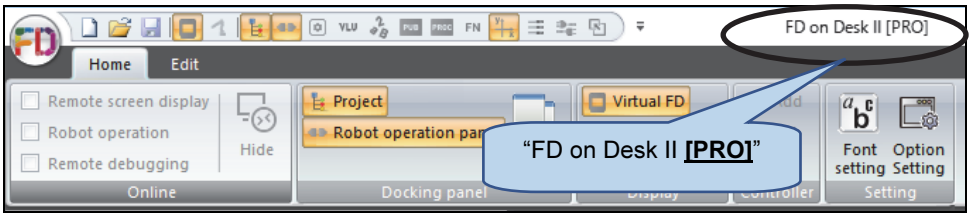
- In order to use this software as Regular or Pro grades, you must obtain an official license file "license.dat" from our company. See one of the following for how to do this.
  “1.1.4 FD on Desk II Regular / Pro / Authentication by license file”
  or
  “1.1.5 FD on Desk II Regular / Pro / Authentication by USB dongle”

1.1.8 How to know the license (FD on Desk II)

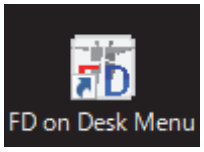


How to know the license

In case of FD on Desk II, current license is already displayed on title bar.
Following example shows the case of [Pro] version.



1.1.9 How to know the license (FD on Desk Menu)

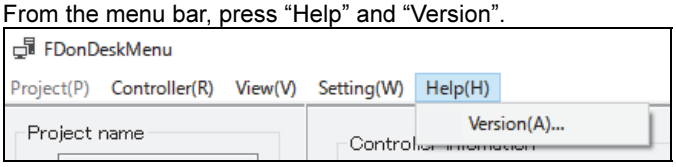


(Note)
The FD on Desk (Menu) has an operating interface similar to the old FD on Desk.
Installed with FD on Desk II and a shortcut is created on the desktop.
This section describes how to check the license status in the FD on Desk Menu.

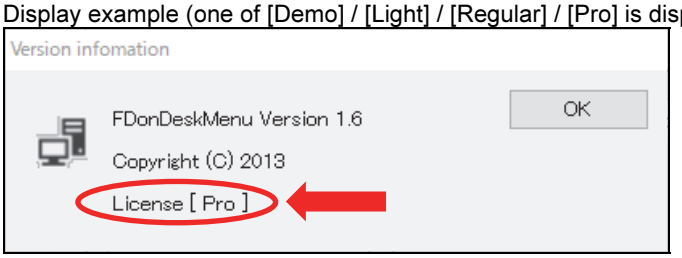
How to know the license

Following operation is enough to know the license.

From the menu bar, press “Help” and “Version”.



Display example (one of [Demo] / [Light] / [Regular] / [Pro] is displayed.)



1.2 Setup

1.2.1 Installation and version up of FD on Desk

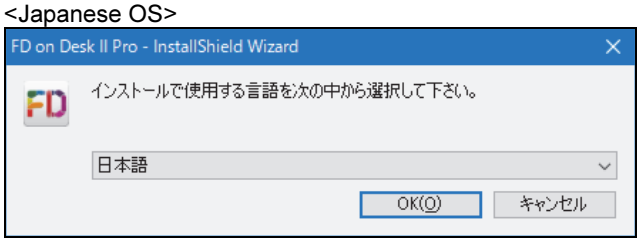
The following describes how to install FD on Desk II.
If FD on Desk II (or FD on Desk) is already installed, the old FD on Desk II (or FD on Desk) will be uninstalled and then FD on Desk II will be newly installed.

IMPORTANT

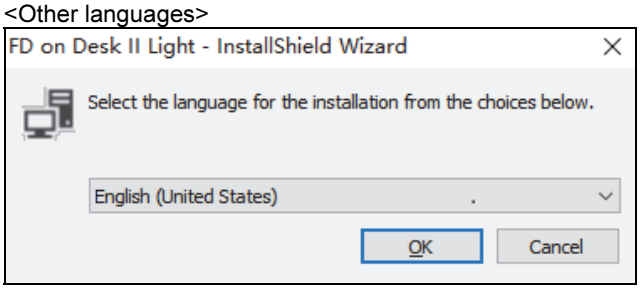
The Administrator account of the PC is required for this installation procedure.

1 **Execute the "`setup.exe`".**
(The file name might be "`setup_FDonDeskII_***.exe`" in some cases.)
In case of installation CD, this will be executed automatically.
≫ The installer will start.
Please select the language.
Japanese and English are available.
If the language setting of the PC is Japanese, the following screens are displayed in Japanese.
In case of other languages, the screens are displayed in English.

<Japanese OS>

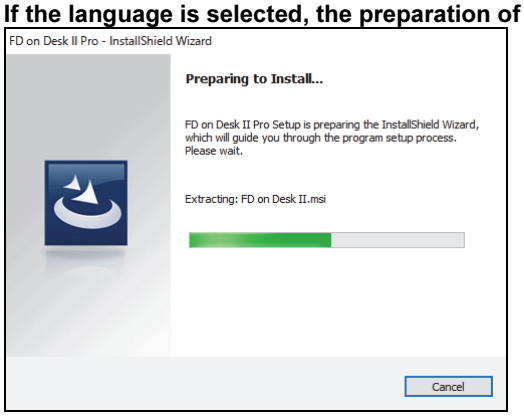


<Other languages>

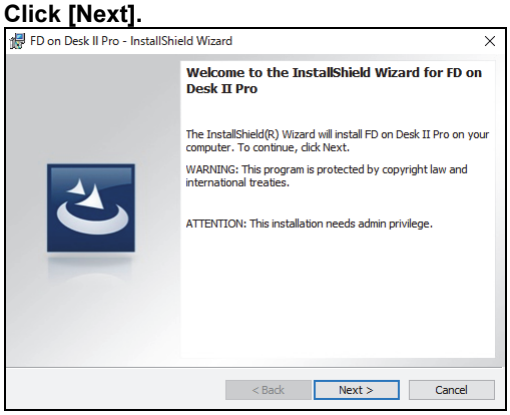


The language selected in this dialog window will be used in this installation procedures, the startup screen of the FDonDesk, and the FDonDeskLight, VirtualIO, Virtual TP, and RobView.
The display language in the FDonDeskII is automatically selected referring to the language setting of the PC. In case of language other than Japanese, SImplifiedChinese and Korean, English is selected.

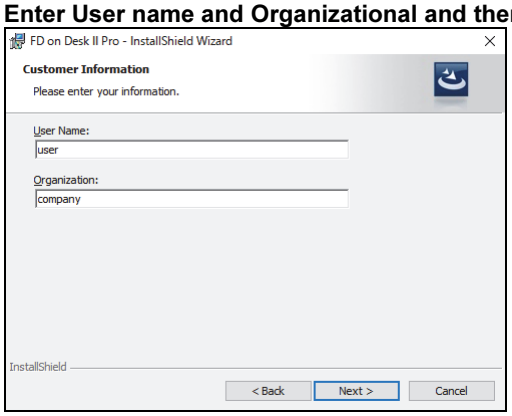
2 **If the language is selected, the preparation of the installation will start.**



3 **Click [Next].**



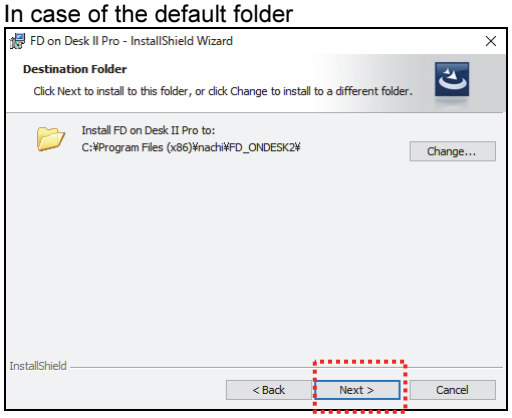
4 **Enter User name and Organizational and then click [Next].**



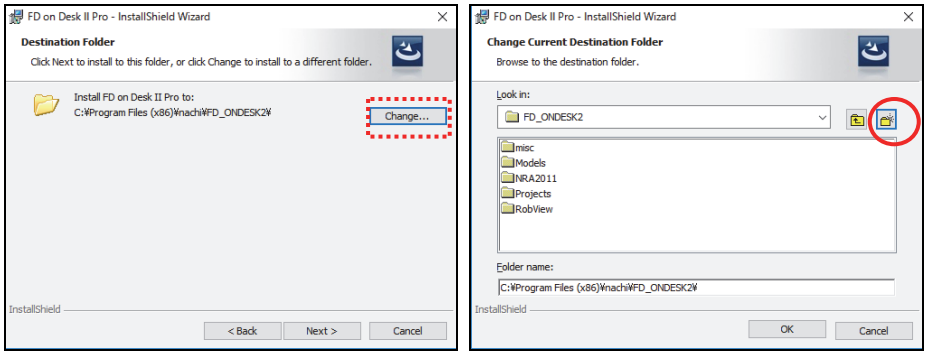
5 **Set the Destination Folder and click [Next].**
The default value of the installation folder is C: \ Program Files \ nachi \ FD_ONDESK2.

If the installation folder is not changed, click [Next>] in the following screen.

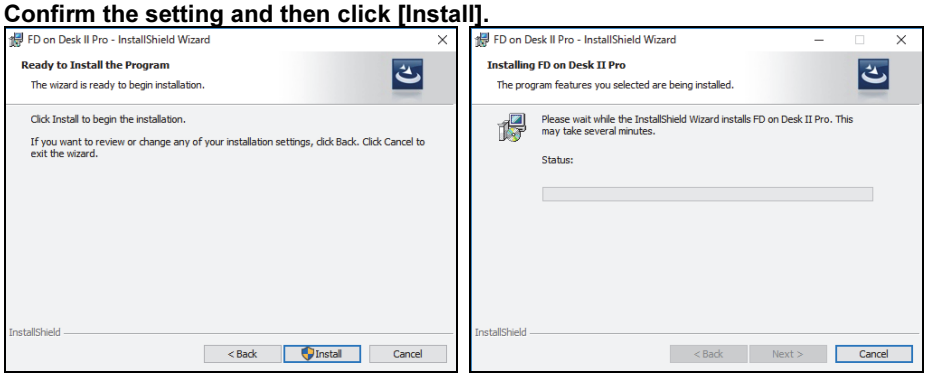
In case of the default folder



If the installation folder is to be changed, click [Change].
Please select the destination folder.

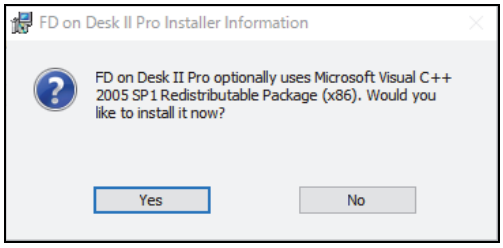


6 **Confirm the setting and then click [Install].**

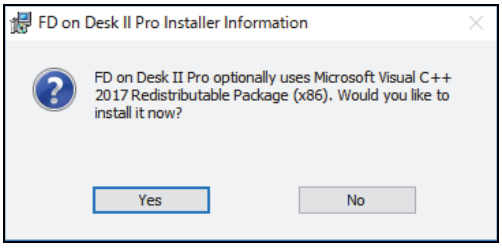


7 **Before finishing the installation, the runtime installation will be performed.**
To install the runtime, click [Yes(Y)].
If the runtime has been installed already, click [No(N)] to skip.

<VC runtime 2005>

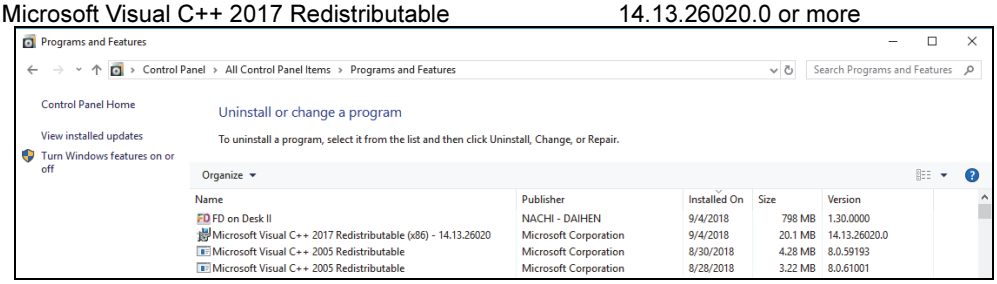


<VC runtime 2017>

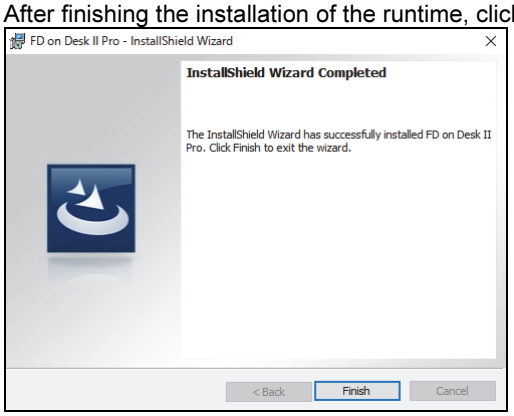


Checking method of runtime version
At “Programs and Features” of the “Control Panel”, please check whether there is the below Microsoft VC++ runtime or not and its version.

	Version
Microsoft Visual C++ 2005 Redistributable	8.0.59193 or more
Microsoft Visual C++ 2017 Redistributable	14.13.26020.0 or more

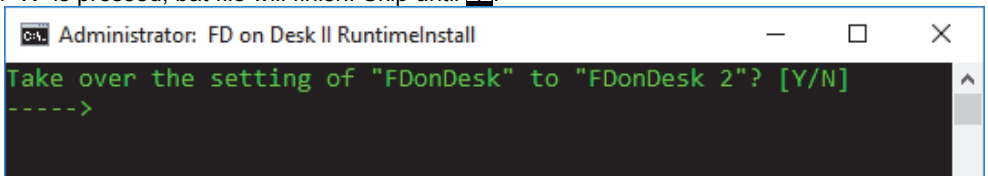


After finishing the installation of the runtime, click [Finish(F)]

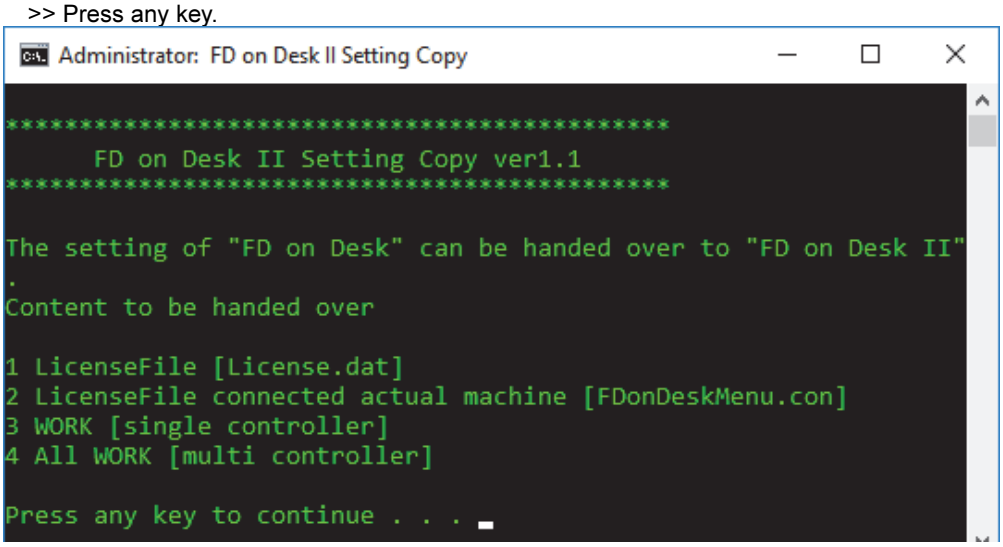


8 **Click [Finish] to launch the bat file which makes necessary settings for FD on Desk II.**
When completed, the following screen will be displayed.
Select the language.
≫Please enter the corresponding number.

9 **Take over the setting to FD on Desk II.**
>> Input Y: YES or N: NO.
If “N” is pressed, bat file will finish. Skip until 22.

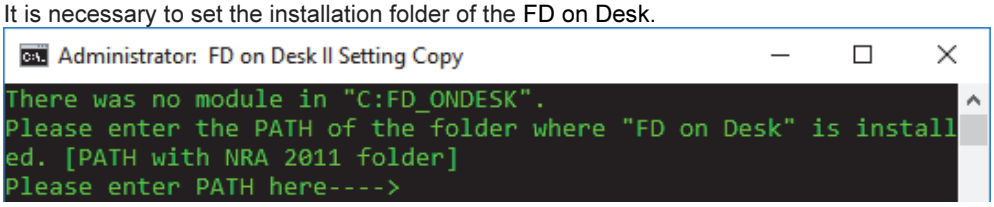


10 **The list of the takeover contents will indicate.**
>> Press any key.

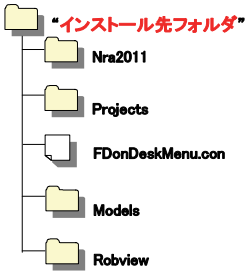


11 **This procedure is not necessary when setting the install folder of FD on Desk as the default value.**

When installing with a value other than the default value, the following screen is displayed.
It is necessary to set the installation folder of the FD on Desk.

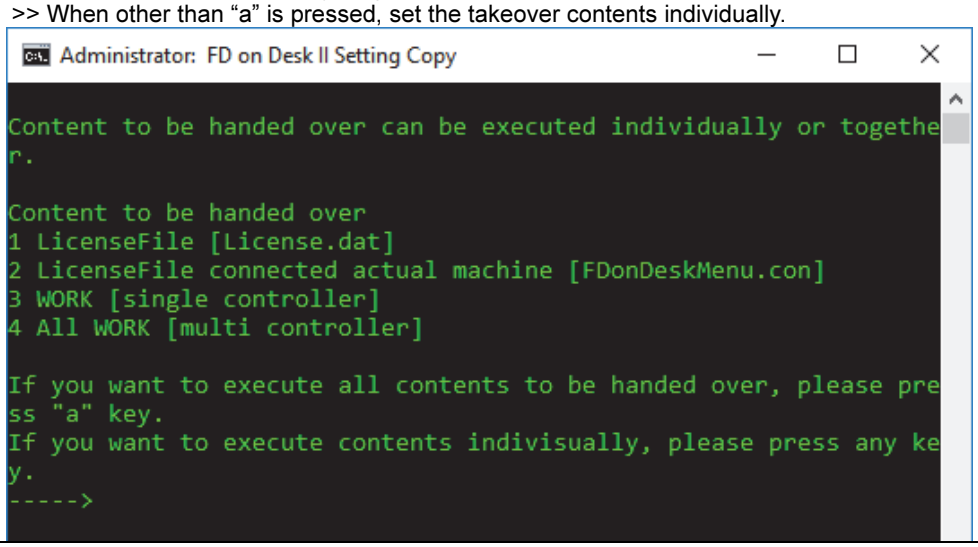


>> Please enter the PATH of the installation folder of FD on Desk.



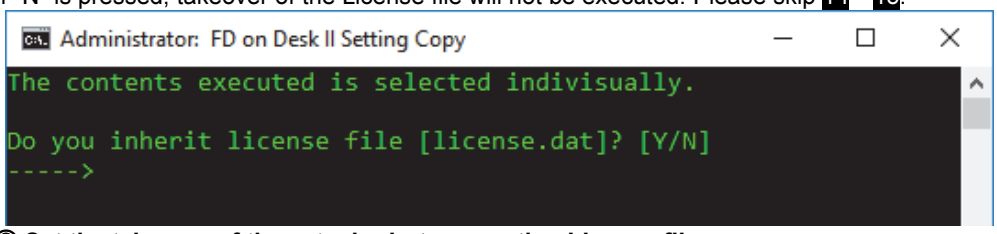
Search the NRA2011 folder from the entered PATH.
If not found, it will be re-entered.

12 **Specify the takeover contents to be individually or together.**
>> When “a” is pressed, everything will be executed. Skip until **14**.
>> When other than “a” is pressed, set the takeover contents individually.



13 **Specify the takeover contents individually.**

① Set the takeover of the License file.
>> Press Y: YES or N: NO.
If “N” is pressed, takeover of the License file will not be executed. Please skip 14～15.

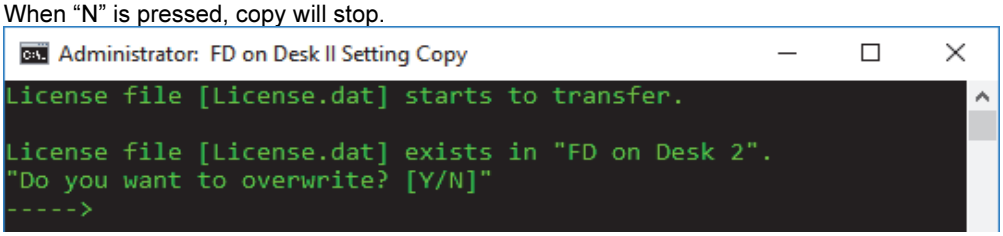


② Set the takeover of the actual robot connection License file.
>> Press Y: YES or N: NO.
When “N” is pressed, the takeover of the license file of actual robot connection will not be executed. Skip 18.

③ Set the takeover of the WORK folder.
>> Press Y: YES or N: NO.
When “N” is pressed, the takeover of the WORK folder will not be executed. Please skip 19.

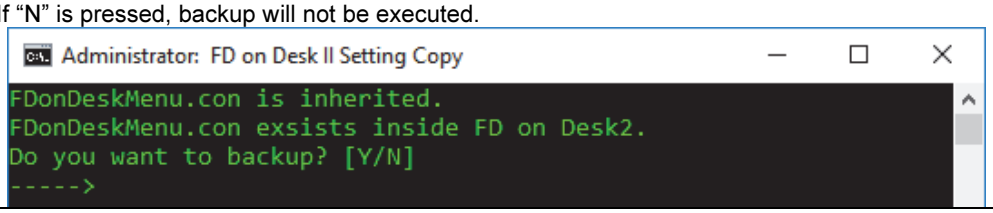
④ Set the takeover of the WORK folder of multi-controller.
>> Press Y: YES or N: NO.
When “N” is pressed, the takeover of the WORK folder of multi-controller will be executed. Please skip 20.

14 **Start the takeover of the License.**
If “N” is pressed at 13-①, please skip 14～15.
If there is no License file (license.dat) in FD on Desk,
Skip license migration work.
Also, if License.dat already exists in FD on Desk II, we will confirm overwriting.
When “N” is pressed, copy will stop.



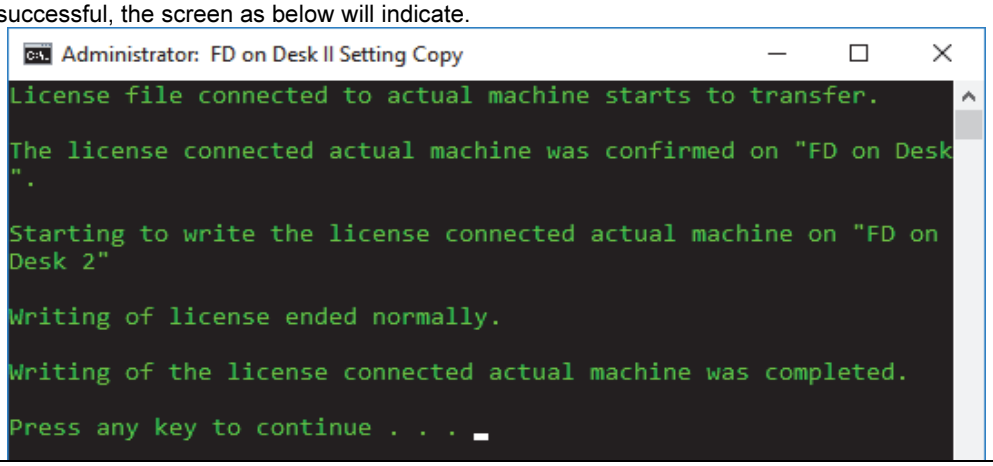
15 If succeeded in taking over the license, the following screen will be displayed.

16 If there is FDonDeskMenu.con at FD on Desk II,
execute backup of FDonDeskMenu.con.
If “N” is pressed, backup will not be executed.



17 If the backup of FDonDeskMenu.con is successful then, the screen as below will indicate.
Backup file will be “FDonDekMenu.con_(Executed date)”.

18 **Start the takeover of license file (FDonDeskMenu.con) of the actual robot connection.**
If “N” is pressed at 13-②, please skip this item.
When the takeover of the license file (FDonDeskMenu.con) of actual robot connection is successful, the screen as below will indicate.



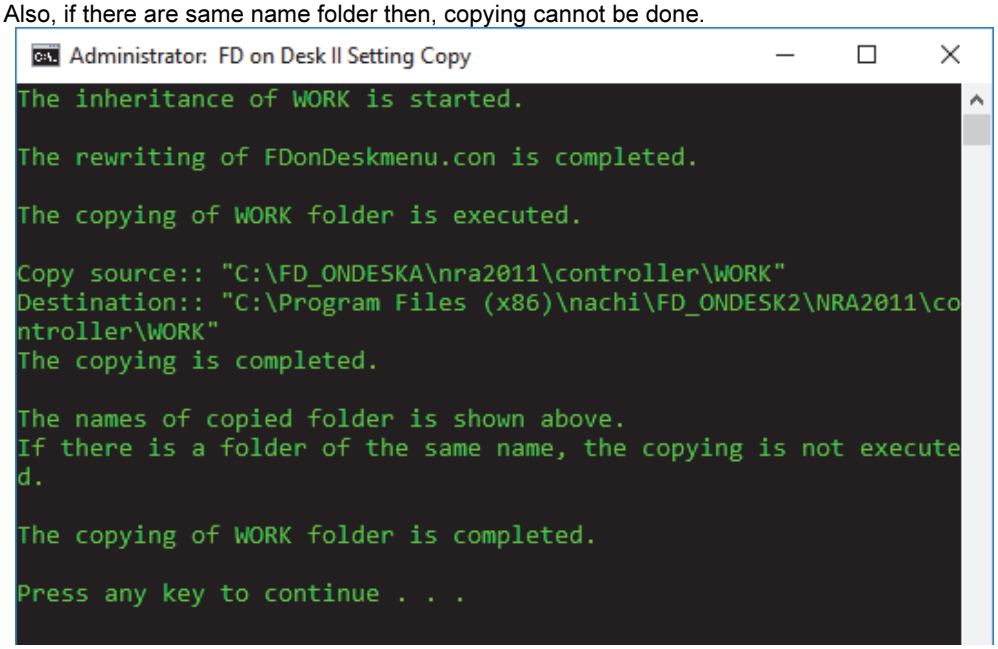
19 **Start the takeover of the WORK folder.**

If “N” is pressed at 13-③, please skip this item.

When the takeover of the WORK folder is successful, the screen as below will indicate.

Copied folder list will indicate.

Also, if there are same name folder then, copying cannot be done.



CAUTION

The following character group cannot be used for the folder name where the WORK folder to takeover exists.

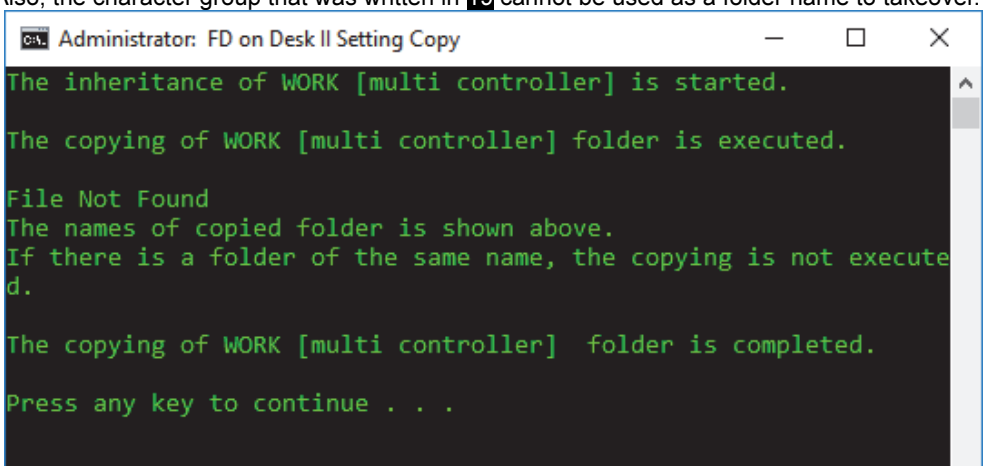
Character group that cannot be used. ¥ / : ? " < > | !

20 **Start the takeover of the WORK folder of the multi-controller.**

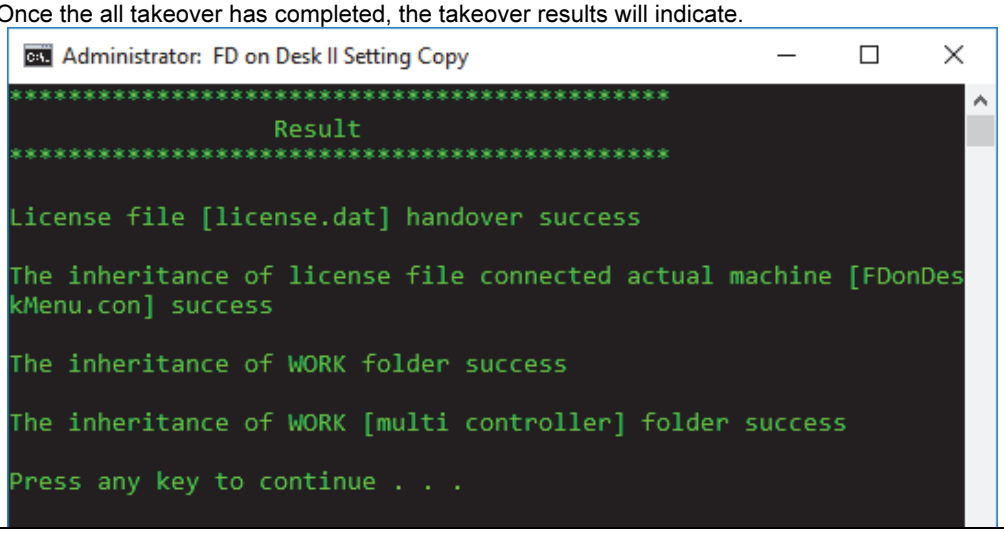
If “N” is pressed at 13-④, please skip this item.

The following screen will indicate when the takeover of the WORK folder of multi-controller has become successful.

Also, the character group that was written in 19 cannot be used as a folder name to takeover.



21 Once the all takeover has completed, the takeover results will indicate.



22 **A shortcut is created after installation is completed.**

Start Menu (In the case of Pro or Regular)

On the desktop (In the case of Pro or Regular)

CAUTION

If the runtime has been installed, please restart the PC.

1.2.2 Uninstallation

FD on Desk II is uninstalled from "Programs and Features" in "Control Panel".

Even if uninstallation is executed, the files/folders (e.g. license file, work folder, etc.) that were created or copied after installing the FD on Desk will not be deleted.
To delete those files/folders after the uninstallation, delete them manually.

Even if FD on Desk II is uninstalled, VC++ Runtime components are not uninstalled.
Uninstall them if not needed anymore by using "Programs and Features" in "Control Panel".

1.3 Communication setting for the robot controller

In this section, how to establish communication between the robot controller and FD on Desk II is described assuming that the robot controller and the relevant PC belong to the same network (192.168.1.0).
The IP address and Subnet mask are shown as below.

○ Robot controller side

IP address	192	168	1	2
Subnet mask	255	255	255	0

※ IP address of controller is a factory set IP address.

○ PC side

IP address	192	168	1	1
Subnet mask	255	255	255	0

POINT

See technical books offered commercially if necessary for various technical terms such as Ethernet, IP address, subnet mask and etc.

POINT

PC operation depends on its operating system and network environment. In this document, examples are introduced assuming that the OS in use is Windows XP and that only one PC and one controller are connected to the network. Except this case, please see technical books offered commercially or consult with your network administrator to know detail.

POINT

In case of the CFD controller, the setting operation depends on the teach pendant type.
- In case of the Smart teach pendant : Refer to section 1.3.2 TCP/IP setting in case of FD or CFD+Smart TP
- In case of the Compact teach pendant : Refer to section 1.3.3 TCP/IP setting in case of CFD+Compact TP

1.3.1 Connection of the Ethernet cable

As shown in the following figure, connect the PC in which FD on Desk II is installed and the robot controller using an Ethernet cable.

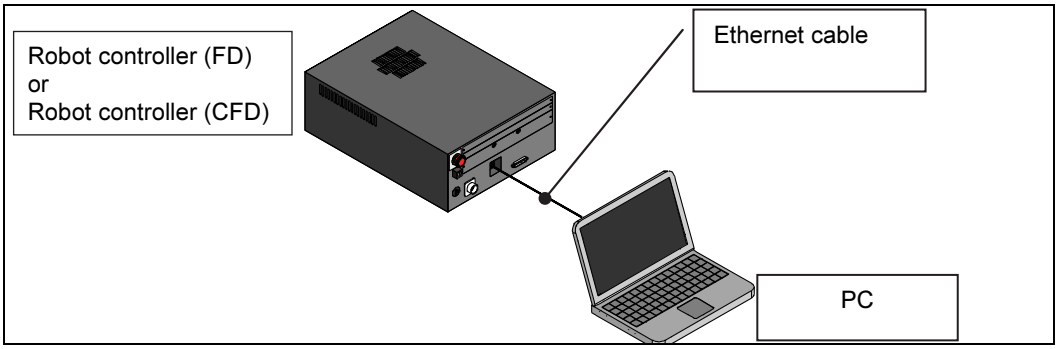


Fig. 1.2 Connection between the controller and the PC

POINT

Usually, an Ethernet cable is not included in the FD on Desk II package.
The cable can be purchased in the market.

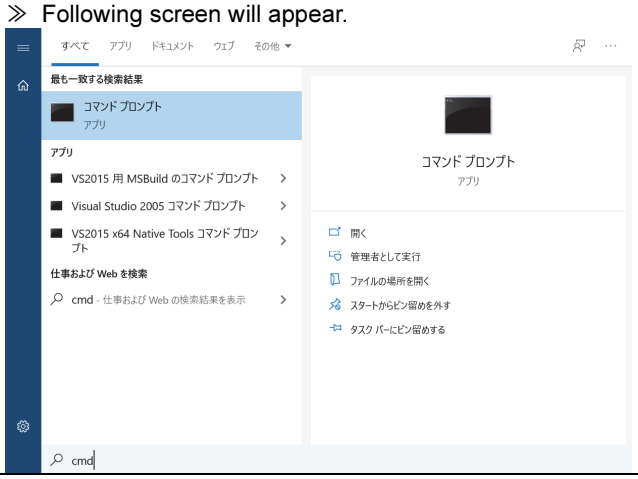
CAUTION

If you want to operate the robot (from FD on Desk II) after changing PC, first exit FD on Desk II and then re-connect the LAN connection.

Communication cannot be established if the IP address of the PC does not correspond to the IP address of controller, or if the LAN cable is not inserted properly.
To check if the PC and controller are connected properly, follow the steps below.

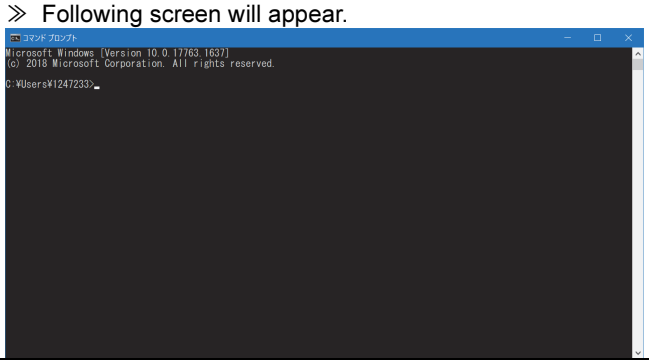
1 **Input [cmd] from [start] menu.**

≫ Following screen will appear.

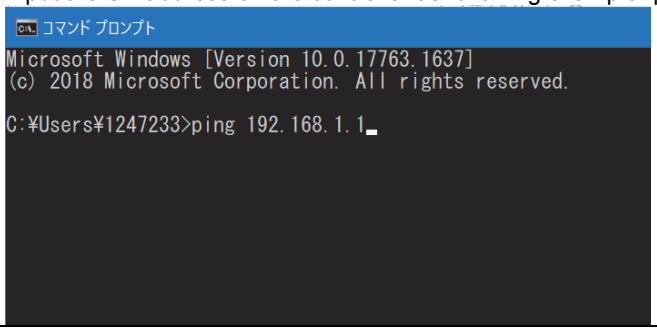


2 **Select command prompt.**

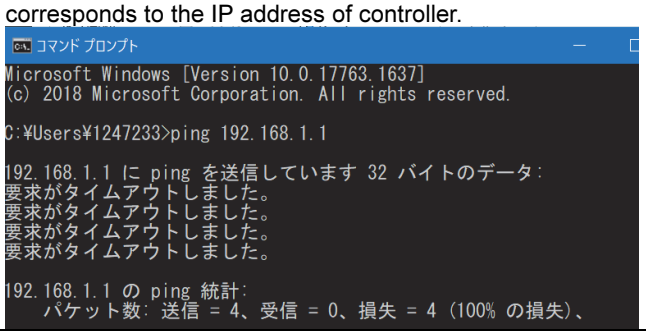
≫ Following screen will appear.



Input the UP address on the controller as following example “ping 192.168.1.1”.



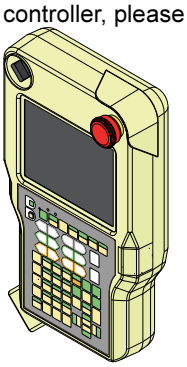
The following message indicates that your PC and controller are not properly communication.
Make sure that the LAN cable is connected properly and that the IP address of the PC corresponds to the IP address of controller.

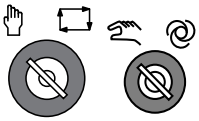


Time out error

1.3.2 TCP/IP setting in case of FD or CFD+Smart TP

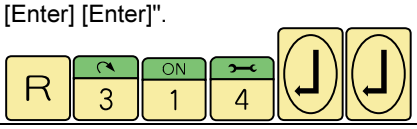
This section describes how to make the TCP/IP settings in the robot controller. It describes operations when using an FD/CFD robot controller and a Smart TP. For details when using a Compact TP with a CFD robot controller, please refer to the next section.



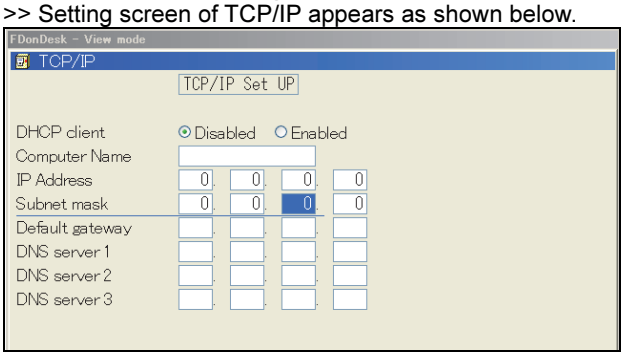


1 **Select the TEACH mode.**

2 Select the ***EXPERT*** mode for the operator class by entering the command "R314 [Enter] [Enter]".



3 **Select <Constant setting> – [8 Communication] – [2. Ethernet] – [1 TCP/IP].**
>> Setting screen of TCP/IP appears as shown below.



4 **Set the parameters.**

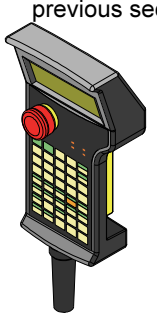
IP address	192	168	1	1
Subnet mask	255	255	255	0

5 **When the setting is completed, press f12 <Complete>.**

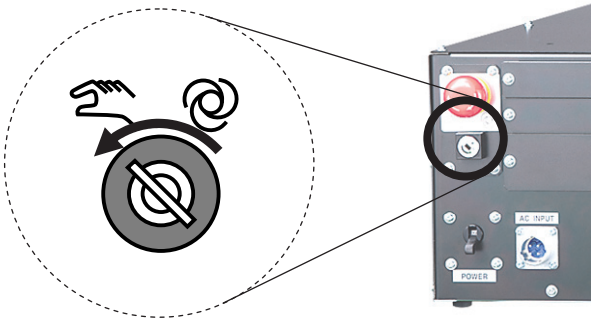
6 **To enable the new settings, restore the power of the robot controller.**

1.3.3 TCP/IP setting in case of CFD+Compact TP

This section describes how to make the TCP/IP settings in the robot controller.
It describes operations when using a Compact TP. For details when using a Smart TP, please refer to the previous section.



1 **Select the TEACH mode.**



START
MENU
↑↓←→
ENTER

2 **Open [START / MENU] - <SETTINGS> - <TCP/IP> menu.**
>> "TCP/IP" setting screen is displayed.

```
*MENU*TCP/IP      V3.07
<IPAddress>   000.000.000
 SubMask      000.000.000
>[1]EXECUTE[2]RETURN
```

ENTER
↑↓

3 **Set the cursor to "IP Address" and press [ENTER].**
>> "I1" is displayed at the prompt.

```
*MENU*TCP/IP      V3.07
<IPAddress>   000.000.000
 SubMask      000.000.000
>I1
```

4 **Input the 1st byte of the IP address (0-255) using the numeric keys and press [ENTER].**
(Now, "192" is inputted)
>> "I1 192" is displayed at the prompt.

```
*MENU*TCP/IP      V3.07
<IPAddress>   000.000.000
 SubMask      000.000.000
>I1 192
```

ENTER

5 **Press [ENTER].**
>> "I2" is displayed at the prompt.

```
*MENU*TCP/IP      V3.07
<IPAddress>   000.000.000
 SubMask      000.000.000
>I2
```

ENTER

6 Repeat **3** and **4** to input to the 4th byte and press [ENTER].
>> The inputted address is displayed as "IPAddress".

```
*MENU*TCP/IP      V3.07
<IPAddress>   192.031.000
 SubMask      000.000.000
>[1]EXECUTE[2]RETURN
```

7 **Set the cursor to the "SubMask (Sub net mask)" and press [ENTER].**
>> "I1" is displayed at the prompt.

```
*MENU*TCP/IP        V3.07
 IPAddres     192.031.0
<SubMask>    000.000.0
>I1
```

8 **Input the 1st – 4th byte in the same way with the IP address and press [ENTER].**
>> The inputted values are displayed at the "SubMask".

```
*MENU*TCP/IP        V3.07
 IPAddres     192.031.0
<SubMask>    255.255.2
>[1]EXECUTE[2]RETURN
```


9 **Press right cursor key.**
>> The setting value of the cursor position is displayed in scroll.

```
*MENU*TCP/IP        V3.07
 IPAddres     192.031.0
<SubMask>    5.255.000
>[1]EXECUTE[2]RETURN
```

10 **Press [FN / 1]. A message like the following screen will be displayed.**

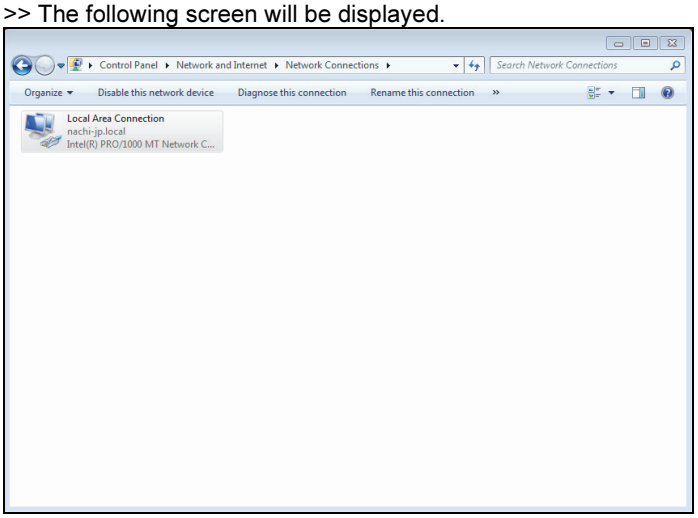
```
*MENU*TCP/IP        V3.07
 IPAddres     192.031.0
<SubMask>    5.255.000
>Please Power Off
```

11 **To enable the new settings, restore the power of the robot controller.**

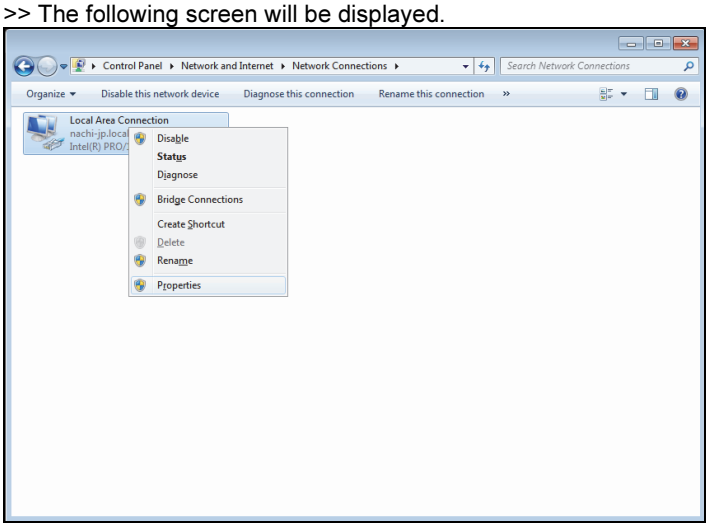
1.3.4 TCP/IP setting for the PC

This section describes how to make the TCP/IP settings in the PC.
(Here we will set Windows 10 as an example but the details depend on the OS version)

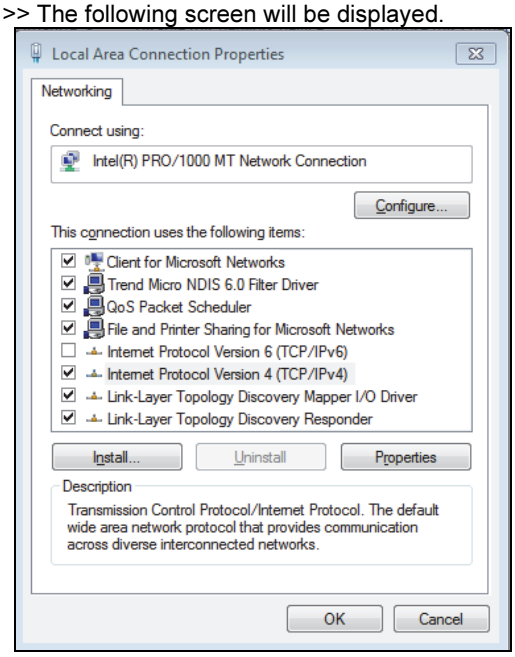
1 **From the Start menu, select [Windows Settings] - [Network and Internet], and click [Change adapter options].**
>> The following screen will be displayed.



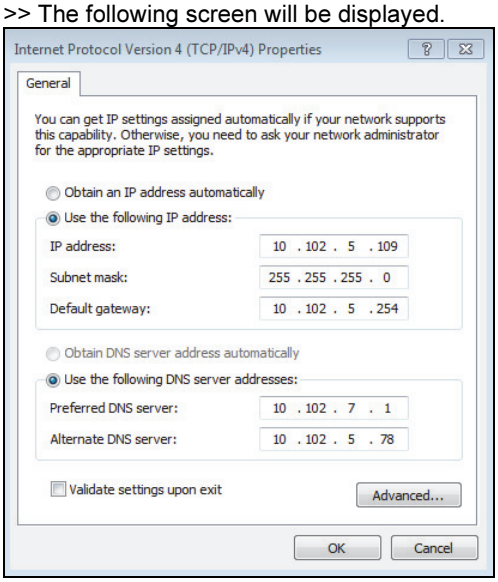
2 **Select [Ethernet] and right-click the mouse.**
>> The following screen will be displayed.



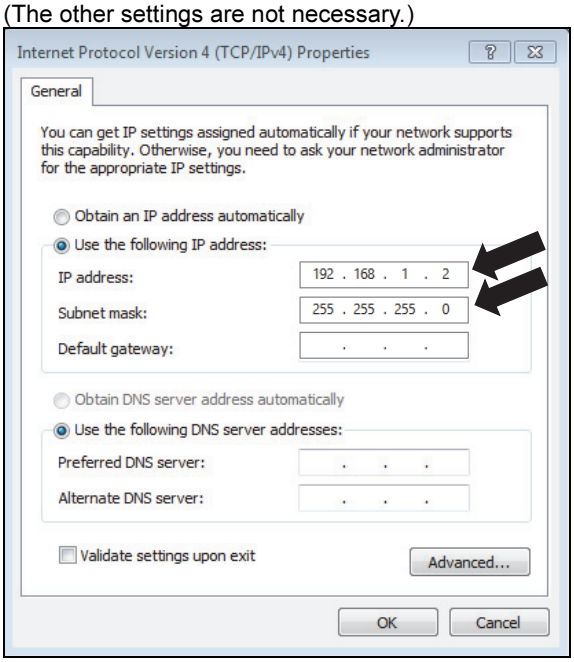
3 **Click [Properties].**
>> The following screen will be displayed.



4 **Select the [Internet protocol (TCP/IP)] and click the [Properties].**
>> The following screen will be displayed.



5 **IP address = 192 168 1 2, Subnet mask = 255 255 255 0**
(The other settings are not necessary.)



POINT

(NOTE) Before changing these parameter, memorize the settings and after using FD on Desk, please, make the setting

6 **Click the [OK] button. And then click [OK] and [Close] in the next screen to finish the setting screen.**

7 **Shutdown the PC and then turn ON the power again.**

1.4 Basic operations

1.4.1 Operation flow

Start up the FD on Desk II operation screen using the following procedure.

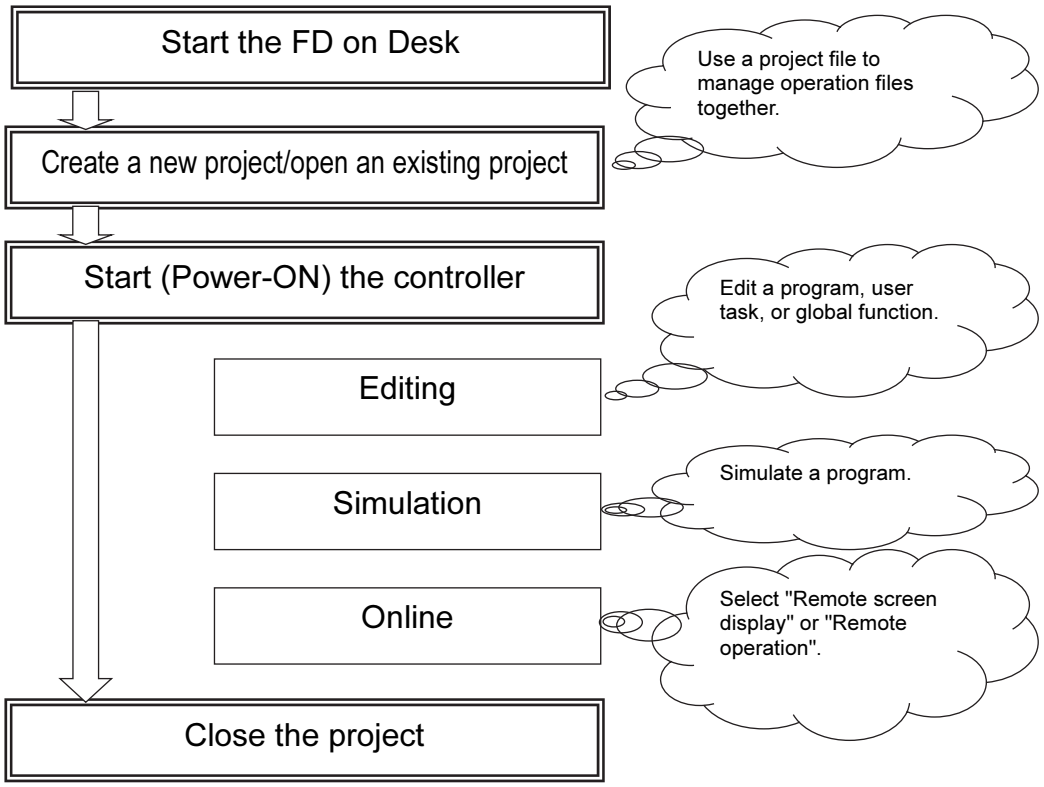


Fig. 1.3 Operation flow

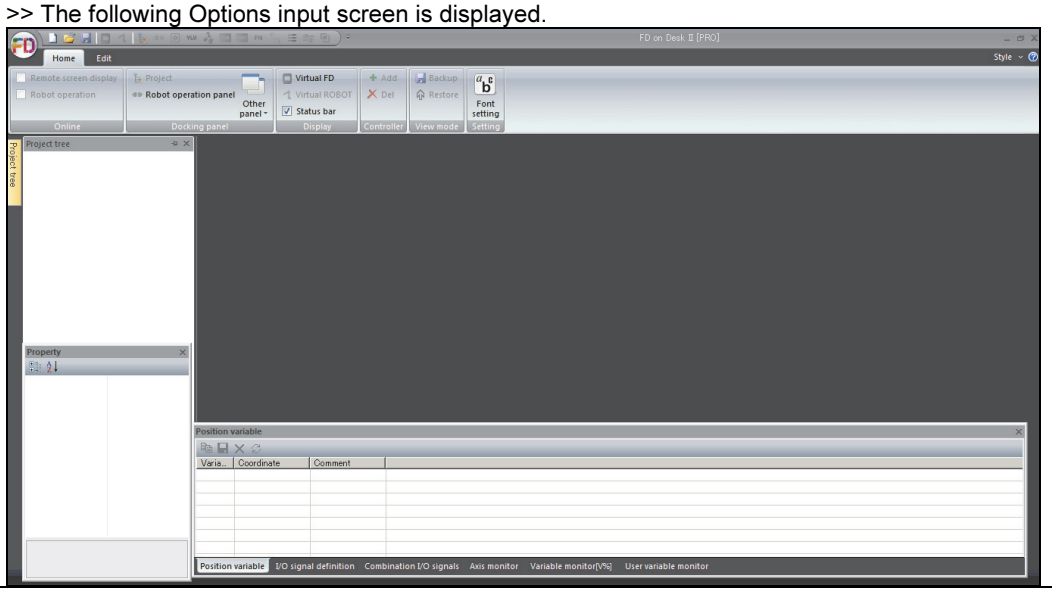
1.4.2 Starting and terminating FD on Desk II

This section explains how to start and terminate FD on Desk II.

How to start the FD on Desk

1 **Execute the shortcut on the desktop.**

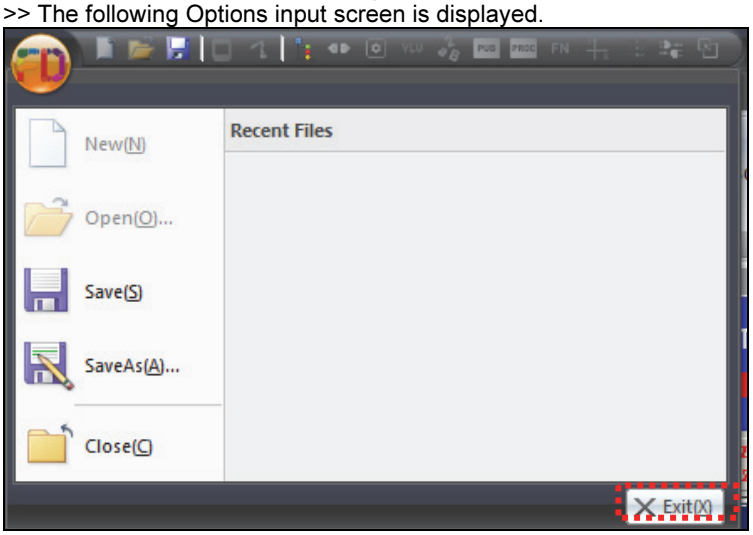
>> The following Options input screen is displayed.



How to terminate the FD on Desk

1 **Click the icon as shown in the figure.**

>> The following Options input screen is displayed.



2 **Click [Exit].**

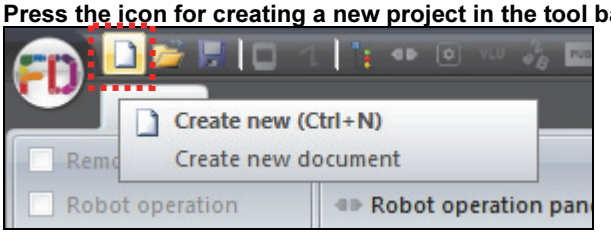
1.4.3 Creating a new project or opening an existing project

POINT

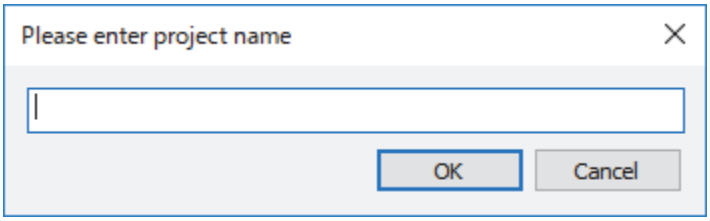
This part explains how to create a new project or how to open an existing project.
Also, when loading a project, when the display language selection at the time of turning on the FD is not Japanese or English, it may not be able to be read correctly.
This happens when double-byte characters are included in the data name or the path to the place where the data is located.

Creating a new project

1 Press the icon for creating a new project in the tool bar.

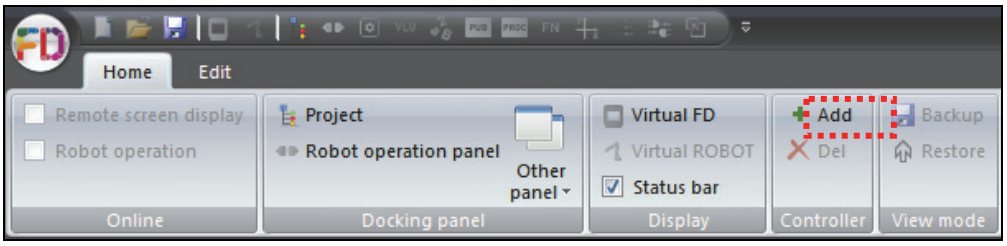


2 Set the project name.
>>Input the project name.



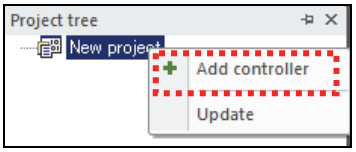
3 Add a controller.
>> Use either of the following procedures.

Select Ribbon, Project, then Controller, and click "Add",



or

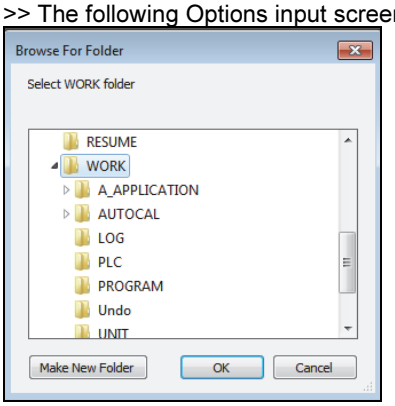
Select Docking panel, then Project tree, right-click the mouse on "New project", and click "Add controller".



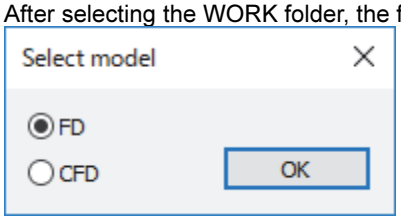
POINT

You can also add a controller by copying the WORK folder in Explorer through drag and drop operation.

4 **Select a WORK folder.**
>> The following Options input screen is displayed.



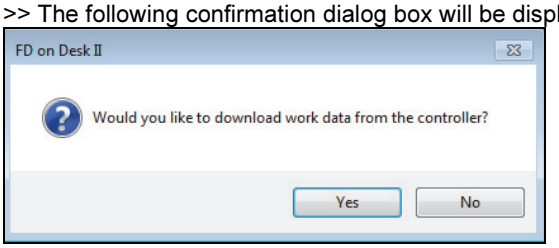
After selecting the WORK folder, the following screen will be displayed.



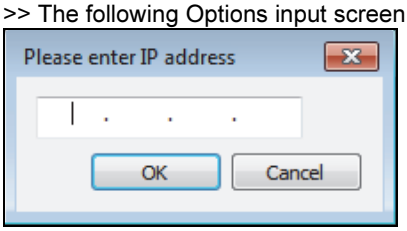
Please select the model of the work to be added.

When an existing work is selected, move to 4.

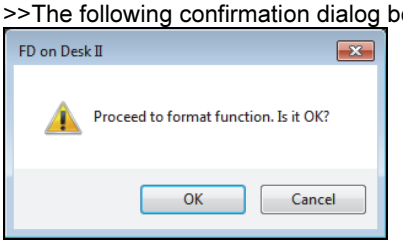
When a new folder is created or an empty folder is selected,
>> The following confirmation dialog box will be displayed.



When Yes is selected, download the work from the FD/CFD robot controller.
>> The following Options input screen is displayed. Enter the IP address of the robot controller.

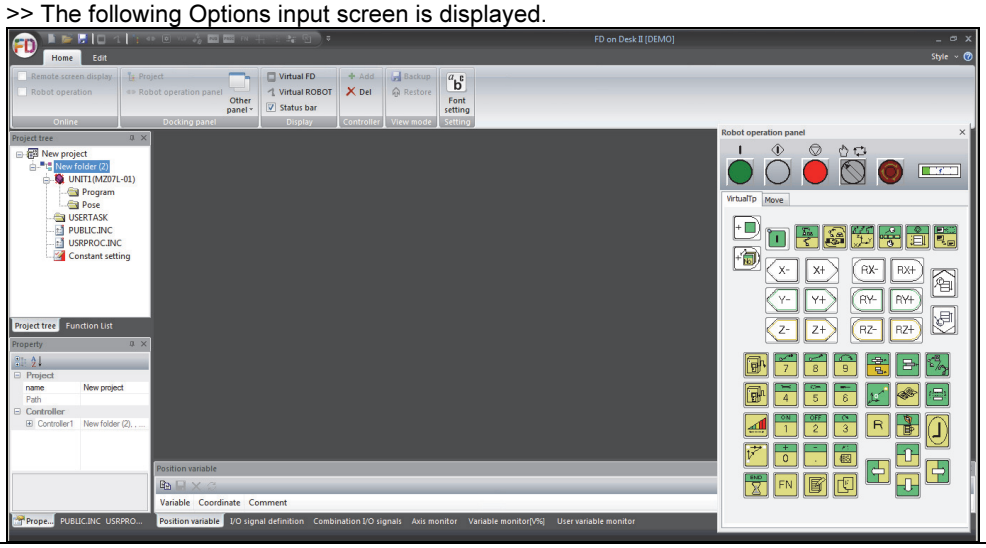


When No is selected, memory format operation is performed using Virtual FD.
>>The following confirmation dialog box will be displayed.

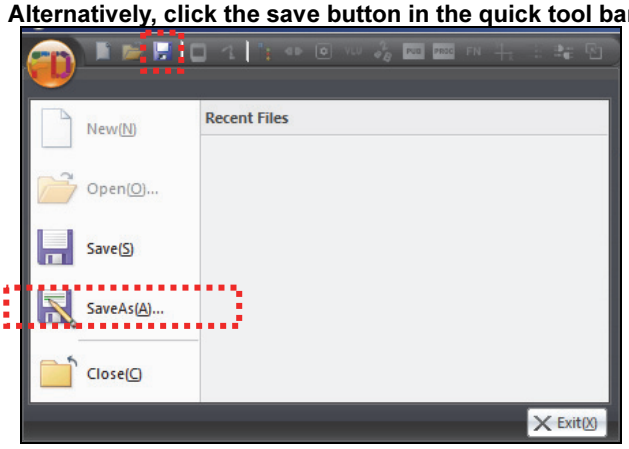


For details, refer to the instruction manual "Memory format procedure"

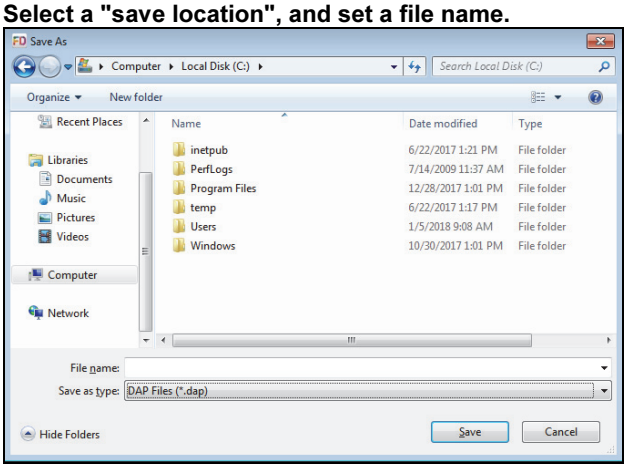
5 **A new project will be created.**
>> The following Options input screen is displayed.



6 **Click the icon as shown in the figure, and click "Save As ...".**
Alternatively, click the save button in the quick tool bar.



7 **Select a "save location", and set a file name.**

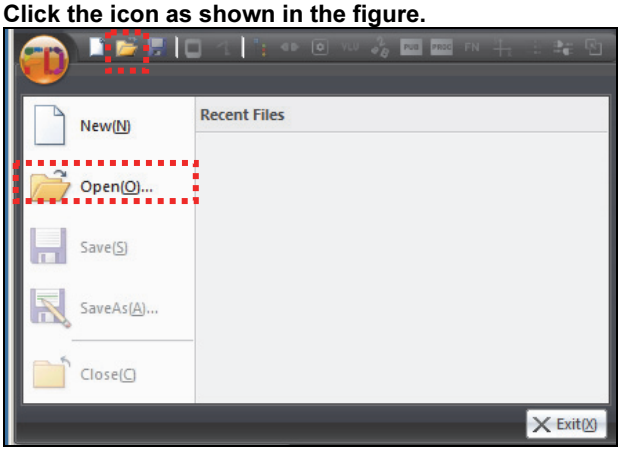


POINT

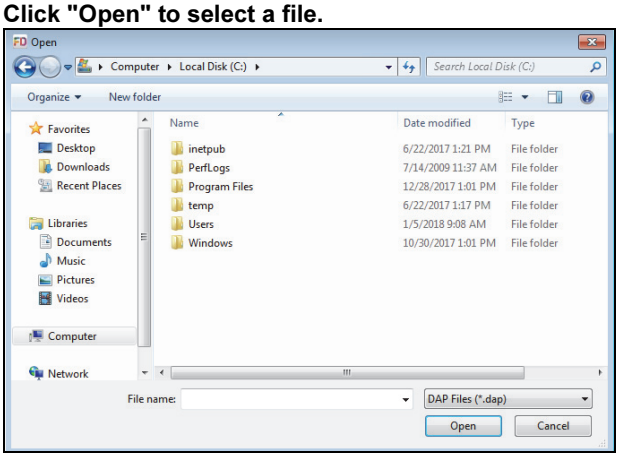
When a project is saved, you can operate easily next time by using "Open an existing project".

Opening an existing project

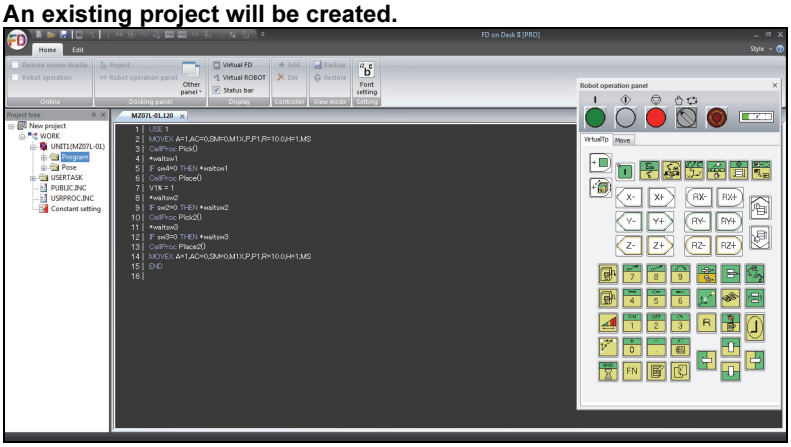
1 **Click the icon as shown in the figure.**



2 **Click "Open" to select a file.**



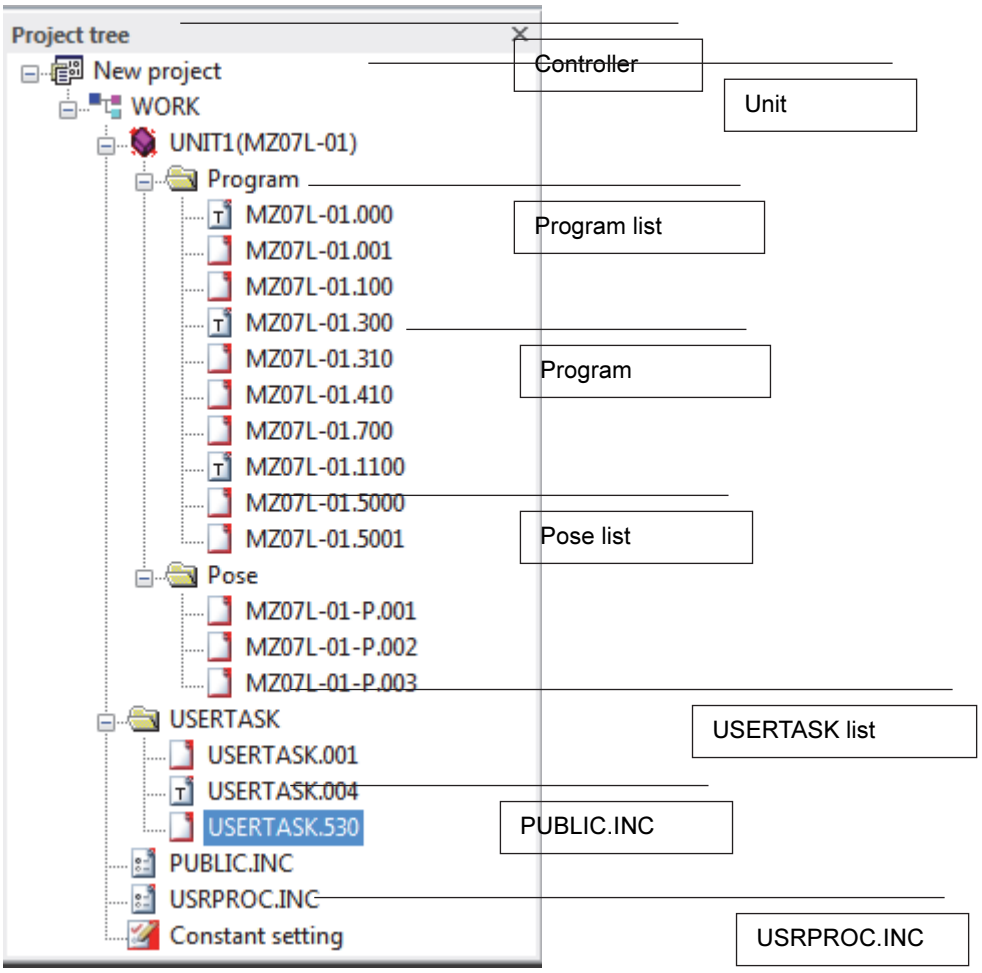
4 **An existing project will be created.**



1.4.4 Project tree panel

This section describes the project tree panel.

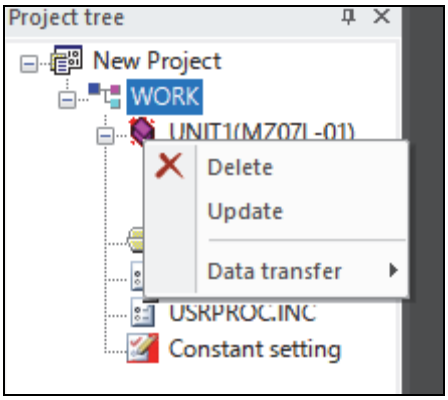
1 **Select Docking panel, and if nothing is displayed, click Project tree.**
>> The following screen will be displayed.



Meaning of each icon (robot program, pose file, user task icon) is;
…File in which only text exists
…File in which only binary exists
…File in which both text and binary exists

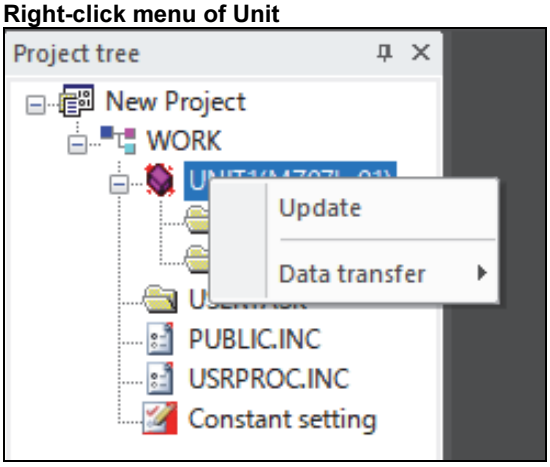
For details on each term, refer to the section of the robot language in the FD controller instruction manual.

2 Right click menu of Controller



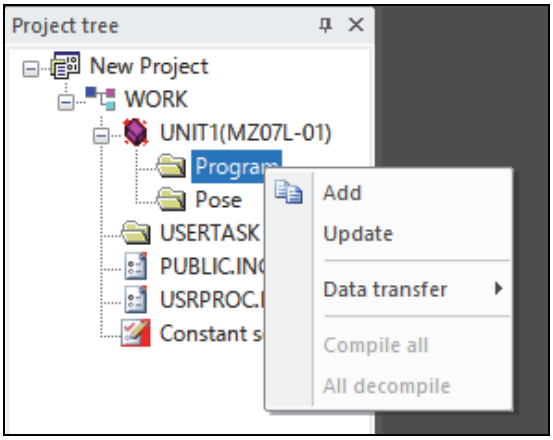
Delete
Delete a controller.
Update
Update to the latest.
Data transfer
Refer to “1.4.10 Transferring Data”

3 Right-click menu of Unit



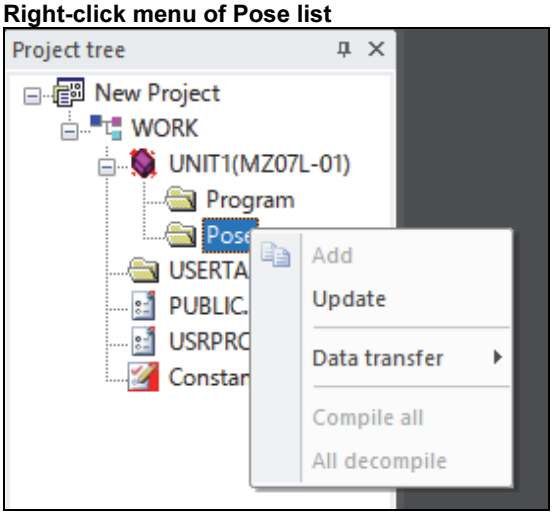
Update
Update the unit data.
Data transfer
Refer to 1.4.10 Transferring data.

4 Right-click menu of Program list and USERTASK list



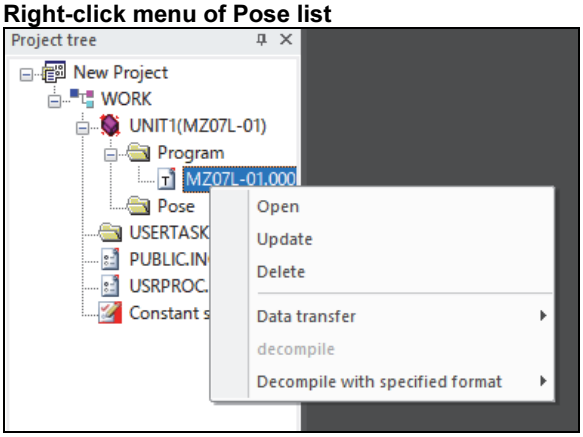
Add
Add a program.
Update
Obtain the latest file details.
Data transfer
Refer to “1.4.10 Transferring data”.
Compile all
Refer to “1.4.6 Editing a program”
All decompile
Refer to “1.4.6 Editing a program”

5 Right-click menu of Pose list



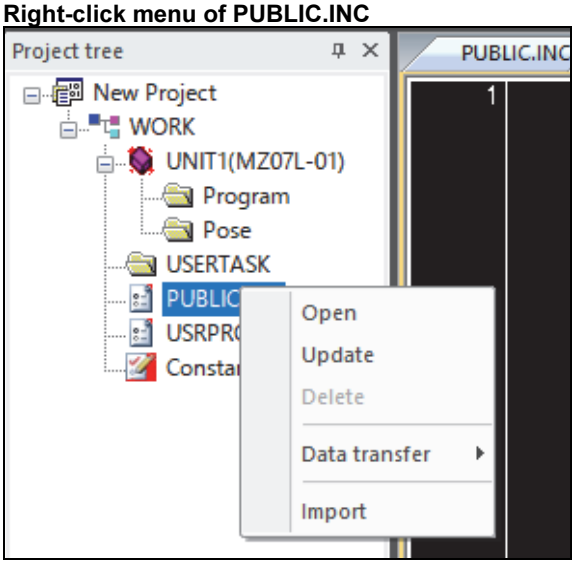
Update
Obtain the latest file details.
Data transfer
Refer to “1.4.10 Transferring data”.
All decompile
Refer to “1.4.6 Editing a program”

6 Right-click menu of Pose list



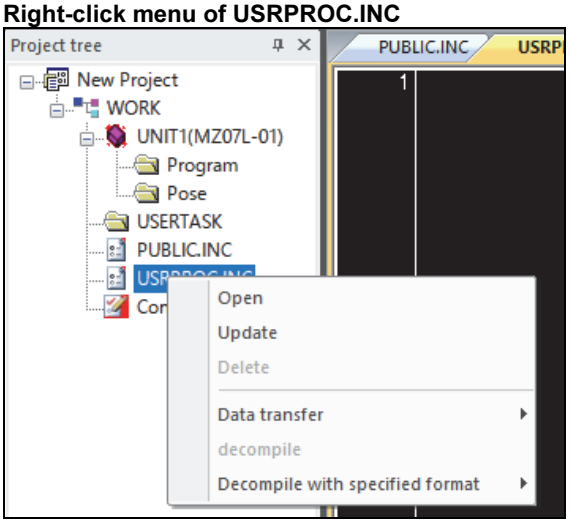
Open
Display a program in Editor.
Update
Obtain the latest file details.
Delete
Delete a program.
Data transfer
Refer to “1.4.10 Transferring data”.
Decompile
Refer to “1.4.6 Editing a program”
Decompile with specified format
Refer to “1.4.6 Editing a program”

7 Right-click menu of PUBLIC.INC



Open
Display a program in Editor.
Update
Obtain the latest file details.
Data transfer
Refer to “1.4.10 Transferring data”.
Import
Import settings from an Excel file.

8 Right-click menu of USRPROC.INC



Open
Display a program in Editor.
Update
Obtain the latest file details.
Delete
Delete a program.
Data transfer
Refer to 1.4.10 Transferring data.
Decompile with specified format
Refer to “1.4.6 Editing a program”

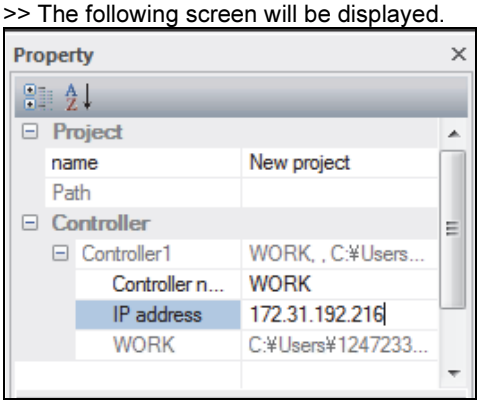
POINT

About update.
When adding items (program · pause · user task) directly with Virtual FD, top items (program list, pause list, user task list, controller) by clicking update, items will be added to the list. Also, if you edit items directly with Virtual FD, the contents will be reflected by updating. For the program, the contents are reflected even by closing the editor and reopening it.

1.4.5 Setting the IP address

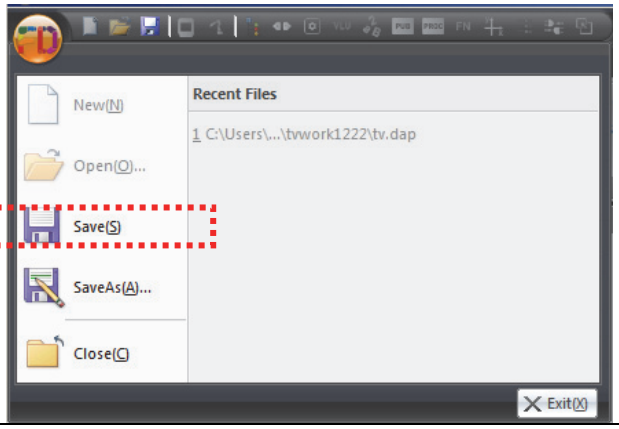
This section describes the setting for the IP address for connecting to the FD/CFD robot controller.

1 **Click Docking panel, then Property.**
>> The following screen will be displayed.



2 **Set the IP address.**

3 **Click the icon as shown in the figure and click "Save".**



POINT

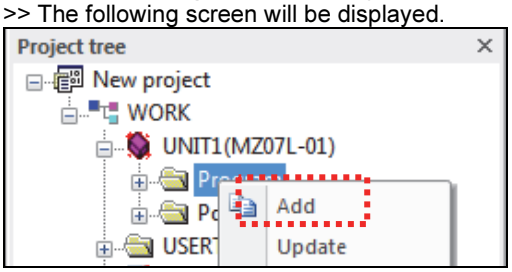
If the IP address is set, it becomes possible to use the following functions;
- Remote operation of the FD/CFD robot controller (online)
- File transmission to and reception from the FD/CFD robot controller (FTP communication)

1.4.6 Editing a program

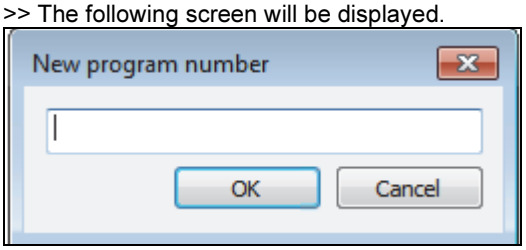
For details on robot language programs, refer to the section of the robot language in the FD controller instruction manual.

Newly creating a program

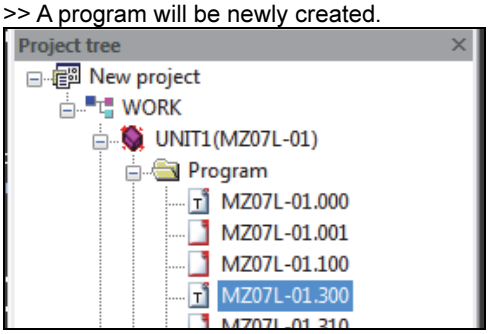
1 **Select Docking panel, then Project tree, and right-click the "Program" folder (the name differs depending on the robot type)".**
>> The following screen will be displayed.



2 **Click [Add].**
>> The following screen will be displayed.

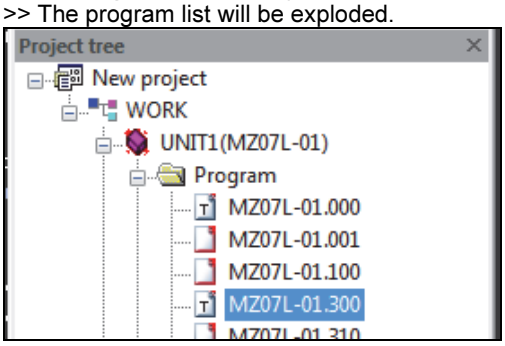


3 **Set a program number for a program to be newly created and press [OK].**
>> A program will be newly created.

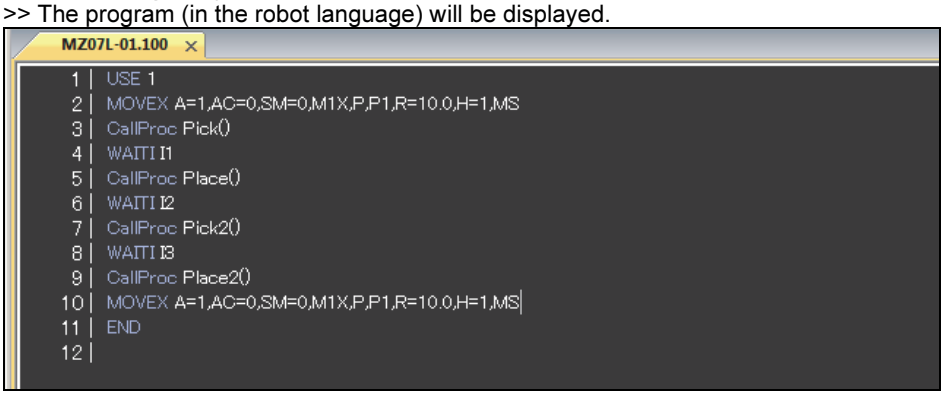


Selecting a program

1 **Select Docking panel, then Project tree, and click the "Program" folder (the name differs depending on the robot type)".**
>> The program list will be exploded.



2 **Click the program you want to edit.**
>> The program (in the robot language) will be displayed.

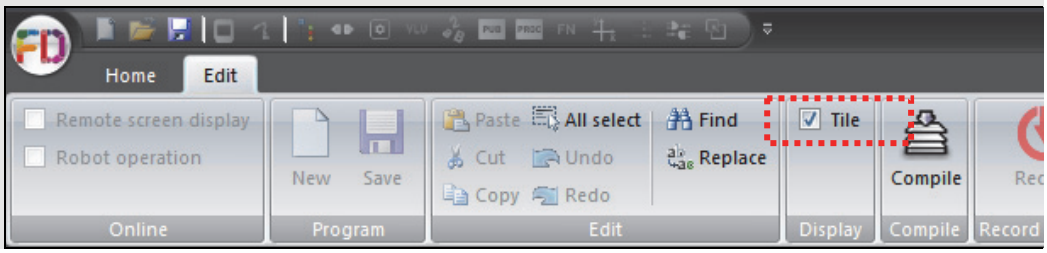


POINT

If there is no robot language file for the program, the program is automatically compiled to create a robot language file.

POINT

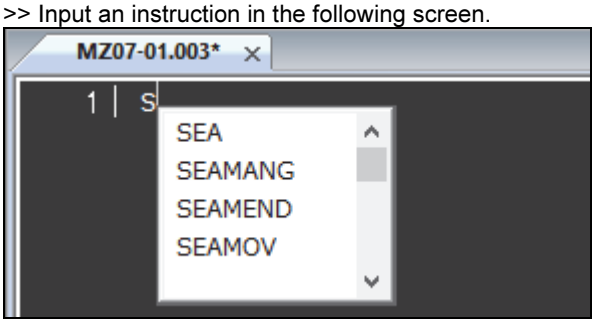
Select Ribbon, then Edit, and click "Display", then "Title" to display multiple windows together.



Editing a program

■ Record function instructions.

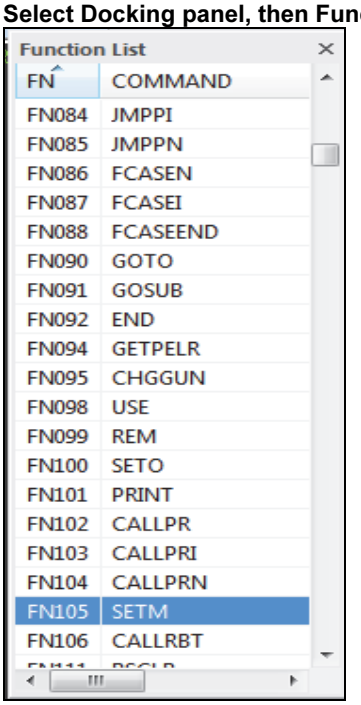
1 **Input an instruction.**
>> Input an instruction in the following screen.



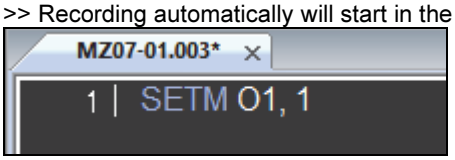
POINT

When a character is input, the names of recordable instructions containing that character will be displayed in the input support dropdown list.
Move the cursor up and down to select the desired instruction and press [Enter].

2 **Select Docking panel, then Function List, and double-click the desired command.**



>> Recording automatically will start in the cursor position.

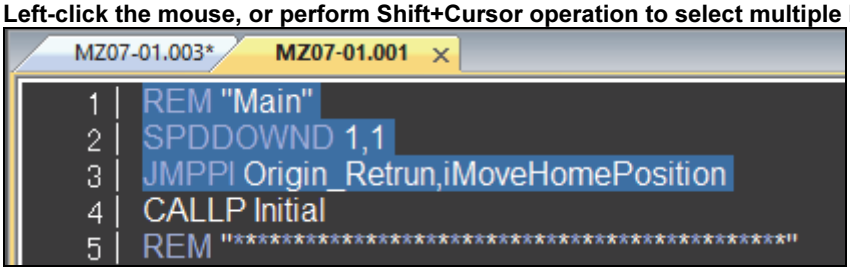


POINT

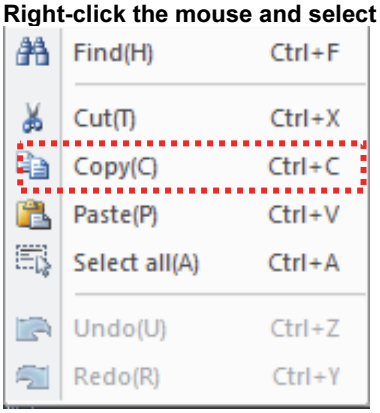
For a command requiring a parameter, the parameter's initial value will be recorded.

■ Copy multiple lines,

1 **Left-click the mouse, or perform Shift+Cursor operation to select multiple lines.**



2 **Right-click the mouse and select "Copy".**

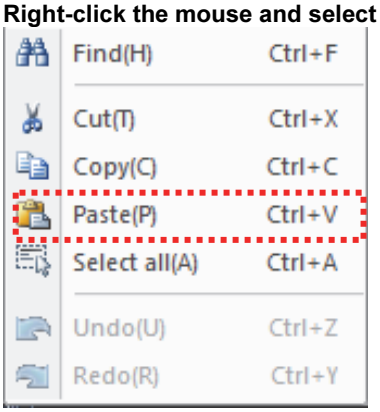


POINT

You can also copy by clicking "Edit", then "Copy", after selecting Ribbon, then Edit.
The short-cut keys (Ctrl+C) can be used as well.

■ Paste the copied lines.

1 **Right-click the mouse and select "Paste".**

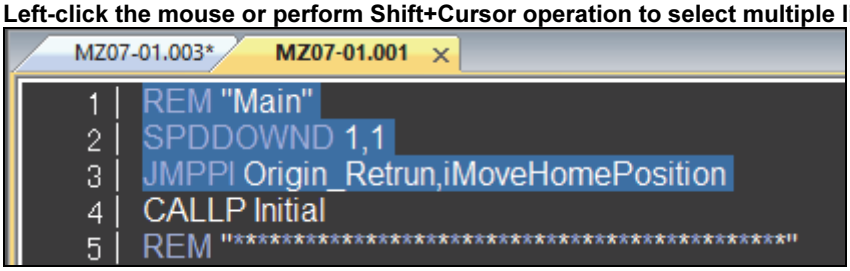


POINT

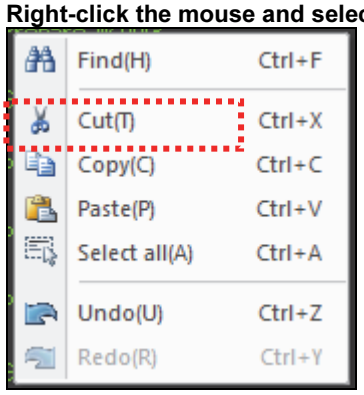
You can also paste by clicking "Edit", then "Paste", after selecting Ribbon, then Edit.
The short-cut keys (Ctrl+V) can be used as well.

■ Cut multiple lines.

1 **Left-click the mouse or perform Shift+Cursor operation to select multiple lines.**



2 **Right-click the mouse and select "Cut".**

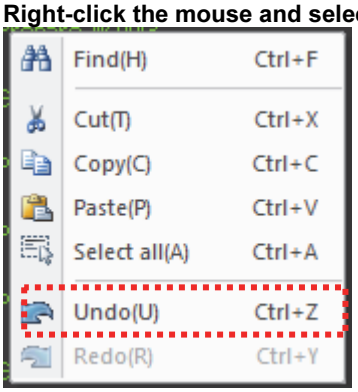


POINT

You can also cut by clicking "Edit", then "Cut", after selecting Ribbon, then Edit.
The sort-cut keys (Ctrl+X) can be used as well.

■ Restore the previous state.

1 **Right-click the mouse and select "Undo".**

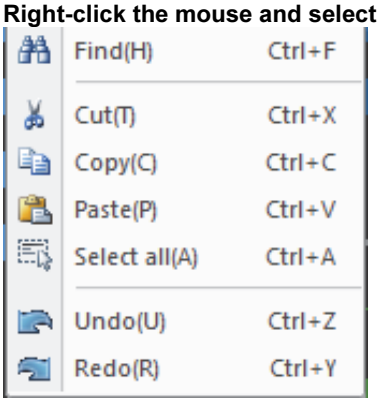


POINT

You can also undo by clicking "Edit", then "Undo", after selecting Ribbon, then Edit.
The sort-cut keys (Ctrl+Z) can be used as well.

■ Redo the previous state.

1 **Right-click the mouse and select "Redo".**

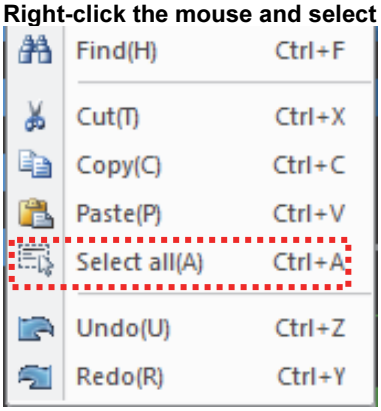


POINT

You can also redo by clicking "Edit", then "Redo", after selecting Ribbon, then Edit.
The sort-cut keys (Ctrl+Y) can be used as well.

■ Select all.

1 **Right-click the mouse and select "Select all".**

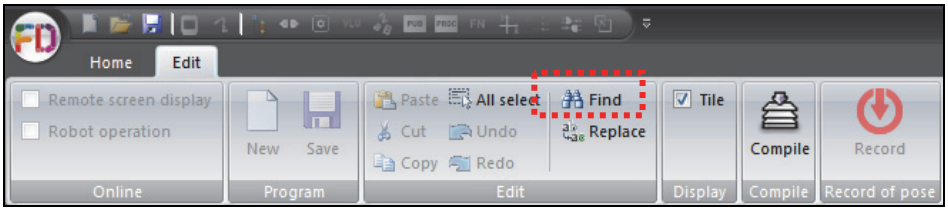


POINT

You can also select by clicking "Edit", then "All Select", after selecting Ribbon, then Edit.
The short-cut keys (Ctrl+A) can be used as well.

■ Conduct a search.

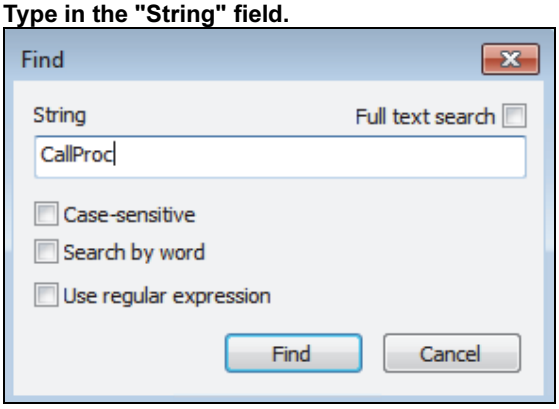
1 **Select "Edit", then "Find" after selecting Ribbon, then Edit.**



POINT

The short-cut keys (Ctrl+F) can be used as well.

2 **Type in the "String" field.**



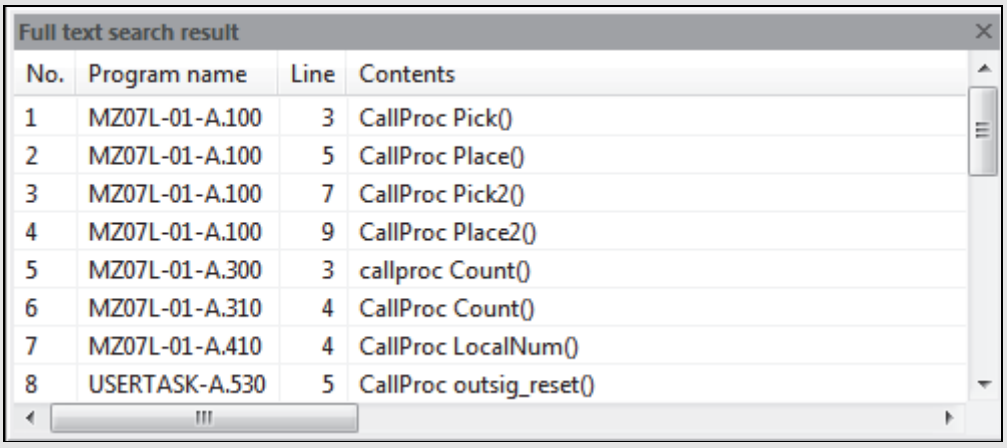
POINT

Keep the candidate selected so that the field can be assumed to be filled with a search string.

3 **Press "Find" to conduct a search.**

POINT

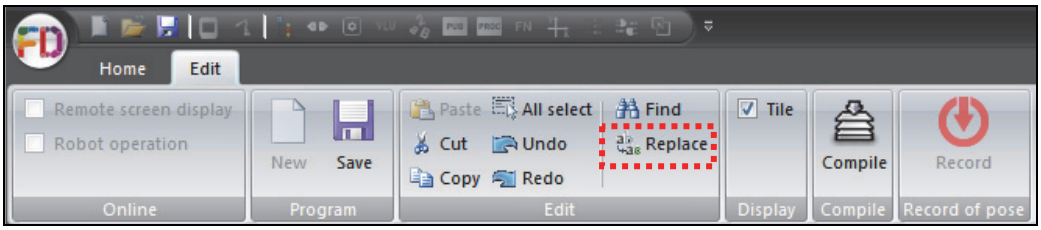
Select the "Full text search" checkbox to search all programs.
Double-click the target in the full text search result to jump to the section where the target exists.



No.	Program name	Line	Contents
1	MZ07L-01-A.100	3	CallProc Pick()
2	MZ07L-01-A.100	5	CallProc Place()
3	MZ07L-01-A.100	7	CallProc Pick2()
4	MZ07L-01-A.100	9	CallProc Place2()
5	MZ07L-01-A.300	3	callproc Count()
6	MZ07L-01-A.310	4	CallProc Count()
7	MZ07L-01-A.410	4	CallProc LocalNum()
8	USERTASK-A.530	5	CallProc outsig_reset()

■ Replace text.

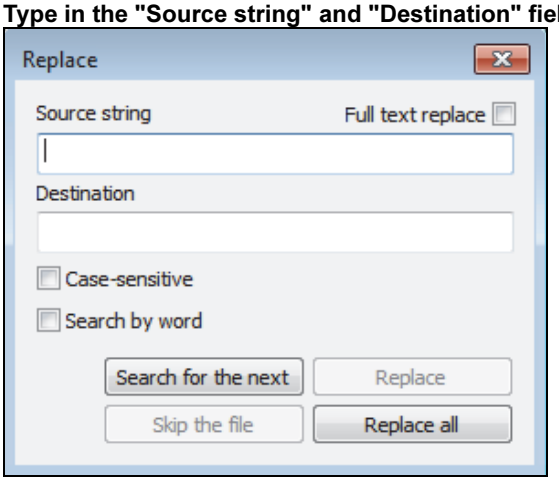
1 **Select "Edit", then "Replace" after selecting Ribbon, then Edit.**



POINT

The short-cut keys (Ctrl+H) can be used as well.

2 **Type in the "Source string" and "Destination" fields.**



POINT

Keep the candidate selected so that the "source string" field can be assumed to be filled with a search string.

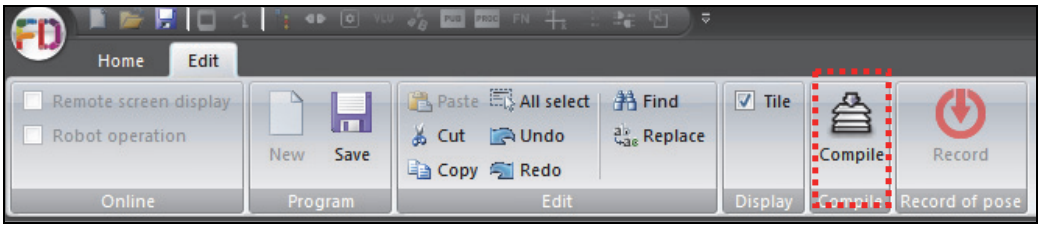
3 **Click "Replace all" for replacement.**

POINT

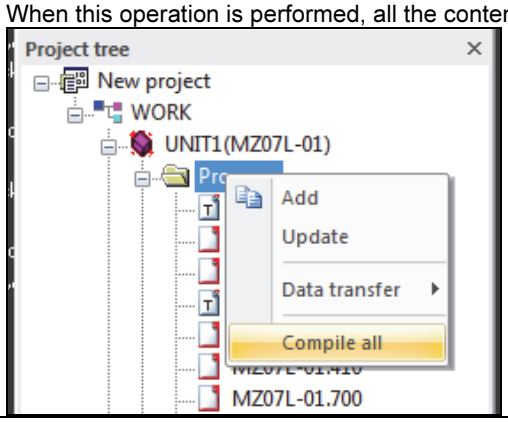
Select the "Full text replace" checkbox to search all programs.

Compile a program.

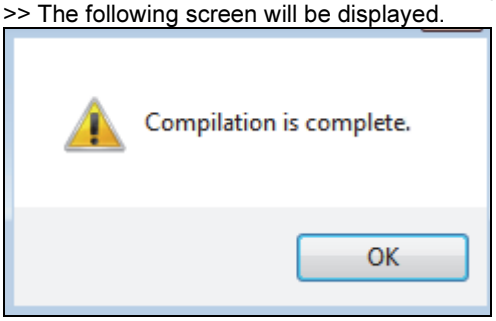
1 **Select Ribbon, then Edit, and click "Compile".**



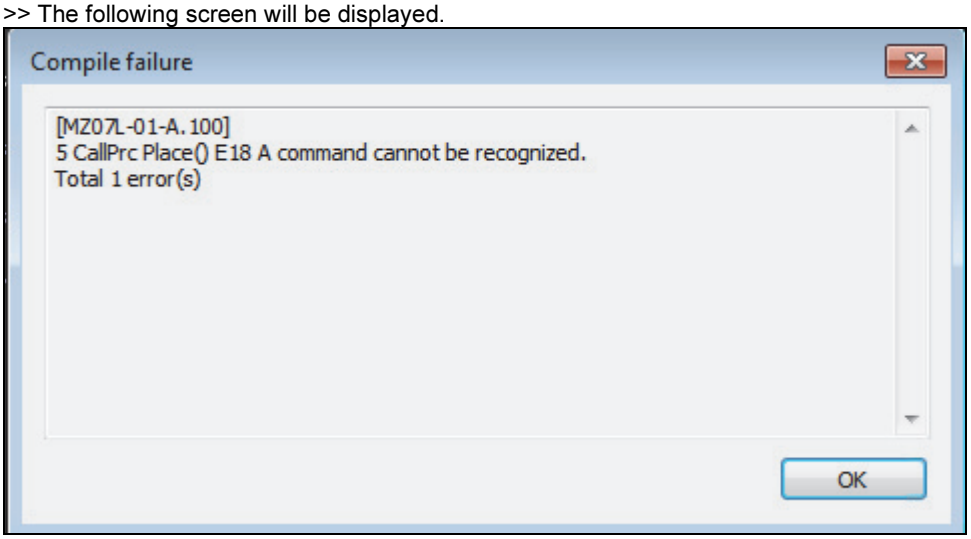
Select Program, Pose, and USERTASK together, and click Compile all for them.
When this operation is performed, all the contents in these folders will be compiled together.



2 **The compile process is completed normally.**
>> The following screen will be displayed.

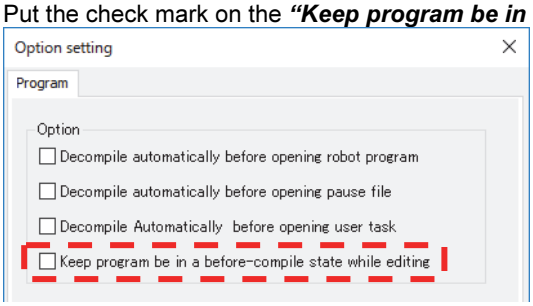


3 **The compile process is completed with an error.**
>> The following screen will be displayed.



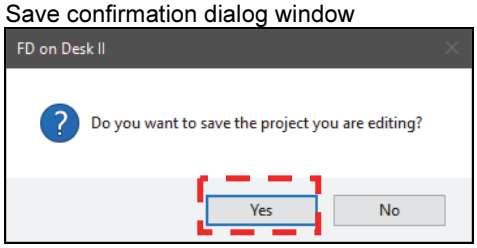
4 In the following option items, if ***"Keep program be in a before-compile state while editing"*** is checked, the program compile confirmatin dialog window will appear after the program save confirmation dialog window when trying to close the program under editing operation without saving it before compile operation.

Put the check mark on the ***"Keep program be in a before-compile state while editing"***

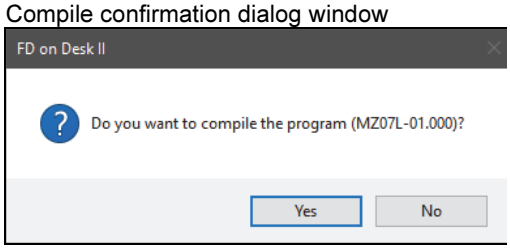


If "Yes" is clicked in the program save confirmation dialog window, the compile confirmation dialog will appear.

Save confirmation dialog window



Compile confirmation dialog window



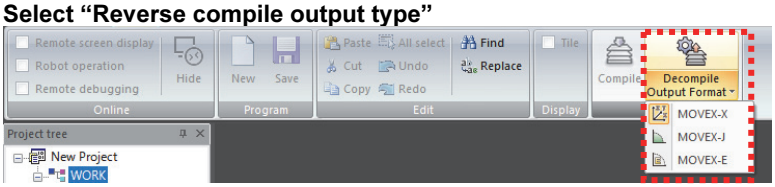
Reverse compile a program

In the FDonDesk2, it is possible to execute a Reverse compile for a program.
See the manual of *"Robot language", "Chapter 4 Compiling programs", "4.2 Reverse compiling"* also.

IMPORTANT

In case of a MOVEX command of encoder value format (a MOVEX recorded using the [REC] key) can be converted to the designated output style when performing the reverse compile.
If the reverse compile is executed for the MOVEX recorded in the joint angle or the machine coordinates (rectangular coordinates), or the program that compile was executed once in the past, the reverse compile will be executed with the format that was used when the MOVEX was recorded in spite of the designated output format.

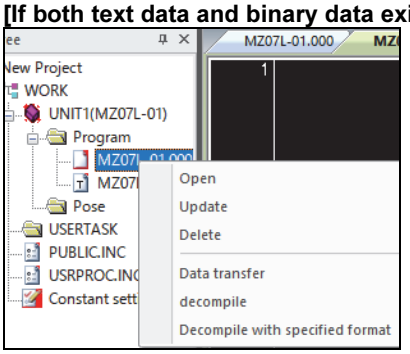
1 **Select "Reverse compile output type"**

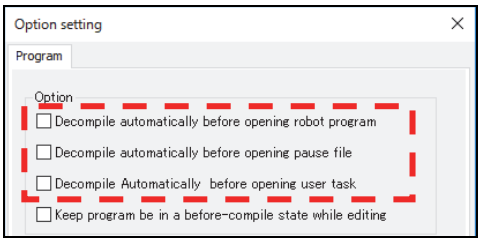


The expression method of each output format is listed as below.

Output format	Expression of the posture
MOVEX-X	TCP coordinates and angle (X, Y, Z, roll, pitch, yaw)
MOVEX-J	Joint angles (positions) (J1,J2, … , J6)
MOVEX-E	Encoder values (E1,E2, … , E6)

2 **[If both text data and binary data exist]**



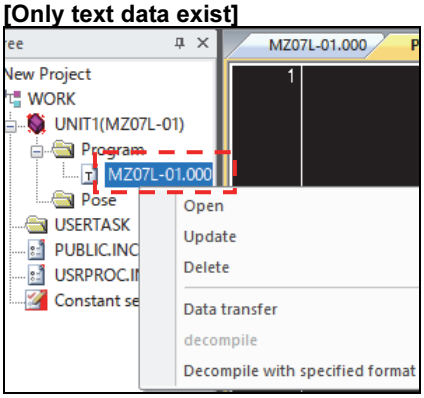


By the following optional settings, it can be selected whether the reverse compiled is executed automatically or not when displaying the text.

[In case of check OFF]
When displaying the text, automatic reverse compile will not be executed.
If the project tree is updated after editing the same program using the VirtualFD, the displayed contents of the text keep the contents before editing the binary data.
In this case, because the automatic reverse-compile is not executed, please execute the [Reverse compile] in the right-click menu to perform the reverse compile.

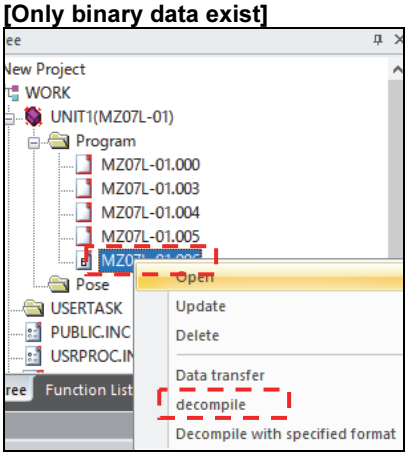
[In case of check ON]
When displaying the text, automatic reverse compile will be executed.
If the project tree is updated after editing the same program using the VirtualFD, the displayed contents are the same with the contents of the edited binary data.

3 **[Only text data exist]**



Because there is no binary data, the “decompile” is not executed.

4 **[Only binary data exist]**

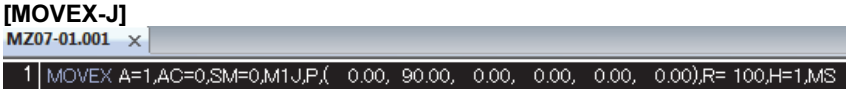


Despite the option setting, the “decompile” is automatically executed with the designated output format.

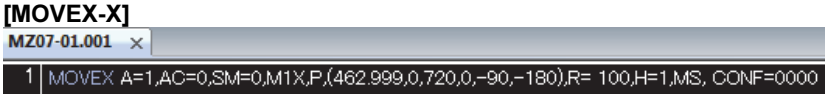
5 **In case of MOVEX that is recorded with the [REC] key (= Encoder value format MOVEX), The data is displayed in the editor by following the “Output format of the reverse -compile)”**

[MOVEX-E]

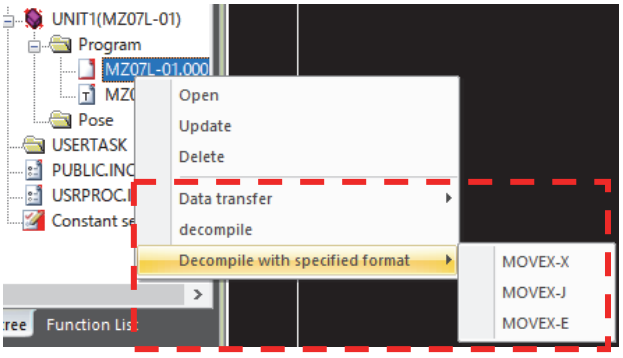
[MOVEX-J]



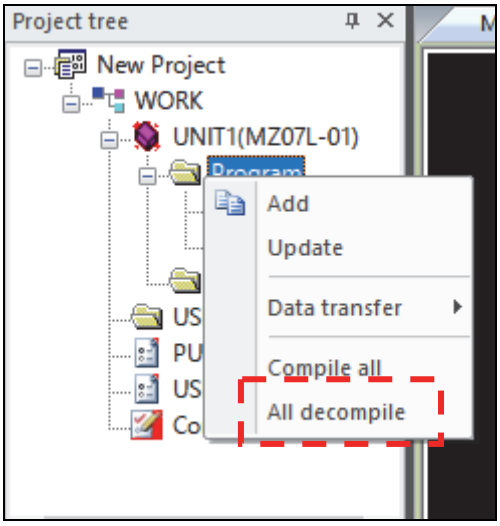
[MOVEX-X]



6 **[Reverse compile with format]**
It is possible to execute the reverse-compile by selecting the “Reverse-compile with format” from the right-click menu.



7 **[Reverse compile all]**
It is possible to reverse-compile the all programs in the designated folder



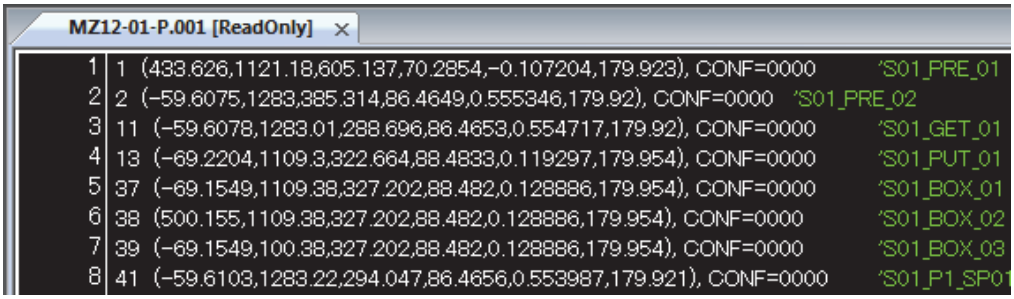
Display posture file (pose file)

For details of the posture file (pose file), please refer to the instruction manual “Robot language”.
In FDonDeskII, it is possible to display the posture file with the text format (Read Only).

POINT

When editing pose file, it is available on robot controller.
It is possible to edit pose file by utilizing the remote operation of FDonDeskII. (Please refer to the section of remote operation.)

1 When opening a posture file, “ReadOnly” is displayed in the tab.

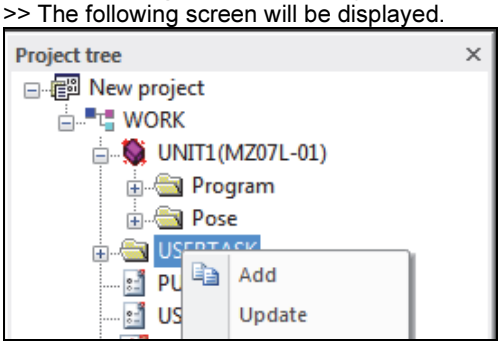


1.4.7 Editing a user task program

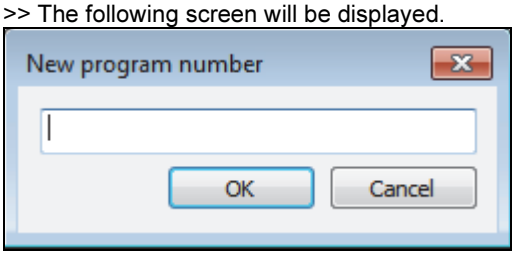
For details on user tasks, refer to the section of user tasks in the FD controller instruction manual.

Create a new user task program.

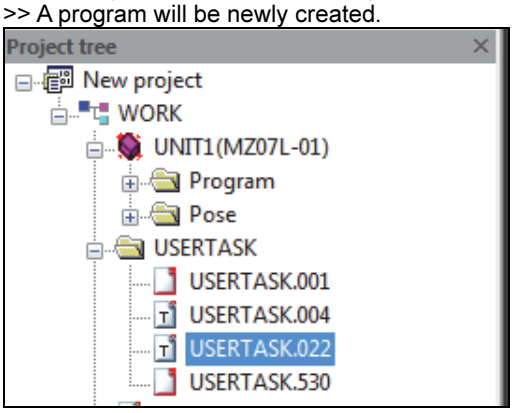
1 **Select Docking panel, then Project tree, and right-click the mouse on "USERTASK".**
>> The following screen will be displayed.



2 **Click "Add".**
>> The following screen will be displayed.

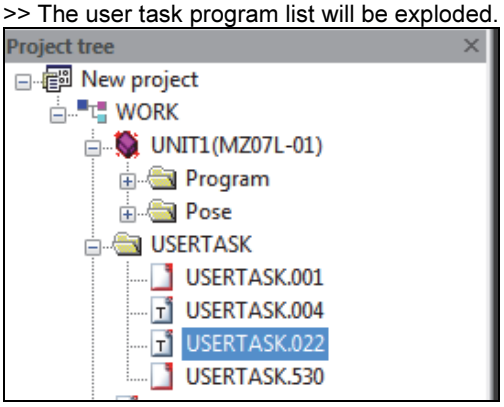


3 **Set a program number for a program to be newly created and press [OK].**
>> A program will be newly created.

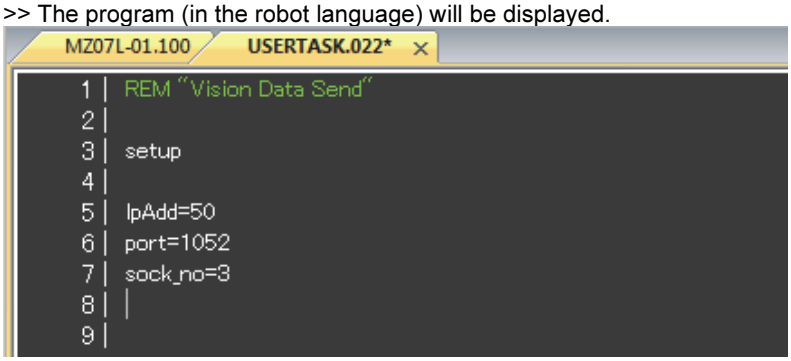


Select a user task program.

1 **Select Docking panel, then Project tree, and click "USERTASK".**
>> The user task program list will be exploded.



2 **Click the user task program you want to edit.**
>> The program (in the robot language) will be displayed.



POINT

If there is no robot language file for the program, the program is automatically compiled to create a robot language file.

Edit a user task program.

Refer to "Edit a program." in 1.4.6 Editing a program.

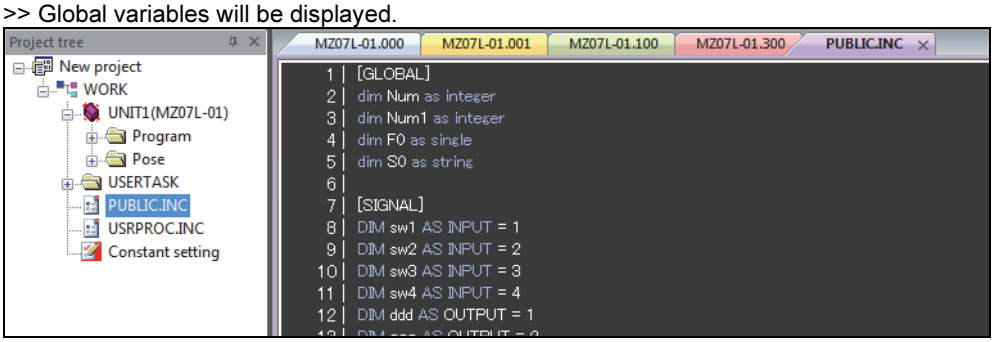
Compile a user task program.

Refer to "Compile a program." in 1.4.6 Editing a program.

1.4.8 Editing a global variable (PUBLIC.INC)

Select a global variable.

1 **Select Docking panel, then Project Tree, and click "PUBLIC.INC".**
>> Global variables will be displayed.

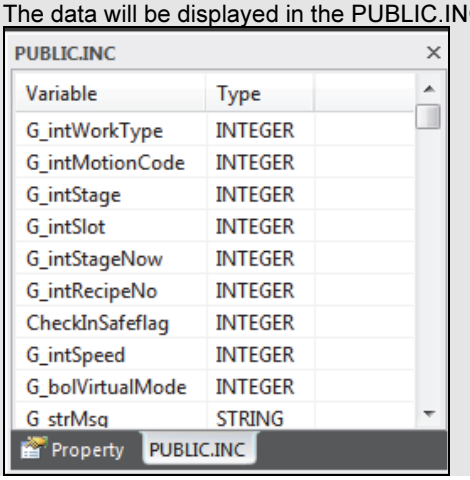


Edit a global variable.

Refer to "Editing a program" in 1.4.6 Editing a program.

The data will be displayed in the PUBLIC.INC docking panel window.

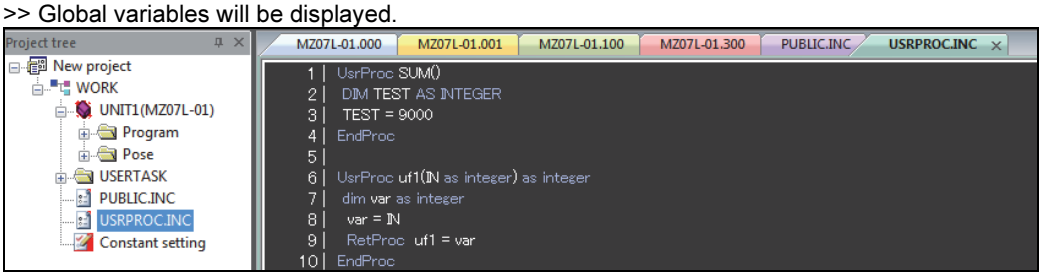
POINT



1.4.9 Editing a global function (USRPROC.INC)

Select a global function.

1 **Select Docking Panel, then Project Tree, and click "USRPROC.INC".**
>> Global variables will be displayed.

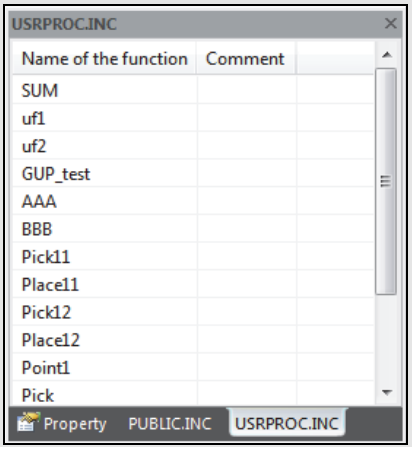


Edit a global function.

Refer to "Editing a program" in 1.4.6 Editing a program.

POINT

By recording "@(a comment)" using a comment in a global function, it can be displayed as a comment in the USRPROC.INC docking panel window.



Compile a global function.

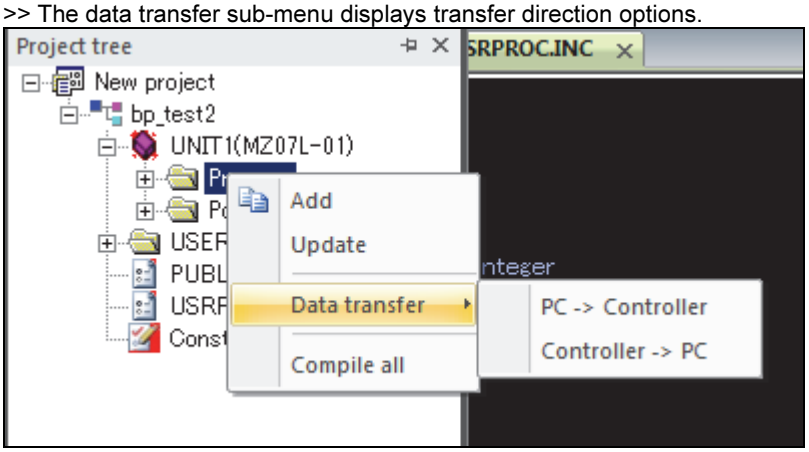
Refer to "Compile a program." in 1.4.6 Editing a program.

1.4.10 Transferring data

This section explains data transfer.

Transfer data to the controller.

1 **Select Docking panel, then Project tree, and right-click the mouse on the desired item.**
>> The data transfer sub-menu displays transfer direction options.



PC -> Controller ... Transfer data from PC to the controller.
Controller -> PC ... Transfer data from the controller to PC.

>> The following table lists up transfer targets according to the selected item.

Item	Transfer target
Controller	All programs, posture files, user tasks, PUBLIC.INC with its related files, and USRPROC.INC with its related files
Unit	All programs and posture files for the selected unit
Program list	All programs for the selected unit
Posture list	All posture files for the selected unit
User task list	All user tasks
Individual program	Selected program
Individual posture file	Selected posture file
Individual user task	Selected user task
PUBLIC.INC	PUBLIC.INC with its related binary files
USRPROC.INC	USRPROC.INC with its related binary files

Depending on the transferring direction (PC to controller / controller to PC), the item that can be transferred will differ.

Item	Controller to PC	PC to controller
Controller	○	—
Unit	○	—
Program list	○	○
Posture list	○	—
User task list	○	○
Individual program	○	○
Individual posture file	○	—
Individual user task	○	○
PUBLIC.INC	○	○
USRPROC.INC	○	○

○ : Possible / —: Not possible

POINT

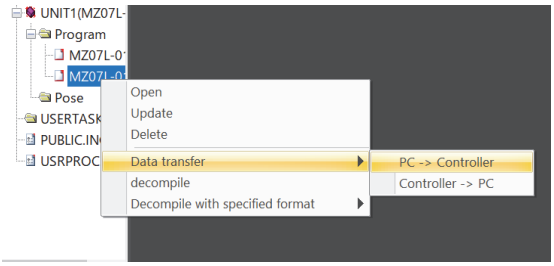
To execute data transfer from the controller to PC for an individual program, posture file, or user task, the target file also needs to exist on the FD on Desk II side.

To display the confirmation message of file transfer

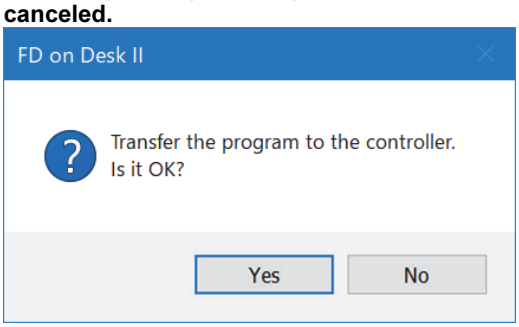
FD on Desk II can display the confirmation message of file transfer in order to avoid the mis-operation.

Following procedure shows how to display the confirmation message when uploading the file only. When uploading the file only, confirmation message comes depending on the existence of binary file. This is same for robot program, pose program and user task program.

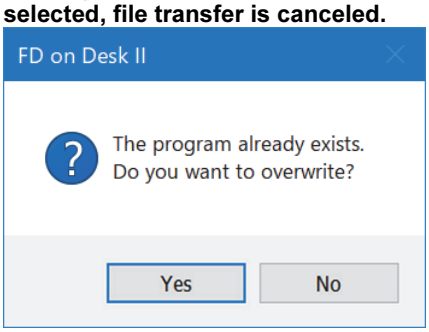
1 **Select the program, and right click on “File transfer” → “PC → Controller”.**



2 **Following dialog message appears. Select “YES”. If “NO” is selected, file transfer is canceled.**

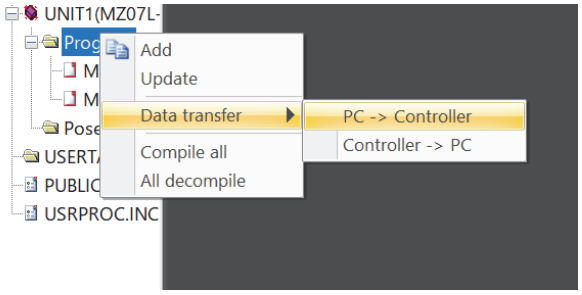


3 **If same file (program number) exists on both FDonDeskII and robot controller, following message appears. If select “YES”, program file is transferred and overwritten. If “NO” is selected, file transfer is canceled.**

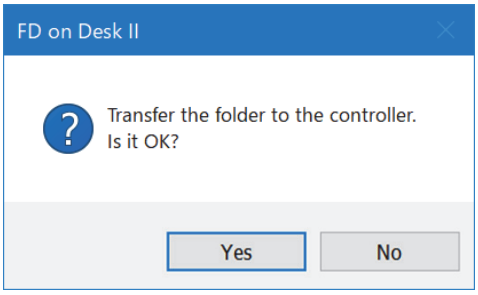


Following procedure shows how to display the confirmation message when uploading the program folder.

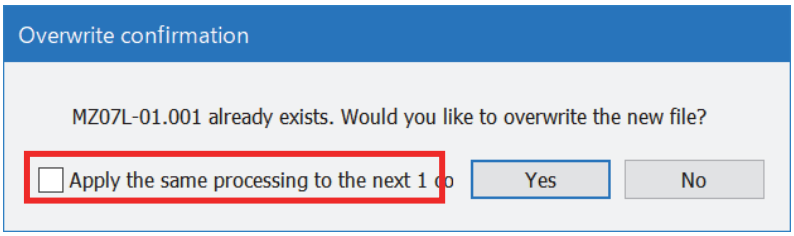
1 **Select the program folder, and right click on “File transfer” → “PC → Controller”.**



2 **Following dialog message appears. Select “YES”. If “NO” is selected, file transfer is canceled.**

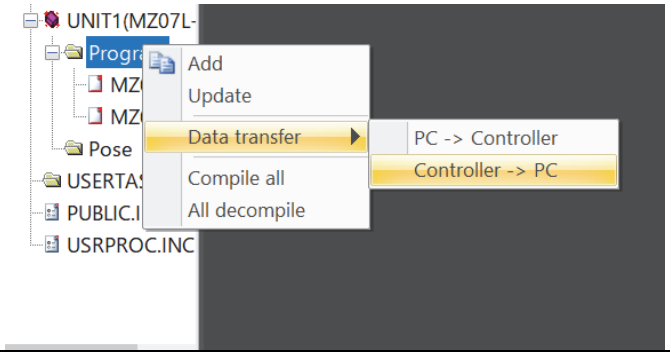


3 **If same file (program number) exists on both FDonDeskII and robot controller, following message appears.**
If select “YES”, program file is transferred and overwritten. If “NO” is selected, file transfer is canceled.
If two or more same program exists, 「Apply the same processing to the next 1」(indicated red frame) appears. If same answer for rest programs, please check the box. Dialog will never appear again. If file transfer needs to be confirmed one by one, do not check the box.

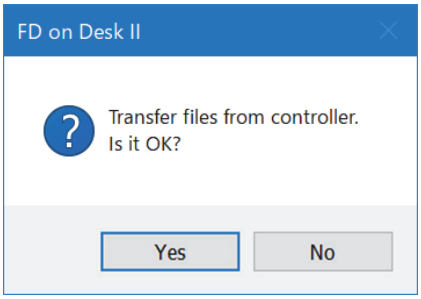


Following procedure shows how to display the confirmation message when downloading the program file or program folder. Confirmation message is displayed for each ascii file and binary file. This is same for robot program, pose program and user task program.

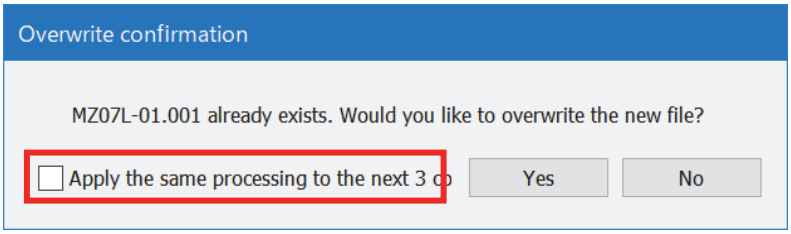
1 **Select the program file or program folder, and right click on "File transfer" → "Controller → PC".**



2 **Following dialog message appears. Select "YES". If "NO" is selected, file transfer is canceled.**

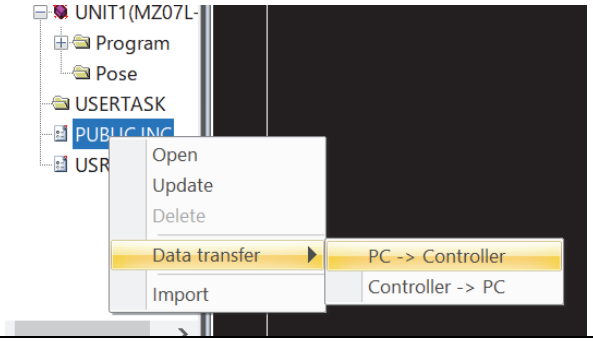


3 **If same file (program number) exists on both FDonDeskII and robot controller, following message appears.**
If select "YES", program file is transferred to FDonDeskII and overwritten.
If "NO" is selected, file transfer is canceled.
If two or more same program exists, 「Apply the same processing to the next 1」(indicated red frame) appears.
If same answer for rest programs, please check the box. Dialog will never appear again.
This dialog appears for each ascii file and binary file.
If file transfer needs to be confirmed one by one, do not check the box.

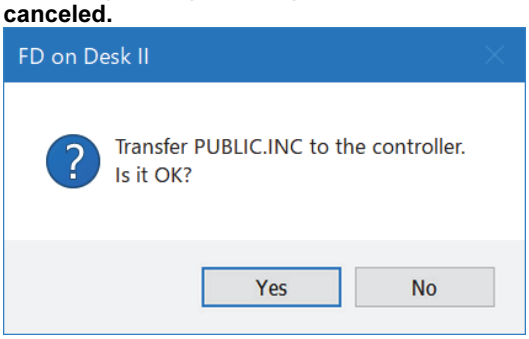


Following procedure shows how to display the confirmation message when uploading PUBLIC.INC.
Confirmation message is displayed when PUBLIC.INC. exists on robot controller.

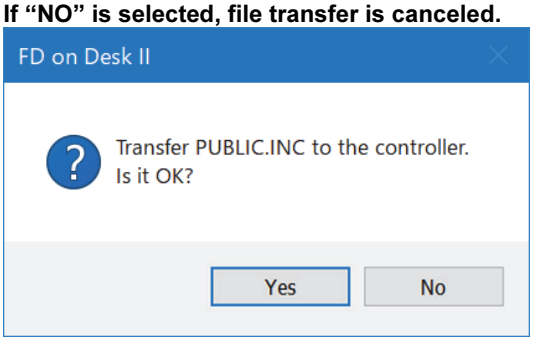
1 **Select PUBLIC.INC, and right click on “File transfer” → “PC → Controller”.**



2 **Following dialog message appears. Select “YES”. If “NO” is selected, file transfer is canceled.**

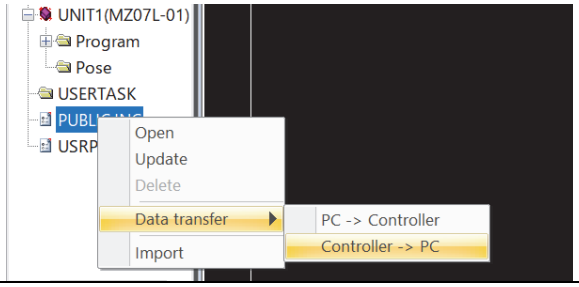


3 **If PUBLIC.INC exists on robot controller, following message appears.**
If select “YES”, PUBLIC.INC is transferred to robot controller and overwritten.
If “NO” is selected, file transfer is canceled.

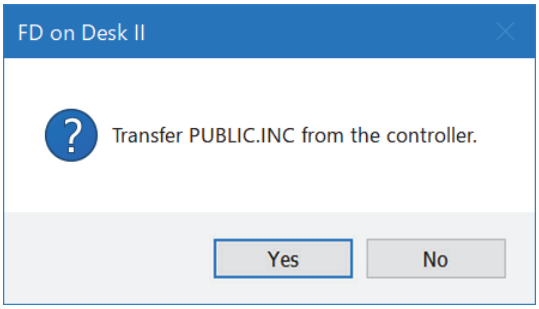


Following procedure shows how to display the confirmation message when downloading PUBLIC.INC.
Confirmation message is displayed when PUBLIC.INC. exists on FDonDeskII.

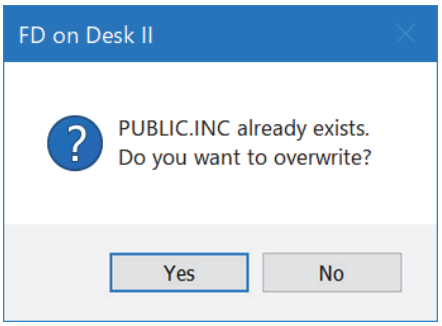
1 **Select PUBLIC.INC, and right click on “File transfer” → “Controller → PC”.**



2 **Following dialog message appears. Select “YES”. If “NO” is selected, file transfer is canceled.**

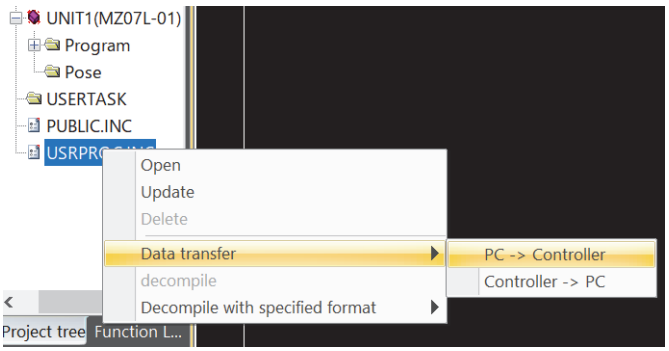


3 **If PUBLIC.INC exists on FDonDeskII, following message appears.**
If select “YES”, PUBLIC.INC is transferred to FDonDeskII and overwritten.
If “NO” is selected, file transfer is canceled.

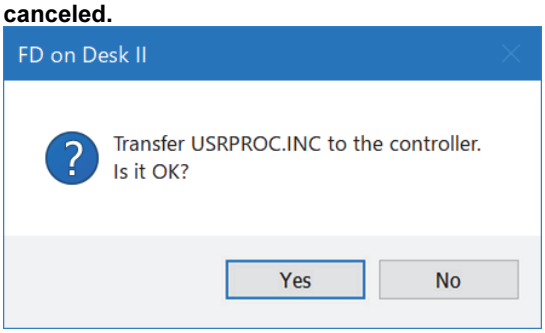


Following procedure shows how to display the confirmation message when uploading USRPROC.INC.
Confirmation message is displayed when USRPROC.INC exists on robot controller.

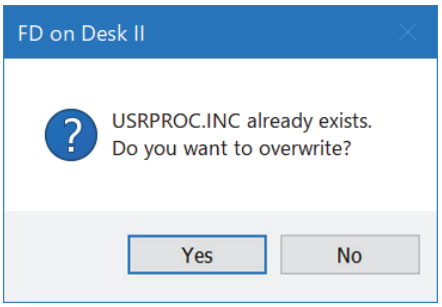
1 **Select USRPROC.INC, and right click on “File transfer” → “PC → Controller”.**



2 **Following dialog message appears. Select “YES”. If “NO” is selected, file transfer is canceled.**

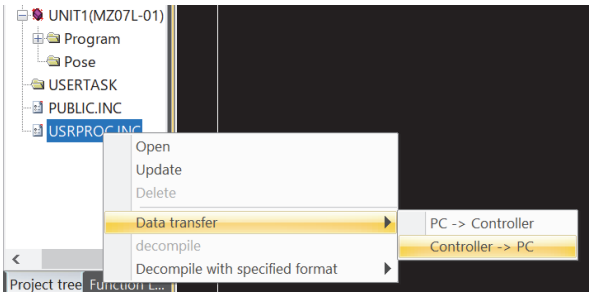


3 **If USRPROC.INC exists on robot controller, following message appears.**
If select “YES”, USRPROC.INC is transferred to robot controller and overwritten.
If “NO” is selected, file transfer is canceled.

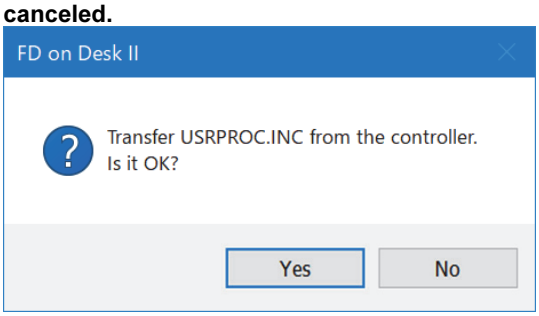


Following procedure shows how to display the confirmation message when downloading USRPROC.INC.
Confirmation message is displayed when USRPROC.INC exists on FDonDeskII.

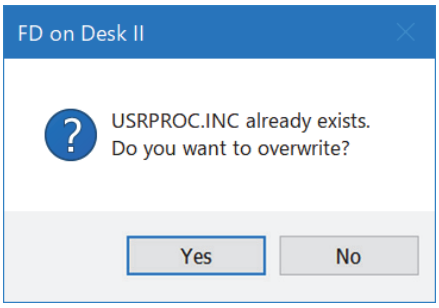
1 **Select USRPROC.INC, and right click on “File transfer” → “Controller → PC”.**



2 **Following dialog message appears. Select “YES”. If “NO” is selected, file transfer is canceled.**



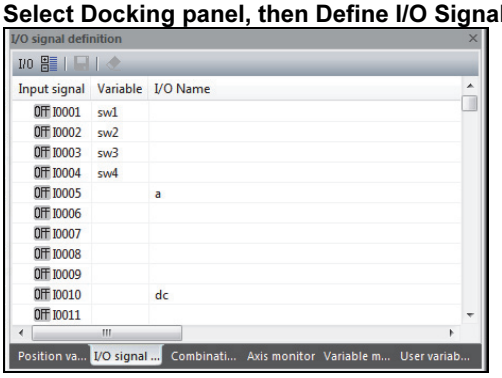
3 **If USRPROC.INC exists on FDonDeskII, following message appears.**
If select “YES”, USRPROC.INC is transferred to FDonDeskII and overwritten.
If “NO” is selected, file transfer is canceled.



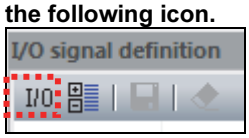
1.4.11 Defining I/O signals

This section explains how to define I/O signals.

1 **Select Docking panel, then Define I/O Signal.**



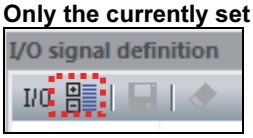
2 **You can switch to the input signal display mode or output signal display mode by clicking the following icon.**



POINT

The display mode changes each time the icon is clicked.

3 **Only the currently set signals can be displayed.**

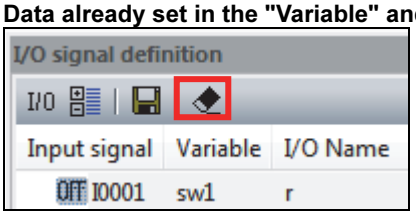


POINT

The display mode changes each time the icon is clicked.

4 **Click the "Variable" or "I/O Name" column for the signal to be defined and set data.**

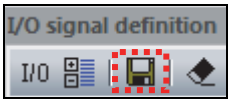
5 **Data already set in the "Variable" and "I/O Name" columns can be cleared easily.**



POINT

Entries can be selected together by holding down the Shift key, and entries can be selected individually by pressing the Ctrl key as needed.

6 **Click "Save".**



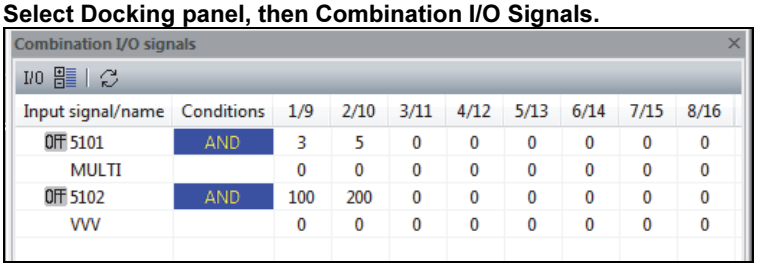
POINT

Data defined in "Variable" is registered as a global variable (PUBLIC.INC), and data defined in "I/O Name" is registered as a constant.
The data will be displayed in the PUBLIC.INC docking panel window.

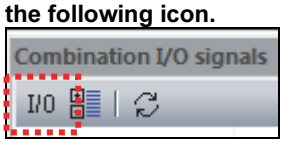
1.4.12 Monitoring multiple I/O signals

This section explains how to monitor multiple I/O signals.

1 **Select Docking panel, then Combination I/O Signals.**



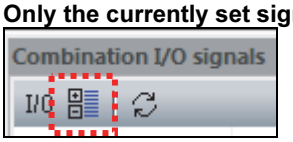
2 **You can switch to the input signal display mode or output signal display mode by clicking the following icon.**



POINT

The display mode changes each time the icon is clicked.

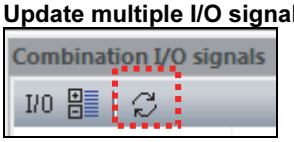
3 **Only the currently set signals can be displayed.**



POINT

The display mode changes each time the icon is clicked.

4 **Update multiple I/O signals.**

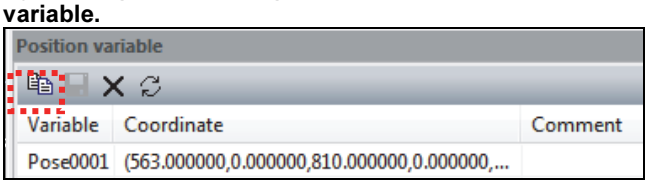


1.4.13 Defining a position variable

This section explains how to define a position variable.

1 **Select Docking panel, then Position variable.**

2 **By clicking the following icon, the coordinates of the robot will be recorded as a position variable.**

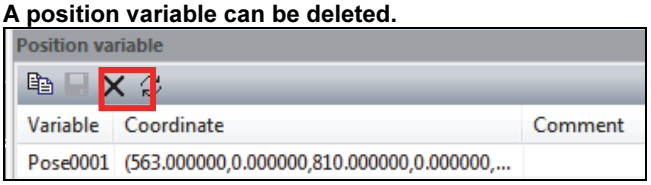


POINT

An empty number "Pose****" is assigned (in ascending order) to a variable to be automatically recorded.

The following coordinate values will be recorded.
- Online connection: Position of the robot connected to the controller
- Not online connection: Position of the virtual ROBOT

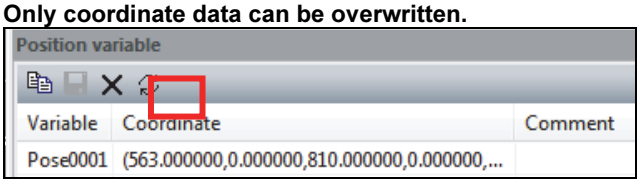
3 **A position variable can be deleted.**



POINT

Entries can be selected together by holding down the Shift key, and entries can be selected on an individual basis by pressing the Ctrl key as needed.

4 **Only coordinate data can be overwritten.**

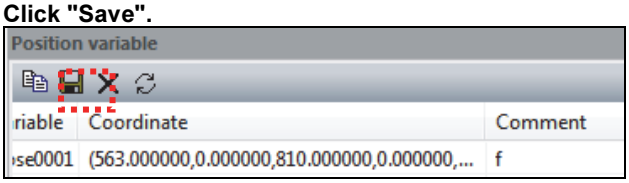


POINT

Entries can be selected together by holding down the Shift key, and entries can be selected on an individual basis by pressing the Ctrl key as needed.

5 **Click the "Variable", "Coordinate", or "Comment" column to set/modify the target data.**

6 **Click "Save".**



POINT

The data will be registered as a global variable (PUBLIC.INC).
The data will be displayed in the PUBLIC.INC docking panel window.

POINT

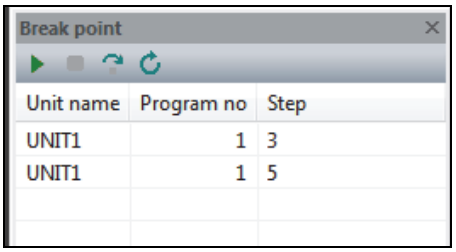
Whether to retain the initial value for a global arbitrary variable is determined according to the following virtual FD setting.
Constant setting => Operation and teaching conditions => Operation conditions => "46 Timing of global arbitrary variable initialization" (variable creation/powering-on)

1.4.14 Using the debugging function

This section explains the debugging function.

Set a break point.

1 Select Docking panel, then Break point.

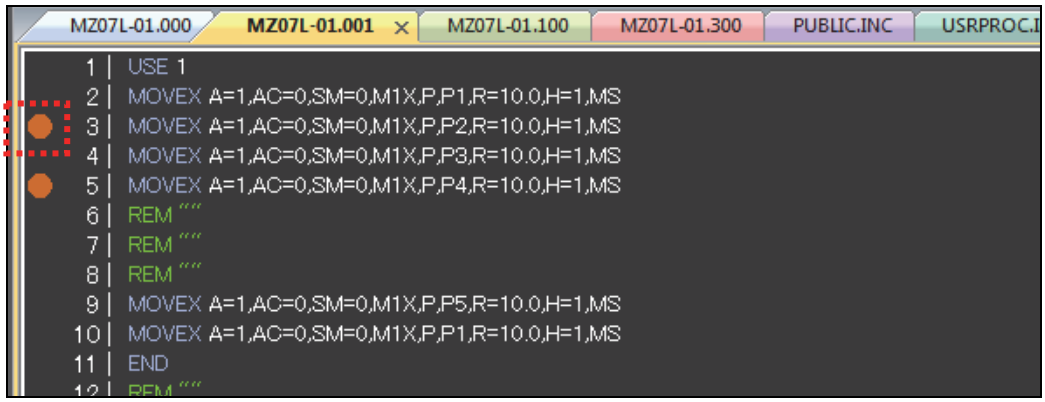


2 From the project tree, select the program or user task to be debugged.

POINT

The debugging function can be used for a program or user task.

3 Double-click the mouse or use the F9 key at the left of the line number of the line where the program is to stop, and set a break point.



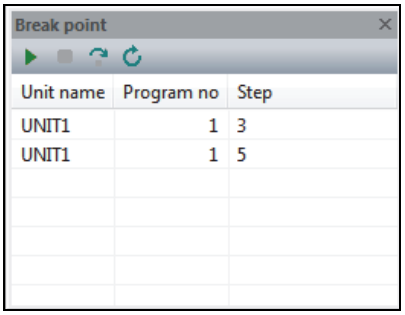
POINT

A break point cannot be set for both a program and user task at the same time.

POINT

A maximum of 10 break points can be set in one file.

4 **Data is displayed in the break point list.**

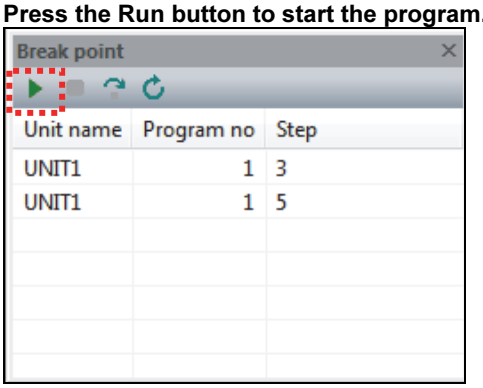


POINT

A break point can be deleted with the DELETE key by selecting a line.

Run or stop a program.

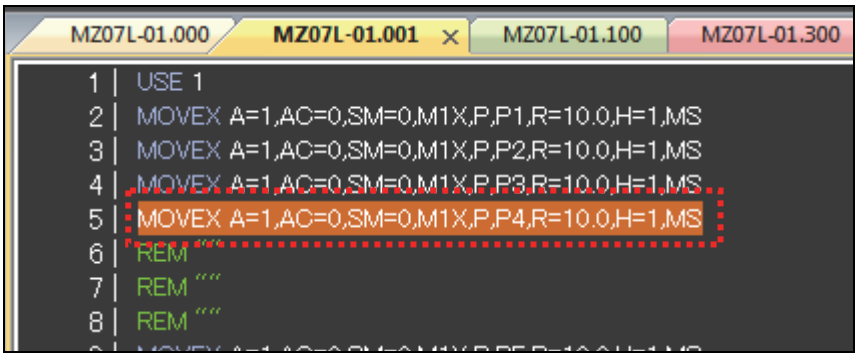
1 **Press the Run button to start the program.**



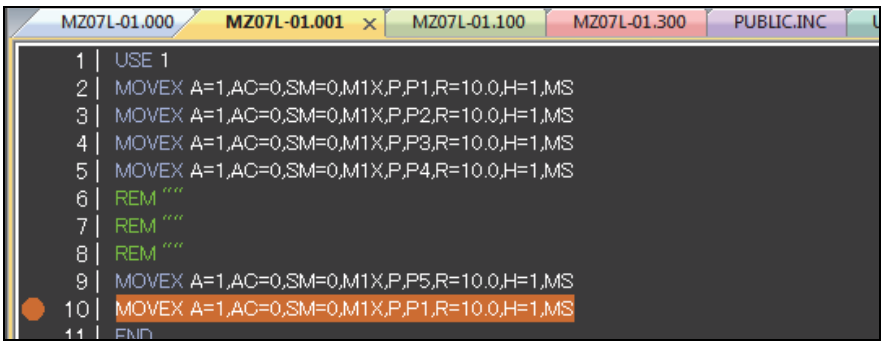
POINT

The motors are automatically turned on from the robot operation panel, and the mode is switched to the playback mode.

2 **The currently running line is displayed in the program editor screen.**



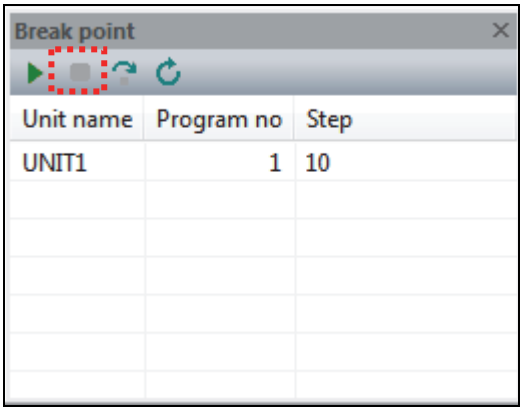
3 **The program stops at a break point.**



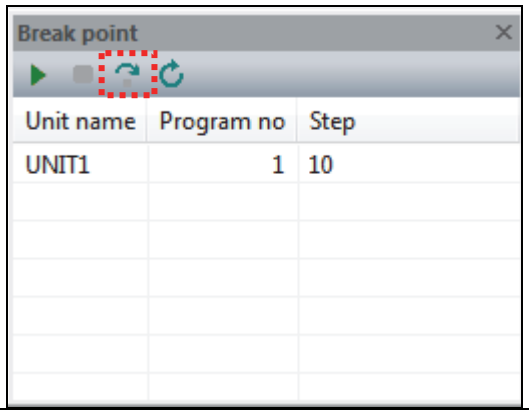
POINT

At a line of code with a break point, the program stops before its execution.

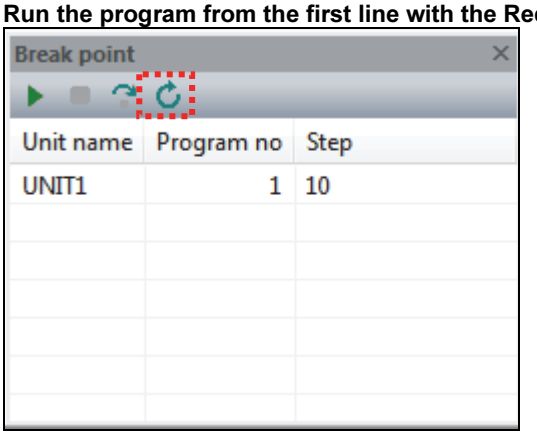
5 **Stop the program with the Stop button.**



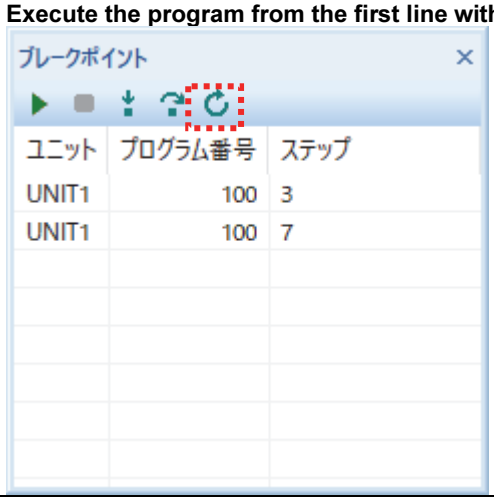
6 **Run the current line of code one step with the Run Step button.**



7 **Run the program from the first line with the Redo button.**



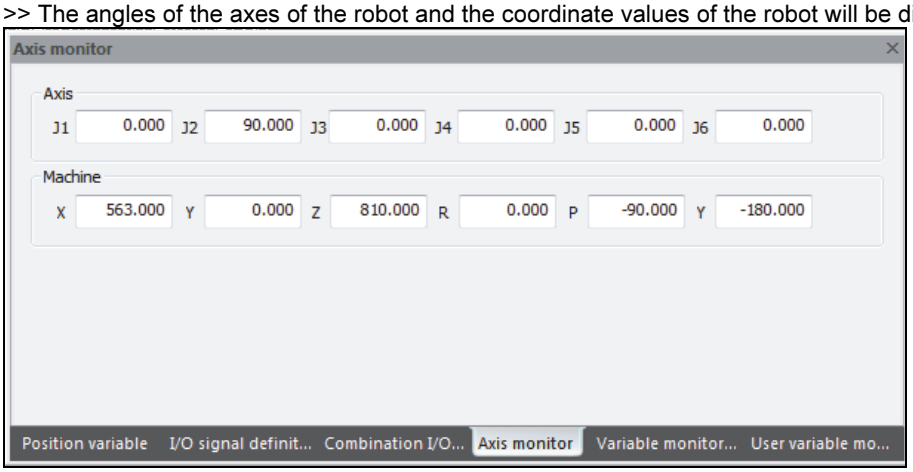
8 **Execute the program from the first line with the redo button.**



1.4.15 Axis data monitor

This section explains the axis data monitor.

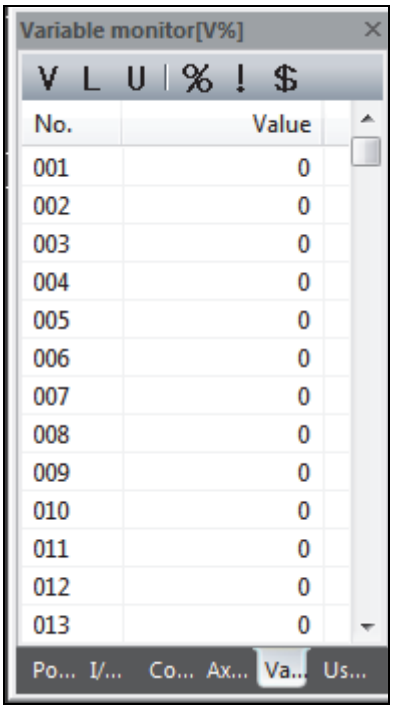
1 **Select Docking panel, then Axis monitor.**
>> The angles of the axes of the robot and the coordinate values of the robot will be displayed.



1.4.16 Variable monitor

This section explains the variable monitor.

1 **Select Docking panel, then Variable monitor.**
>> The global variable, local variable, and user task variable values will be displayed.



V : Global variable
L : Local variable
U : User task variable
Active user tasks are monitored in rotation, one task per each click, starting from user task 1.

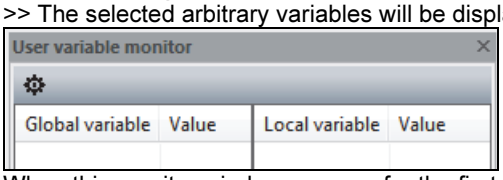
%: Integer variable
! : Real variable
$: String variable

1.4.17 Arbitrary variable monitor

This section explains the arbitrary variable monitor.

1 Select Docking panel, then User variable monitor.

>> The selected arbitrary variables will be displayed.



When this monitor window appears for the first time, nothing is displayed because no arbitrary variable is selected.

Setting

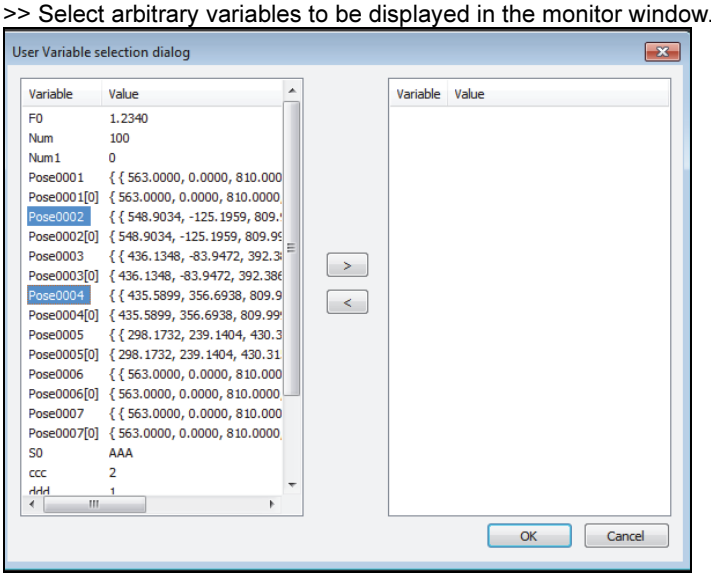
Display the dialog box for selecting arbitrary variables (global variables) to be displayed.

POINT

The values for arbitrary variables will be updated automatically.

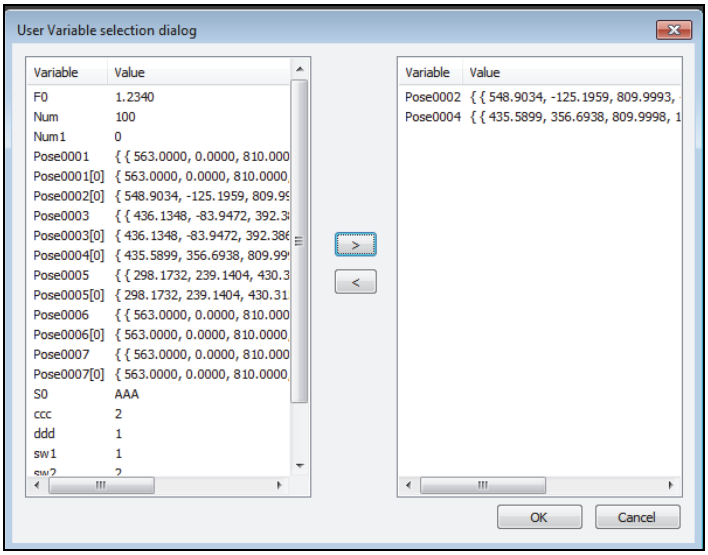
2 User Variable selection dialog box

>> Select arbitrary variables to be displayed in the monitor window.



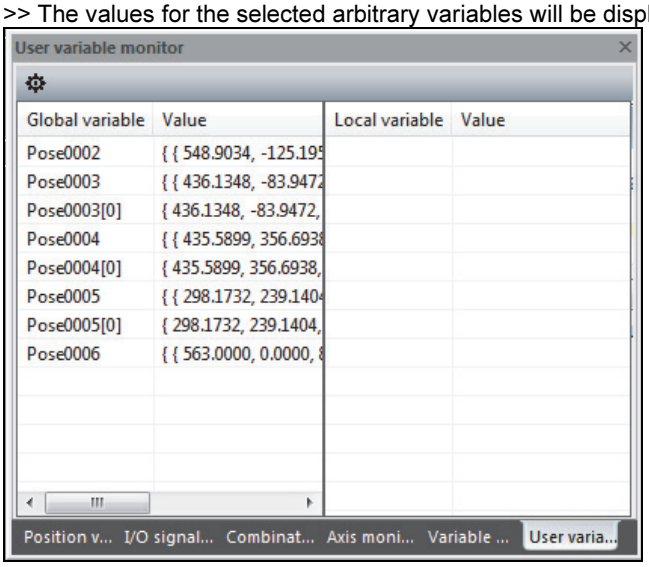
Add button: Add the item selected in the list on the left to the list on the right.

Delete button: Delete the item selected in the list on the right.



3 **User variable monitor**

>> The values for the selected arbitrary variables will be displayed.



POINT

A local variable is created in the declaration line and initialized when the program reaches END.

The values for the variables are updated when the robot stops, and they are not updated while the robot is in operation.

1.4.18 Online

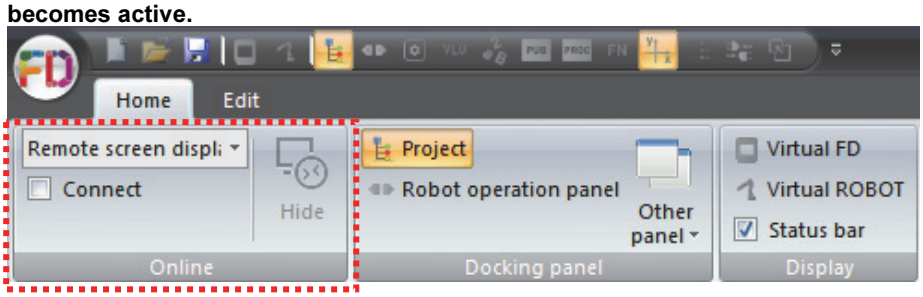
This section explains the online function for connection to the controller.

POINT

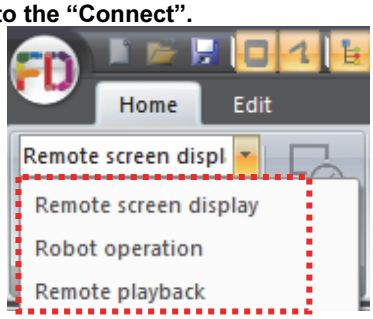
You cannot connect without changing the version to 4.37 or later.

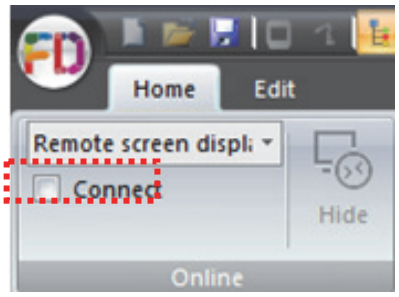
Common operation

If it is possible to connect the controller and the PC, the area surrounded by the red line becomes active.

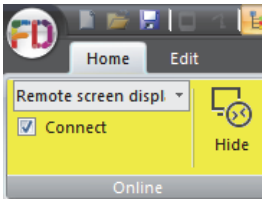


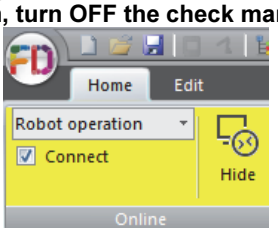
Select the connection method from the pull-down menu and then turn ON the check mark to the "Connect".

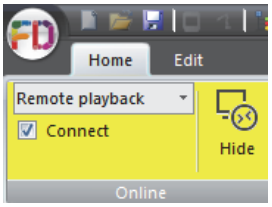




If the connection is successfully established, the following part is displayed in yellow. To finish the online connection, turn OFF the check mark.





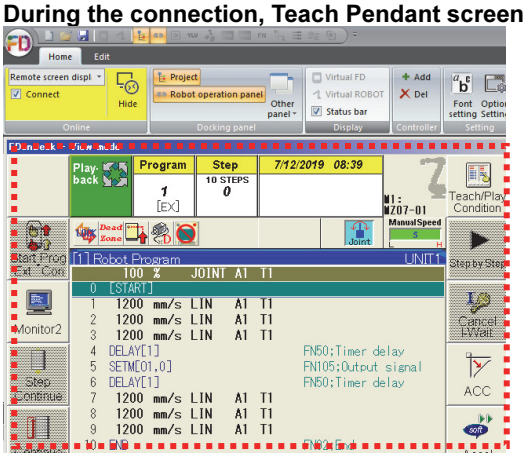


CAUTION

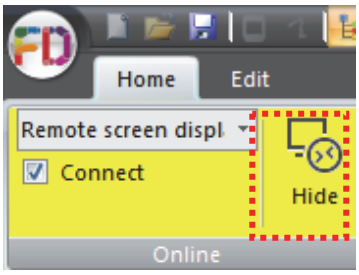
When the other connection method is selected with the connection is already established, the connection is automatically disconnected.

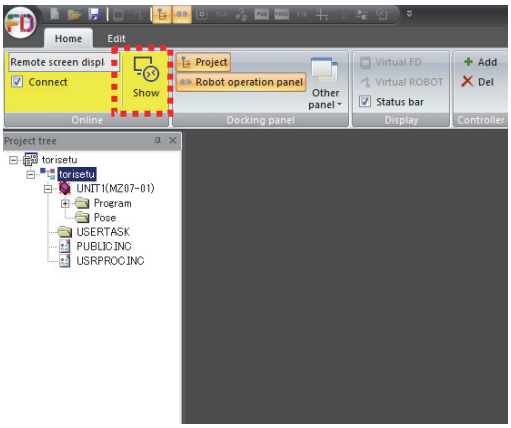
POINT

During the connection, Teach Pendant screen is displayed in the Virtual FD window



During the connection, the Virtual FD window is brought to the front.
By clicking the “Hide”, the Virtual FD window can be turned OFF.

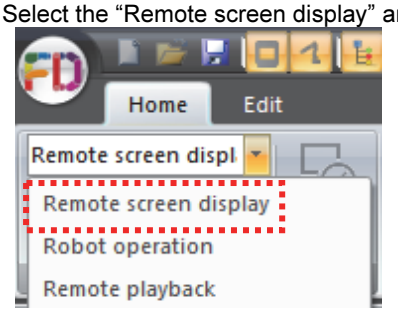


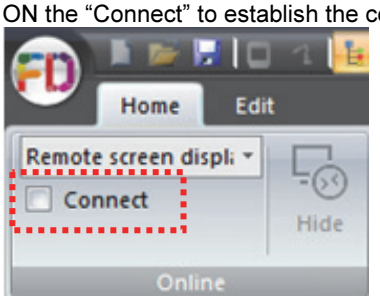


Remote screen display

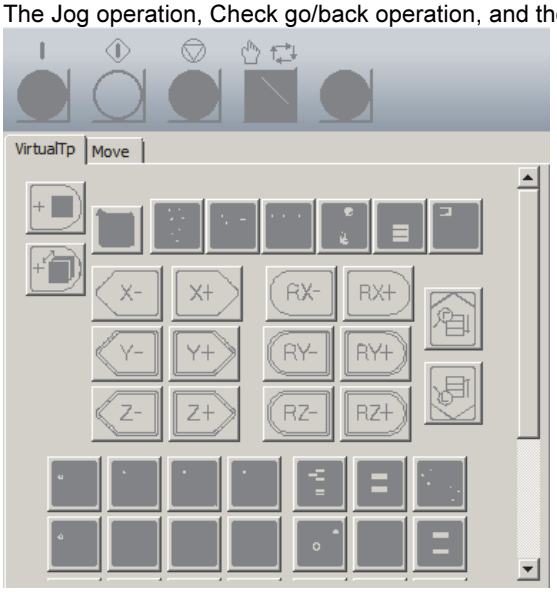
The screen of the Teach Pendant is displayed on the PC. It is impossible to operate the robot. But it is possible to perform various setting.

Select the “Remote screen display” and then turn ON the “Connect” to establish the connection.

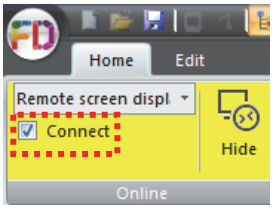




The “Robot operation panel” window is deactivated. (The window turns to Gray)
The Jog operation, Check go/back operation, and the Playback operation are not available.



Turn OFF the check mark of the “Connect” to terminate the online mode.



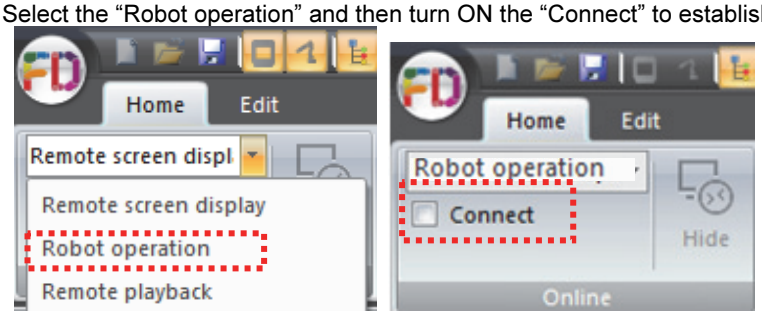
Remote operation

By using the “Robot operation panel”, the Jog operation, the Check go/back operation, and the Playback operation becomes available.

POINT

Select playback mode of FD/CFD controller.

1 Select the “Robot operation” and then turn ON the “Connect” to establish the connection.

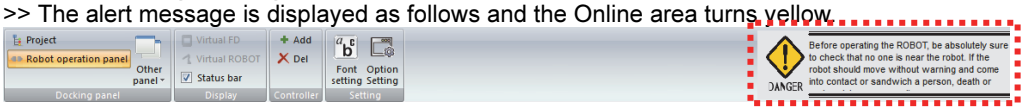


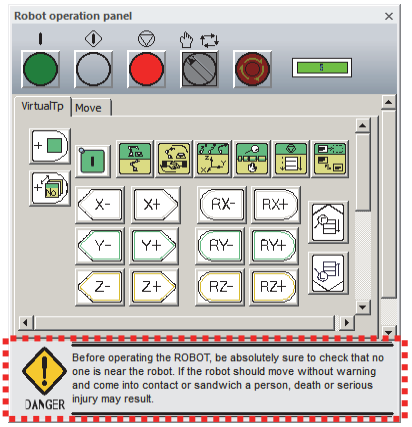
2 **Caution message**

>> The following screen will be displayed.

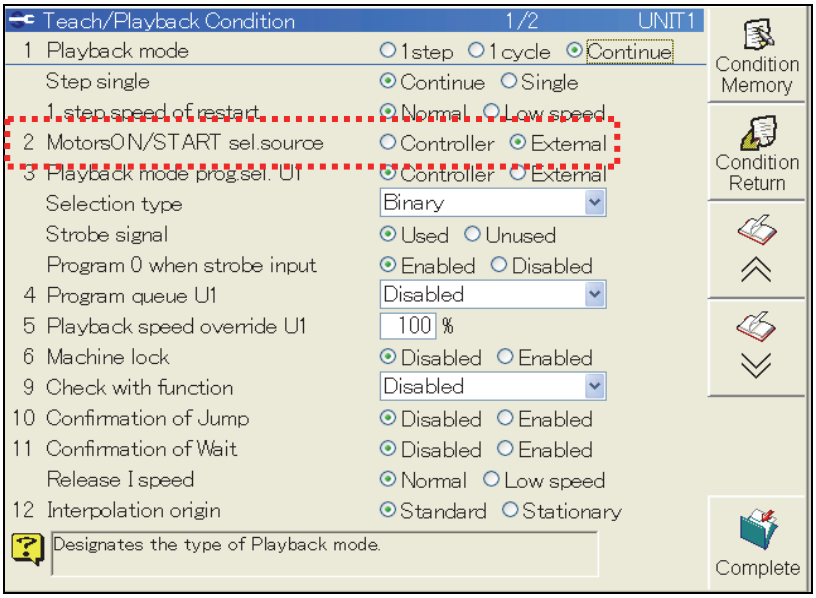
3 **Caution message during connection in robot-operation-permitted mode**

>> The alert message is displayed as follows and the Online area turns yellow.

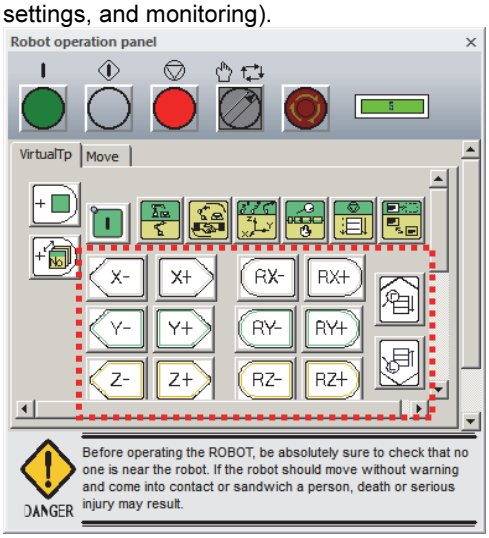




4 **Set the [Service Utilities] [Teach/Playback Condition] “2 MotorsON/START selection source” to “External”.**



5 **Using the “Robot operation panel”, turn ON the Motors.**
The FD/CFD controller can be remotely operated (axis operation, CHECK GO, configuration of settings, and monitoring).



For details on how to operate the robot operation panel, refer to 1.5.2 Robot operation panel.

Virtual TP tab's key layout is compatible with the key layout of the FD controller teach pendent.
For details on the functions of operation keys, see the instruction manual "BASIC OPERATIONS MANUAL" as well.

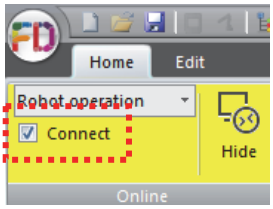
CAUTION

When operating the robot using the value input on "MOVE" tab, set the "Velocity override" to 10% to 30% before operating the robot.
Since robot speed depends on the "Velocity override", robot may move suddenly very fast if it was 100%.

CAUTION

When you move the robot, make sure there are no people around robot before moving it.
When turning the motor power on, please work outside the safety fence.

6 Turn OFF the check mark of the “Connect” to terminate the online mode.



Remote playback

It is possible to run (playback) the work-program of the robot.

POINT

Select playback mode of FD/CFD controller.
FD/CFD controller version needs to be 4.67 or later.

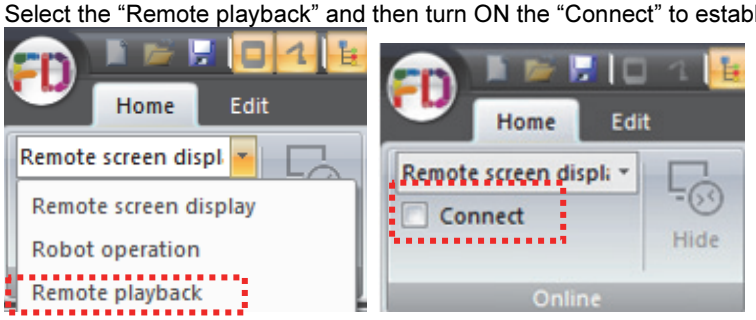
CAUTION

To terminate this type connection while the work-program is being played back, please be sure to turn OFF the check mark of the “Connect” in advance. Then disconnect the LAN cable.

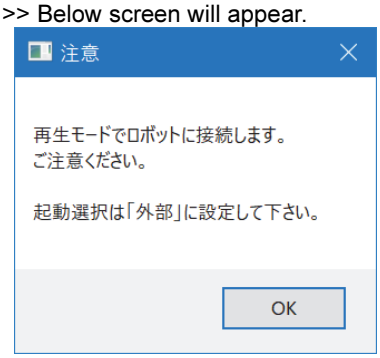
CAUTION

When you move the robot, make sure there are no people around robot before moving it.
When turning the motor power on, please work outside the safety fence.

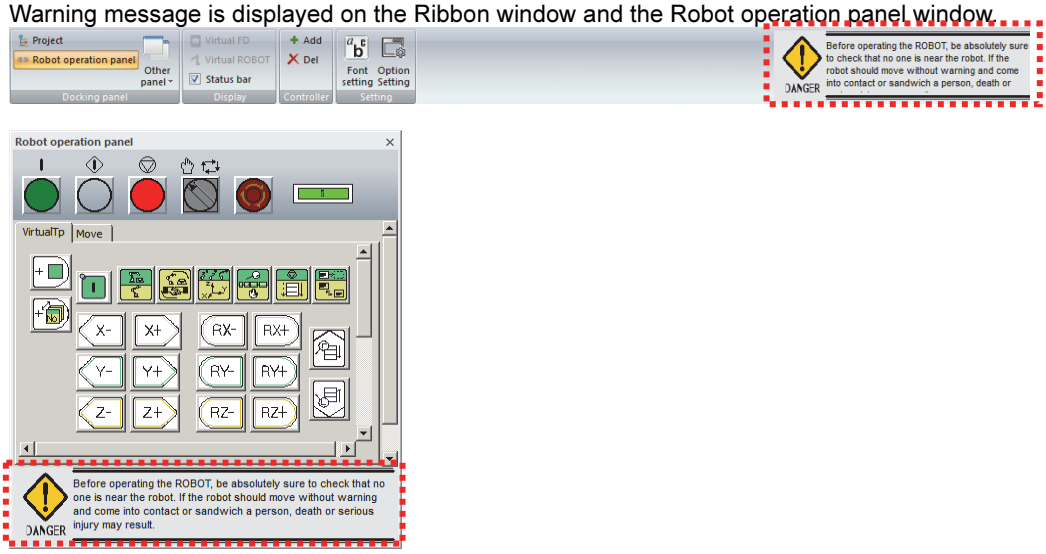
1 Select the “Remote playback” and then turn ON the “Connect” to establish the connection.



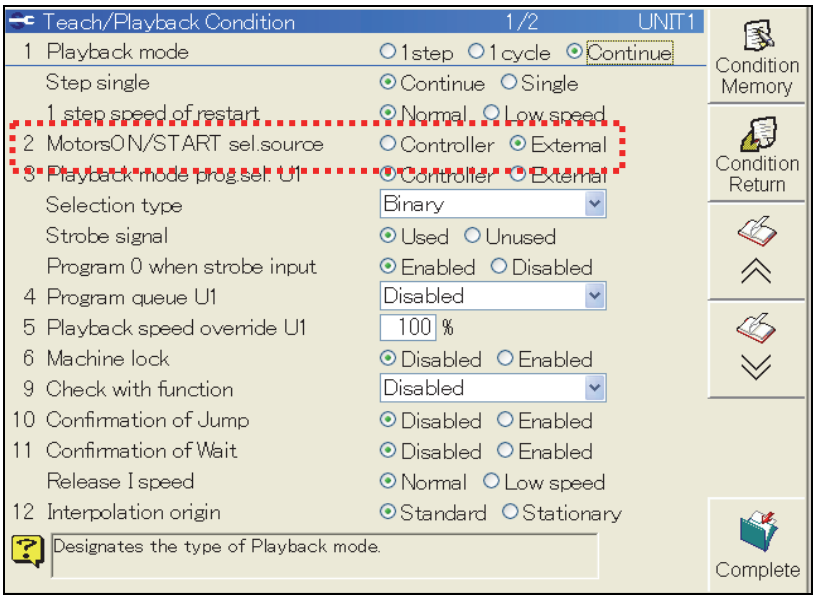
2 **Caution message**
>> Below screen will appear.



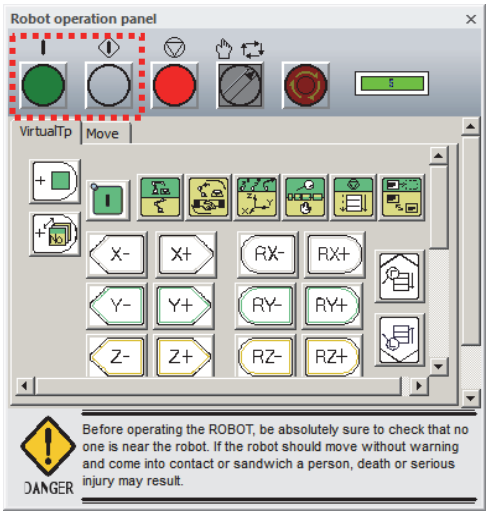
3 Warning message is displayed on the Ribbon window and the Robot operation panel window.



4 **Set the [Service Utilities] [Teach/Playback Condition] "2 MotorsON/START selection source" to "External".**



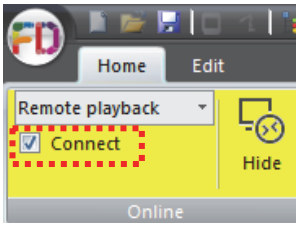
5 **Turn ON the Motors using the “Robot operation panel” window.**
Because the robot controller is in the “PLAYBACK” mode in this case, the controller immediately turns to SERVO ON mode.
It is possible to run (Playback) the work-program.
But, jog operation, check go/back operation are not available in this mode.



For details on how to operate the robot operation panel, refer to 1.5.2 Robot operation panel.

Virtual TP tab's key layout is compatible with the key layout of the FD controller teach pendent.
For details on the functions of operation keys, see the instruction manual "BASIC OPERATIONS MANUAL" as well.

6 Turn OFF the check mark of the “Connect” to terminate the online mode.



1.5 Virtual FD

1.5.1 Outline

Virtual FD shows exactly the same screen as in the Teach Pendant of FD/CFD Controller.
Virtual FD is operated using the mouse, keyboard, or "robot operation panel".
For details, refer to the following sections.

Operation using the robot operation panel:	"1.5.2 Robot operation panel"
Operation using the mouse:	"1.5.3 Mouse operation"
Operation with the keyboard:	"1.5.4 Keyboard operation"

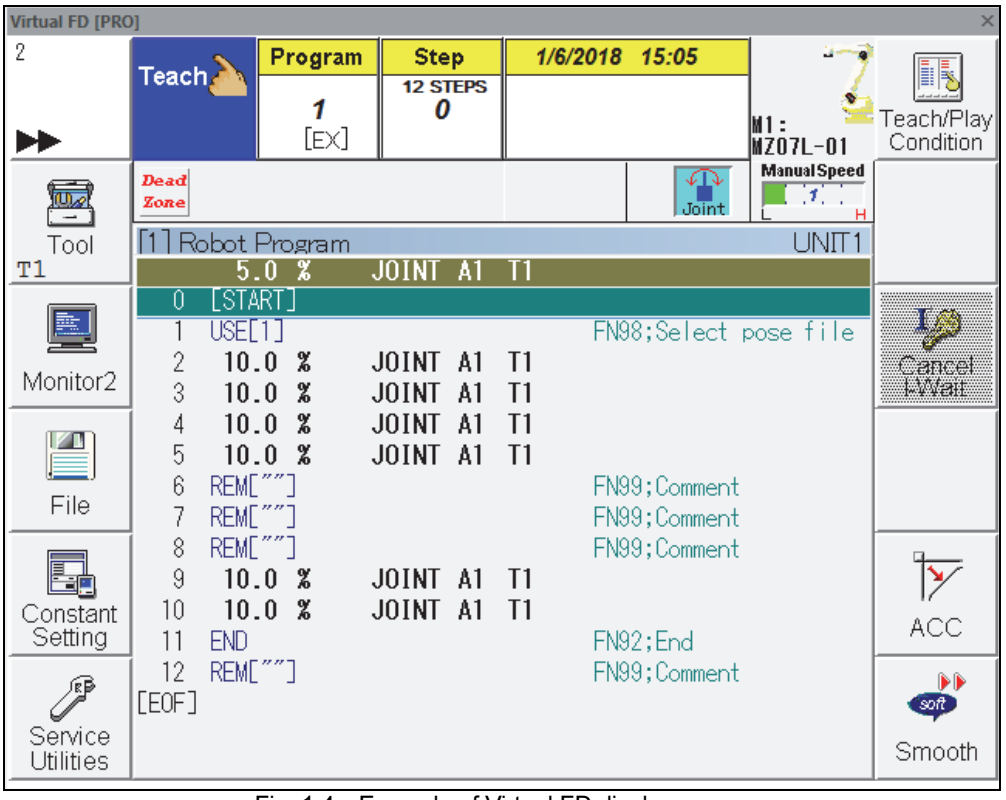


Fig. 1.4 Example of Virtual FD display

POINT

- The size is fixed to 640 x 480 pixels.
- The color and design of FD on Desk may change depending on the desktop theme of PC.
- There may be several ways for one operation, please use the one that you prefer.

1.5.2 Robot operation panel

The robot operation panel has equivalent functionality to the functionality of the Teach Pendant of FD Controller. Click on the button (icon) by a mouse.

- **FD operation buttons**
  The buttons at the top of the robot operation panel are used for operating the robot in the same way as operating it from the FD controller main unit.

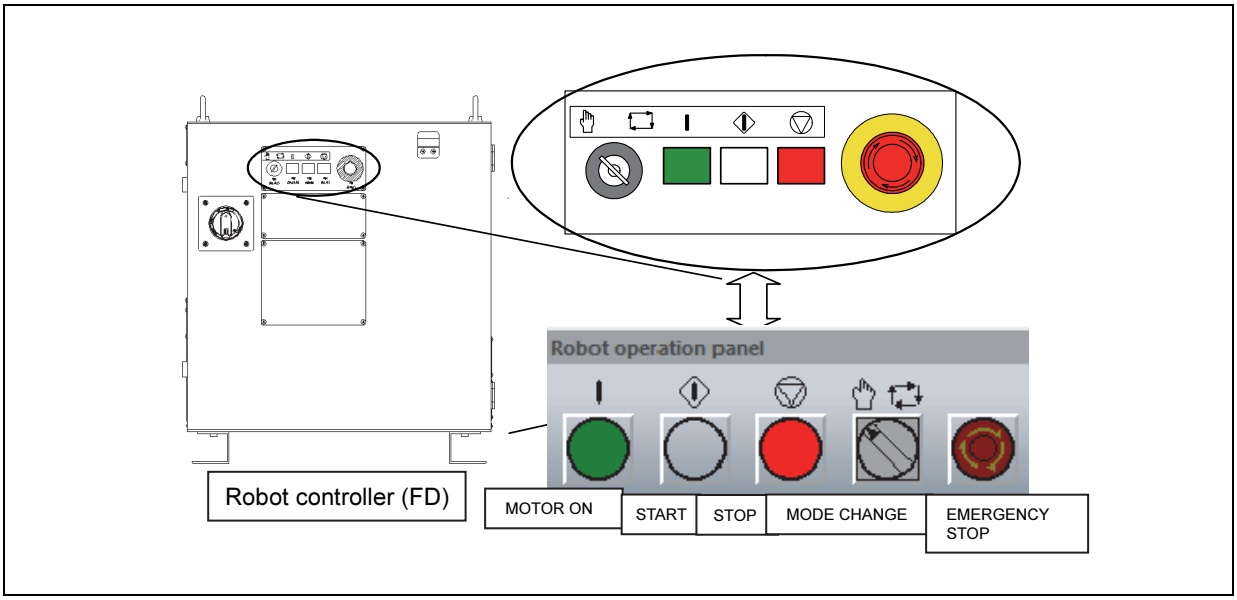
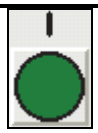
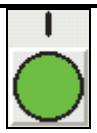
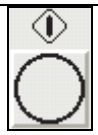
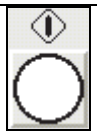
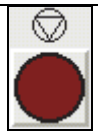
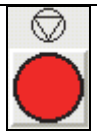
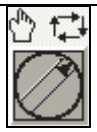


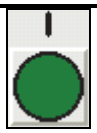
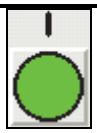
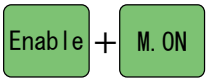
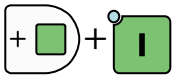
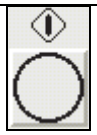
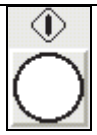
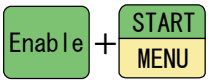
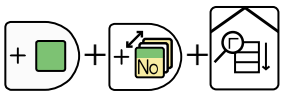
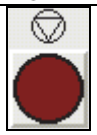
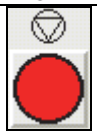
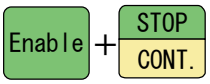
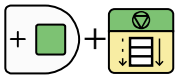
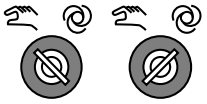
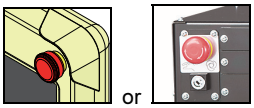
Fig. 1.5 Robot operation panel (FD operation buttons)

Table 1.5.1 Operation panel buttons

Figure		Button name	Motion
 OFF	 ON	MOTOR ON BUTTON	This is used to set the motor power to ON. When it is set to ON, the robot gets ready for operation.
 OFF	 ON	START BUTTON	In the playback mode, this starts the program which has been selected.
 OFF	 ON	STOP BUTTON	In the playback mode, this stops the program which is in running condition.
 Teach	 Playback	MODE CHANGE SWITCH	This is used to select the mode. The Teach or Playback mode can be selected. This switch is used in combination with the Teach pendant “TP selector switch”.
 OFF	 ON	EMERGENCY STOP BUTTON	When this is pressed, the condition will change from ON to OFF and the robot is set to emergency stop (The robot cannot move). When pressing again, the condition will return to ON.

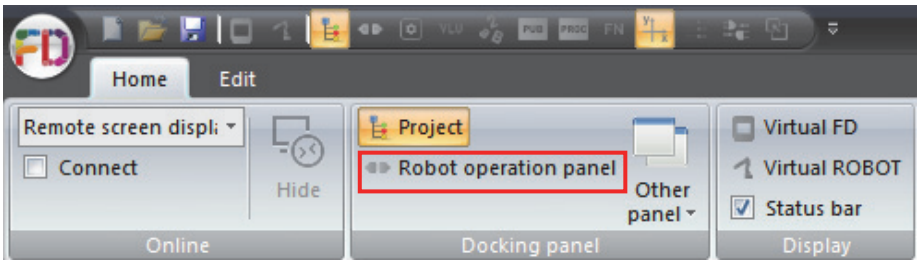
(NOTE) For CFD controller users

The buttons/switches on the “FD Control Panel” are equivalent to keys/switches/buttons of the CFD controller shown as below.

Figure		Button name	Compact teach pendant	Smart teach pendant
 OFF	 ON	MOTOR ON BUTTON		
 OFF	 ON	START BUTTON		
 OFF	 ON	STOP BUTTON		
 Teach	 Playback	MODE CHANGE SWITCH		
 OFF	 ON	EMERGENCY STOP BUTTON		

- **Virtual TP tab**

VirtualTP tab is displayed by selecting the following robot operation panel. Display on/off can be switched by the following red frame button. Orange display means that operation panel is now displayed.



In the case of simultaneous press with Enable, click on the button after having pressed Enable. Click Enable, it changes to Enable valid (red color). And click again it, it reverts to Enable invalid (green color).

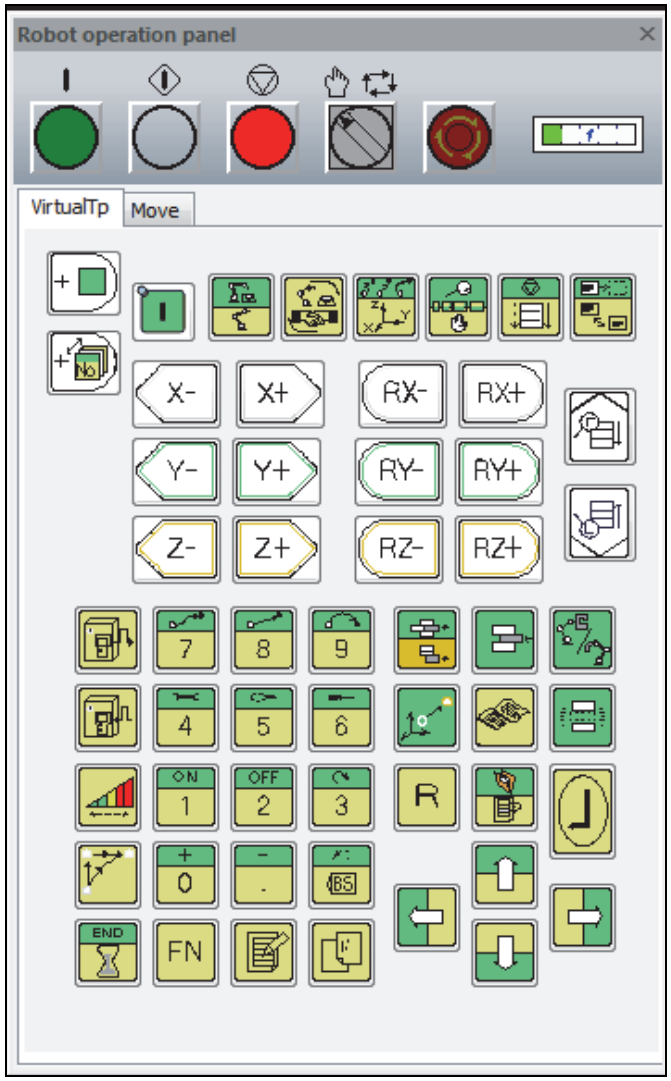


Fig. 1.6 Robot operation panel (Virtual TP tab)

For the keys of Teach Pendant, see “BASIC OPERATIONS MANUAL”.

POINT

- The [Enable] + [Motors ON] key combination on the Virtual TP does not work. Please use the [MOTOR ON] FD operation button.

- **Move tab**

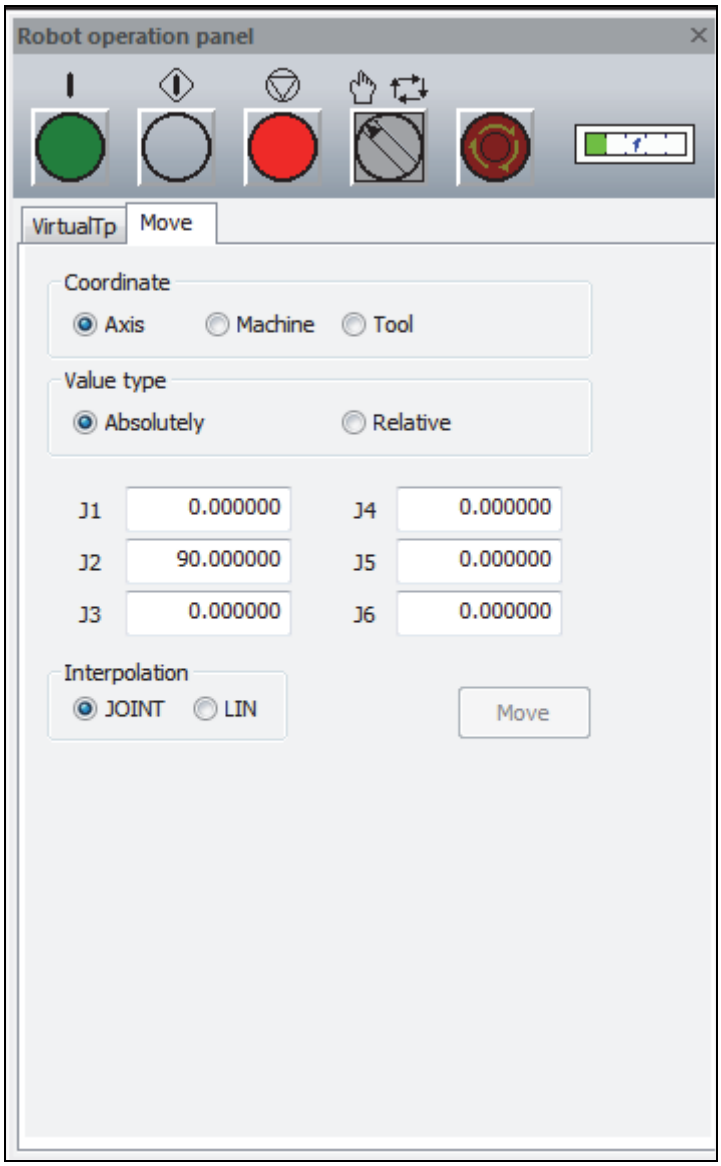


Fig. 1.7 Robot operation panel (Move tab)

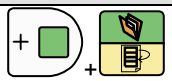
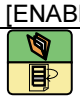
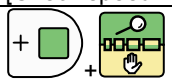
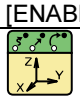
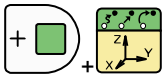
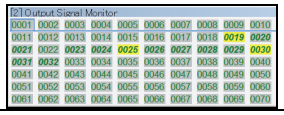
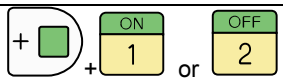
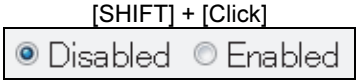
The robot is operated by specifying the coordinates.

(How to operate)

Item	Description
Coordinate system	Specify the coordinate system corresponding to the values to be input.
Input value	When the values are specified with world coordinates, move to a point at the specified coordinates. When the values are specified with relative coordinates, move to a relative position in relation to the current position.
Text input area	When each axis is specified using a coordinate system, enter values for axes J1 to J6. When selecting mechanism coordinates or tool coordinates, enter a value for each of X, Y, Z, r, p, and y.
Interpolation	Specify interpolation processing when the robot moves.
Move button	Move only while the Move button is held down. When the Move button is released, stop the move process.

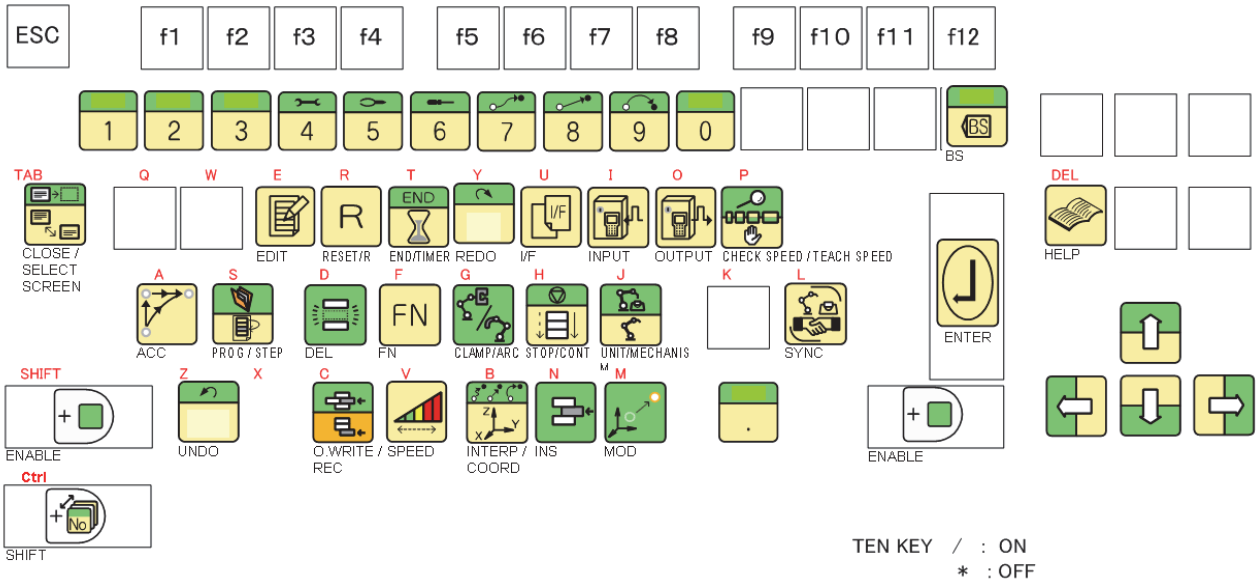
1.5.3 Mouse operation

The Virtual FD can be operated by clicking the icos like touching them using the teach pendant touch screen. (Some operations can be done also using the Virtual TP or the PC keyboard)

Operation	Icon	Remarks
Program selection		 [ENABLE] + [Program / Step]
Step selection		 [Program / Step]
Manual speed change		 [Check speed / Manual speed]
Check speed change	[SHIFT]+ 	 [ENABLE] + [Check speed / Manual speed]
Coordinate system selection		 [Interpolation / Coordinate]
Interpolation type change (Record status)	[SHIFT]+ 	 [ENABLE] + [Interpolation / Coordinate]
Mechanism selection		 [Unit / Mechanism]
Open the <ConstantSetting> menu		If this icon is not displayed, please press [SHIFT] key of the PC keyboard.
Open the <ServiceUtilities> menu		If this icon is not displayed, please press [SHIFT] key of the PC keyboard.
Monitor window focus change	Click the monitor window 	 [Close / Select screen]
Check mark ON/OFF	[SHIFT] + [Click] 	 [ENABLE] + [ON/1] or [OFF/2]
Radio button change	[SHIFT] + [Click] 	 [ENABLE] + [Cursor keys]
TAB change		 [Close / Select screen]
Jog dial operation 	The jog dial operation can be simulated by the mouse wheel operation.	High-speed scroll is possible when moving the wheel of the mouse with pressing the [SHIFT] key of the PC keyboard.

1.5.4 Keyboard operation

The correspondence between keyboard and FD Teach Pendant are shown in the following;



(Supplement)

Operation	Icon	Keyboard operation
Check mark ON/OFF		[SHIFT]+[/] : ON [SHIFT]+[*] : OFF [/] and [*] are included in the ten-keys.
Radio button change	Disabled Enabled	[SHIFT]+[←] or [SHIFT]+[→]
Page up		[SHIFT]+[↑]
Page down		[SHIFT]+[↓]

Operations not available on the keyboard

The motors ON/OFF operation and the manual robot operation cannot be done from the keyboard.
For details, refer to 1.5.2 Robot operation panel.

1.5.5 Character Input Screen

There are two methods for inputting character line on the character input screen of FD on Desk. Choose an appropriate method based on users' needs.
Change a keyboard to be used by use of F2 key. Press [HARD KEYBOARD], it changed to PC keyboard, while pressing [SOFT KEYBOARD] to the soft keyboard

Fig. 1.8 Character input screen

Table 1.5.2 Method for inputting character

Name	Display	Method for inputting character
SOFT KEYBOARD	Soft-Keyboard	Select characters using the arrow keys on Virtual TP and press the [Enter] key to enter them.
HARD KEYBOARD	Hard-Keyboard	Type characters using the PC keyboard. Use the IME (Input Method Editor) you are using to switch the input mode between kana, kanji, and alphabetic characters.

1.6 Virtual ROBOT

In this Virtual ROBOT window, the picture of the robot is displayed and it is possible to check the behavior of the robot visually. And this window has several functions e.g. simple CAD function, servo gun axis definition function, target tag creation function, interference detection function etc.

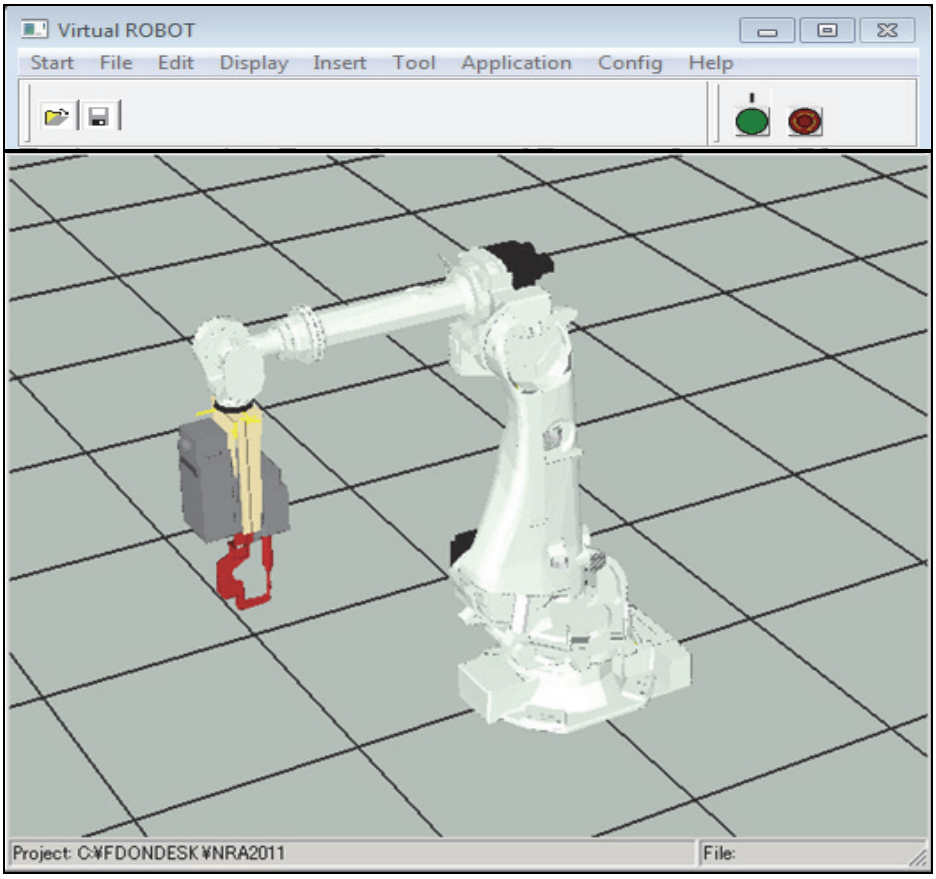


Fig. 1.9 Virtual ROBOT

1.6.1 The robots supported in the viewer

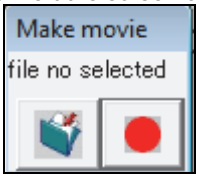
Concerning the robot types that are supported by this viewer, refer to the table included in the installation CD.

1.6.2 How to operate

For details, refer to the help menu of the Virtual ROBOT window.

1.6.3 How to create a movie

It is possible to convert the screen of the Virtual ROBOT to a movie file (*.avi).



POINT

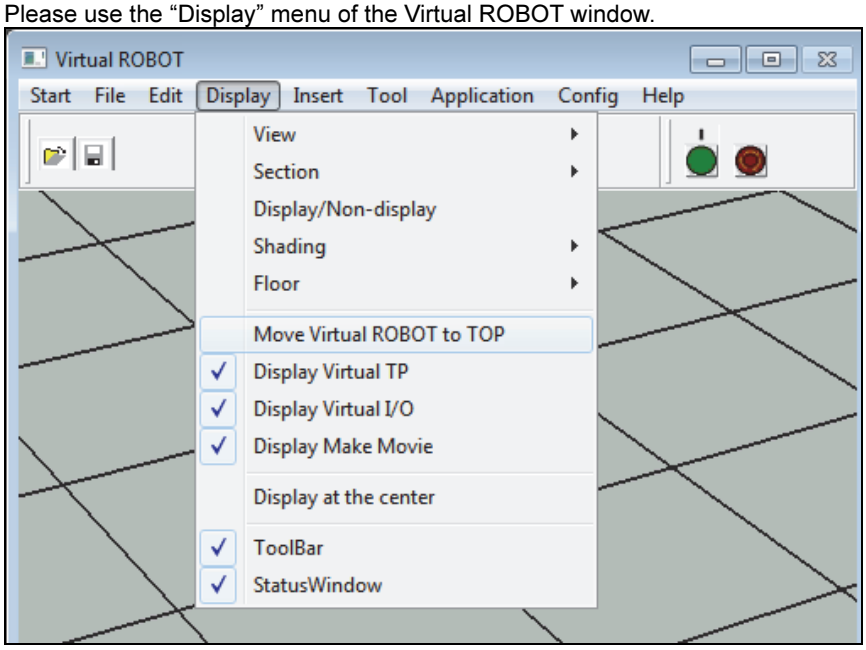
To use this function, please select the “Windows classic” desktop theme. You can select it from "Personalize" by clicking the mouse on Desktop.

POINT

The movie function of Virtual ROBOT does not support the Aero theme of Windows Vista or later. For Windows Vista and Windows 7, please use Classic Theme, and for Windows 10, please use the standard movie function or a movie function available on the market. Please note that some edition of Windows 10 does not have a movie function as a standard function.

1.6.4 Display ON/OFF for the Virtual TP, the Virtual IO, and the Movie creation

It is possible to change the setting of display ON/OFF for the Virtual TP and the Virtual IO.
Please use the “Display” menu of the Virtual ROBOT window.

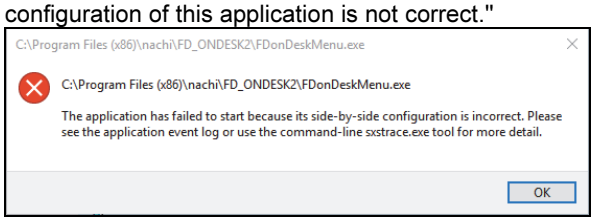
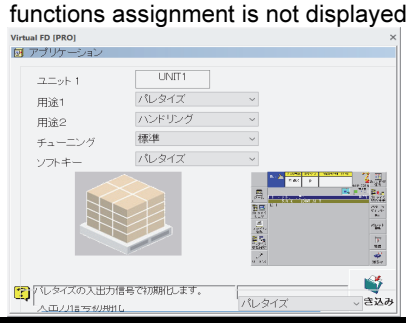
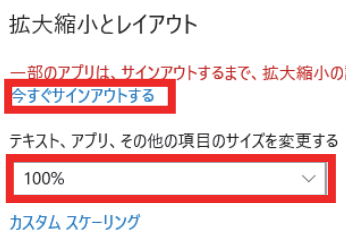


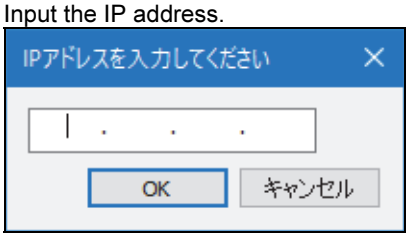
1.7 Troubleshooting

This section explains errors that may occur in FD on Desk II and countermeasures.

1.7.1 Troubleshooting

Table 1.7.1 Troubleshooting

No.	Phenomenon	Countermeasure
1	The operator class becomes ***BEGINNER***, and it does not change even when the password is entered using the R314 command.	License file is not authenticated. Or FD controller is selected when the grade is “Light”. See “1.1.3 Grades” for details. (This occurs when copying the license.DAT in the installation CD to the PC as it is. Because this license.DAT is just a file for DEMO version.)
2	Error occurs when starting. "The application could not start because the configuration of this application is not correct." 	This occurs when the runtime (Microsoft Visual C++ 2005 Redistributable) is not installed correctly. Run "vcredist_x86.exe" in the installation CD.
3	“E0959 Communication board is not found” occurs when start up.	Change the setting of field-bus to “not used” and restart FD on Desk. Menu:<Constant Setting> - [8.Communication] [3.Fieldbus]
4	"dongle.dat file does not exist." occurs at startup.	Please check the license file (Refer to Chapter 1 license certification). If it does not work, INSTAL_DIR of FDonDesk II.ini in the installation folder may not be appropriate. This may occur if copying the FDonDesk II.ini from another PC.
5	At the time of remote debug connection, set the FD/CFD controller to the playback mode and played back at the breakpoint, an error had occurred to make the startup selection internal.	Please set the startup selection to external by pressing the teaching /playback condition that is located at the upper right at the FD screen on the computer. Then, the power of the controller turns on and the playback of the program from break point panel will become possible.
6	When menu is selected on Virtual FD, dialog is not displayed correctly, or screen is distorted. Example) Dialog of application signals assignment and functions assignment is not displayed correctly. 	Open “Windows setting - System - Display - Text, Application, Change size of other items”, change the following red square menu to 100%. Then click「今すぐサインアウトする」and restart your PC. 

7	License file “license.dat” issued correctly is surely stored in specified folder, but FD on Desk II is still started “Trial (DEMO)” version. ([DEMO] is displayed on title bar and operator class is fixed ***BEGINNER***.)	Check the following item. ・Aren’t you using the license of another PC? Please confirm that MAC address of your PC and MAC address of license file (host id) is same. FEATURE ORIGINAL_BUTTON:FOREVER hostid=6C4B906 FEATURE FD_ONDESK:FOREVER hostid=6C4B906A9E5C ・Is the trial period of the license file expired? Please confirm the trial period (limit day to use) of the license file. FOREVER ： The license is valid forever Other than FOREVER ： The license will be invalid after that date. ・Are you using a temporary license file instead of an issued license file? Here is a partial temporary license file:. FD_ON_DEMO means temporary license files. For the official license file, this is displayed FD_ONDESK. FEATURE ORIGINAL_BUTTON:FOREVER H FEATURE FD_ON_DEMO:FOREVER hostic
8	When starting FD on Desk II, following message appears and not allowed to use. (If trying to proceed without inputting IP address, FD on Desk II shut down.) Input the IP address.  	If "license.dat" is not in the specified folder, FD on Desk II displays this dialog window to start with "Light" grade. The following are possible causes of this problem. ・Incorrect file name for "license.dat" (misspelled) ・The folder where you saved "license.dat" is in the wrong location. *Correct destination folder is “NRA2011¥License” in the destination folder.

1.7.2 Cautions on making inquiries

When troubles occurs and making an inquiry to our NACHI-FUJIKOSHI, please prepare the items listed on the following list.

Files and folders
WORK folder that was working on
The DAP file (.dap) that was working on
CAB file created by ColectResult →Procedures are described at 1.7.3
Image or video at the time of trouble

Please prepare the above files / folders.

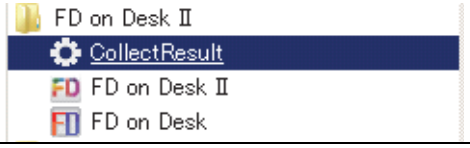
Also, please describe about the following items in detail as much as possible.

Contents of contact e-mail
Phenomenon when trouble occurs
Reproduction procedure
Frequency of occurrence
Windows OS version　e.g.: Windows 10 etc.
Processor　e.g.: 64 bit etc.

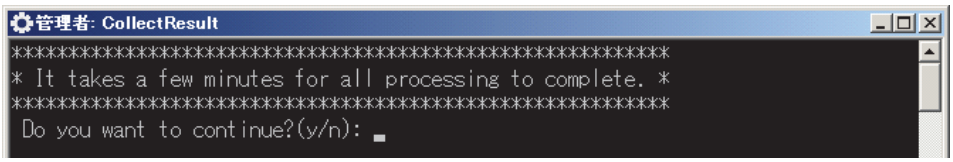
1.7.3 Creating the CAB File

The procedure of the CAB file creating method is explained.

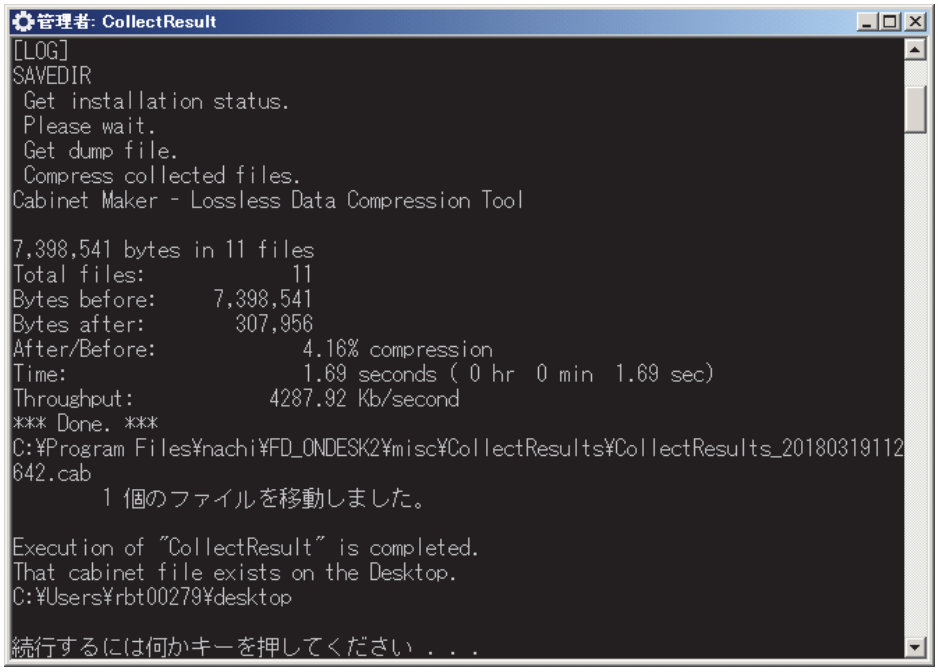
1 **Run ColectResult.bat.**
Select [Start menu] → [FD on Desk II] → [ColectResult].



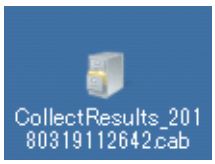
2 **Creating a CAB file.**
>> Press "Y".



We collect files necessary for CAB file generation.
>>Please wait.
Once the execution of creating the CAB file has completed, the following screen will be displayed.
>> Pressing any key to close the bat file.



3 **CAB file that has created will be sent.**
The CAB file created at [ColectResult] will be on the desktop.
The created date will be on the file name.
Please send this CAB file, when inquiring.



Chapter 2 Using FD on Desk II in the Same Way as Previous FD on Desk

This document describes how to use FD on Desk II with the functions and operation procedures equal to those available for the conventional simplified simulation tool "FD on Desk".

2.1 Outline

2.1.1 Major functions of previous FD on Desk

The previous FD on Desk has 3 operation modes. Please choose one mode for respective usage.

VIEW MODE

Teach pendant color screen is displayed on PC screen as it is. PC keyboard can be used as teach pendant key. (But the robot can not be operated manually and play backed from FD on Desk operation.)
Setting operation on constant setting screen and service utility screen is possible. Edited data is directly stored in robot controller. In case of CFD controller, using this software with Compact TP enables same operation as Smart TP.

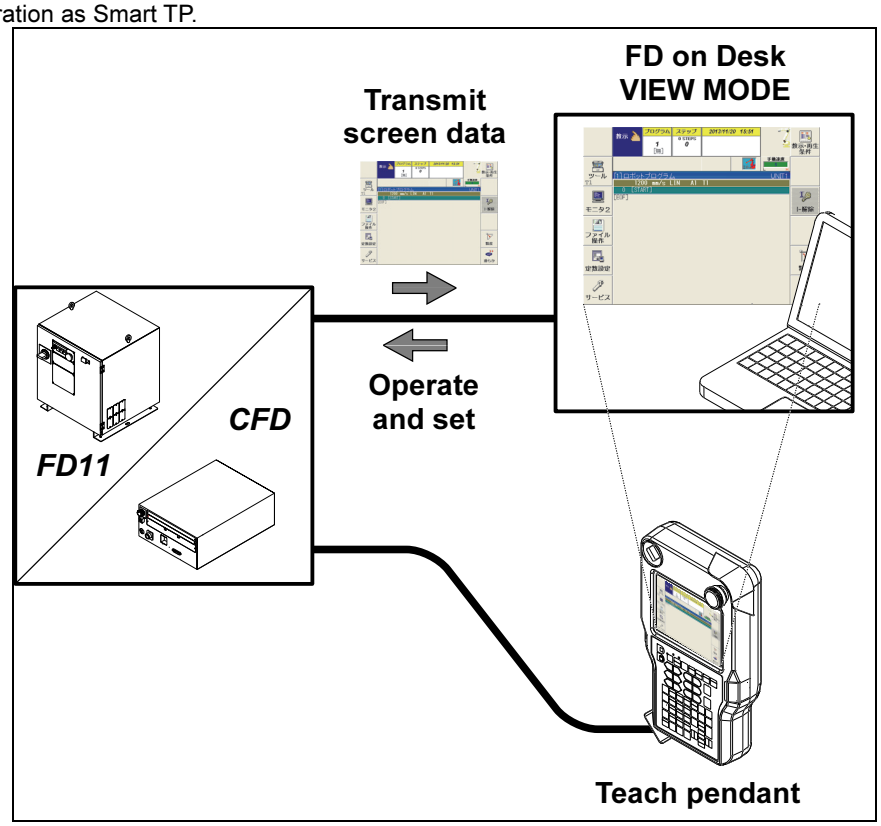


Fig. 2.1 View mode conceptual diagram

IMPORTANT

If the setting of the FD/CFD controller is changed on this View mode, it will affect the motion of the real robot and the controller directly.
Pay special attention when changing the setting by referring the respective operation manuals.

POINT

To use this function, it is necessary to execute a communication between the PC and this robot controller.
For details on how to execute a communication, refer to "1.3 Communication setting for the robot controller".

POINT

Robot controller transmits just the mirror copy of TP screen image.
So it is unnecessary to download WORK folder data from robot controller to PC in advance.

POINT

Manual operation, work program playback, etc. from the FD on Desk (PC) is not possible.

MONITOR MODE

This mode is for remote operation. I/O signals and robot pose of connected robot controller can be monitored on PC screen. FD on Desk operation is separated from TP operation. For example, it is possible to open the axis data monitor on the teach pendant and the output signal monitor on the FD on Desk at the same time. Manual operation, work program playback, etc. from the FD on Desk (PC) is not possible.

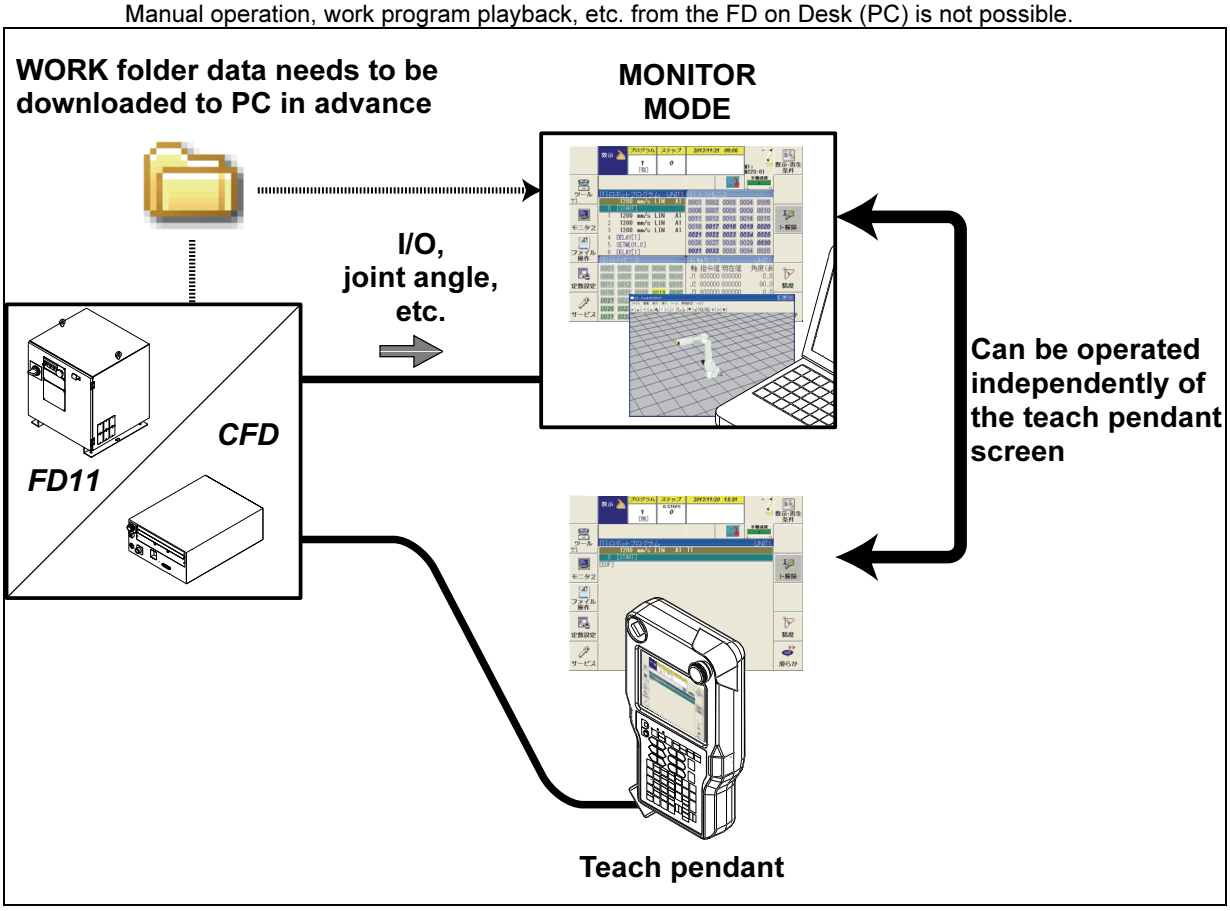


Fig. 2.2 Monitor mode conceptual diagram

POINT

To use this function, it is necessary to execute a communication between the PC and this robot controller.
For details on how to execute a communication, refer to "1.3 Communication setting for the robot controller".

POINT

If any file is modified or created, it is stored only in local folder of PC. In order to upload this file to robot controller, file transferring utility of OFFLINE mode is necessary.

* What is file transferring utility?
By operating FDonDesk, file can be transferred from PC to robot controller or from robot controller to PC.

INFO.

Up to 4 monitor windows can be activated by using following shortcuts.
R245 Monitor 1
R246 Monitor 2
R247 Monitor 3
R248 Monitor 4

OFFLINE MODE

FD on Desk can perform the following tasks without connecting to a robot controller.
- Offline teaching (teaching in which the real robot is not used)
- Cycle time simulation
- Development of a robot language program and operation check of it
- Operation practice without a real robot

And, it is also possible to transfer robot program files created on FD on Desk to the robot controller.

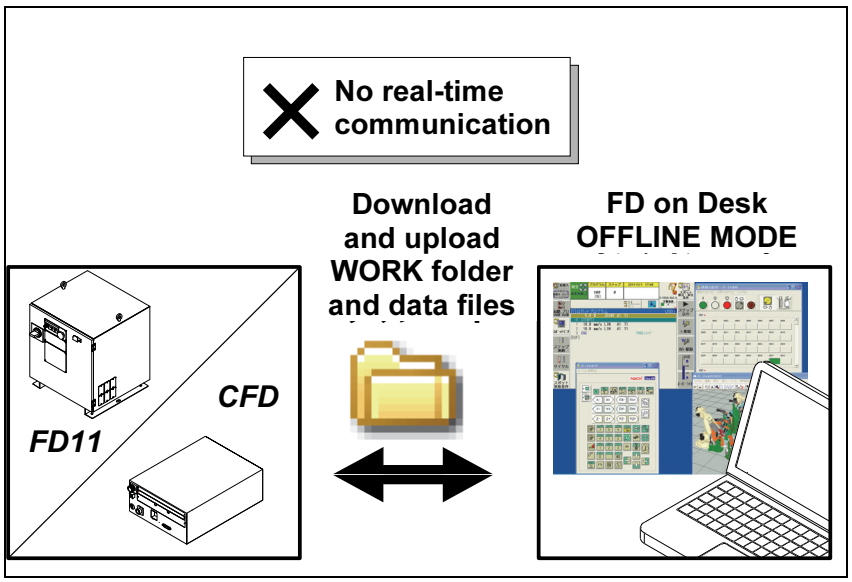


Fig. 2.3 Offline mode conceptual diagram

POINT

To use this function, it is necessary to execute a communication between the PC and this robot controller.
For details on how to execute a communication, refer to "1.3 Communication setting for the robot controller".

2.1.2 Single controller mode and multi controller mode

When using the "Pro" grade for previous FD on Desk, the "Single controller mode" or the "Multi controller mode" can be selected. In the "Single controller mode", only 1 controller can playback the work program. But in the "Multi controller mode", up to 8 controller at maximum can playback the work programs at the same time.
Therefore, the file format is different between the "Single" and the "Multi". In case of "Single", the data for the controller is stored in the respective folders one by one. But in case of "Multi", the data folders for the controllers are stored in the "project" folder altogether.
In case of "Single", the folders for the respective controllers will be made under the "NRA2011" folder and the settings of the controller, Virtual I/O, and the model data etc. are stored in those folders. The model data is stored in a format of "cel". In case of "Multi", in the "Project" folder, the folders for the respective projects will be made. And then the folders for the respective controllers will be made under it. The "wcl" file keeps the models of the whole project.
To copy the data created by the FD on Desk to other PC, please copy the folder of the controller (in case of "Single" mode) or copy the folder of the project (in case of "Multi") as they are.

POINT In case of Regular or lower grade, only "Single controller mode" is available. ("Multi controller mode" is not available)

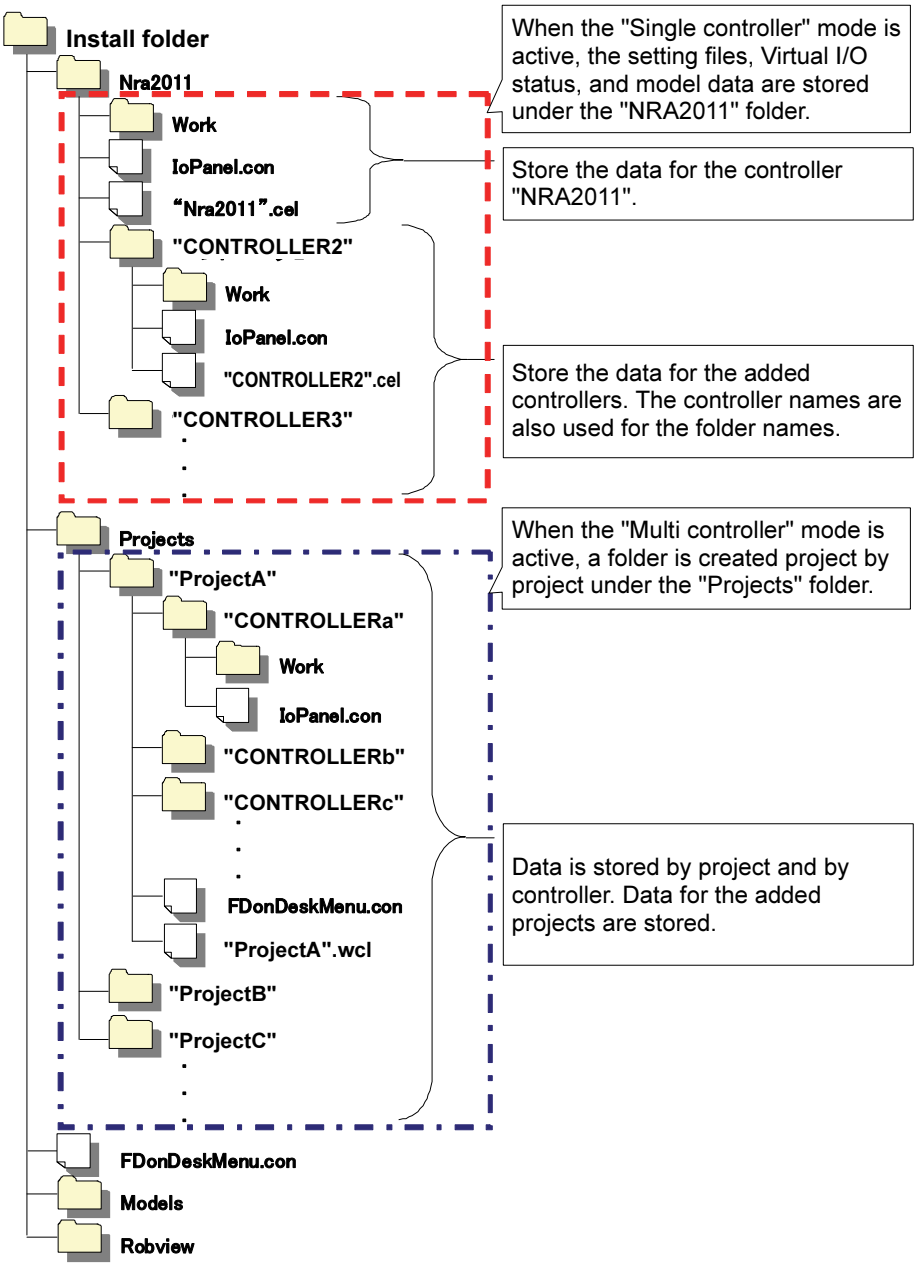


Fig. 2.4 Data storage structure

2.1.3 Composition of FD on Desk

Conventional FD on Desk can be activated by selecting the Start menu - All Programs - FD on Desk II - FD on Desk. When the controller is turned ON (powered ON), as shown in the following figure, windows such as the Virtual FD, Virtual TP, Virtual I/O and Virtual ROBOT windows will be displayed according to the selected mode.

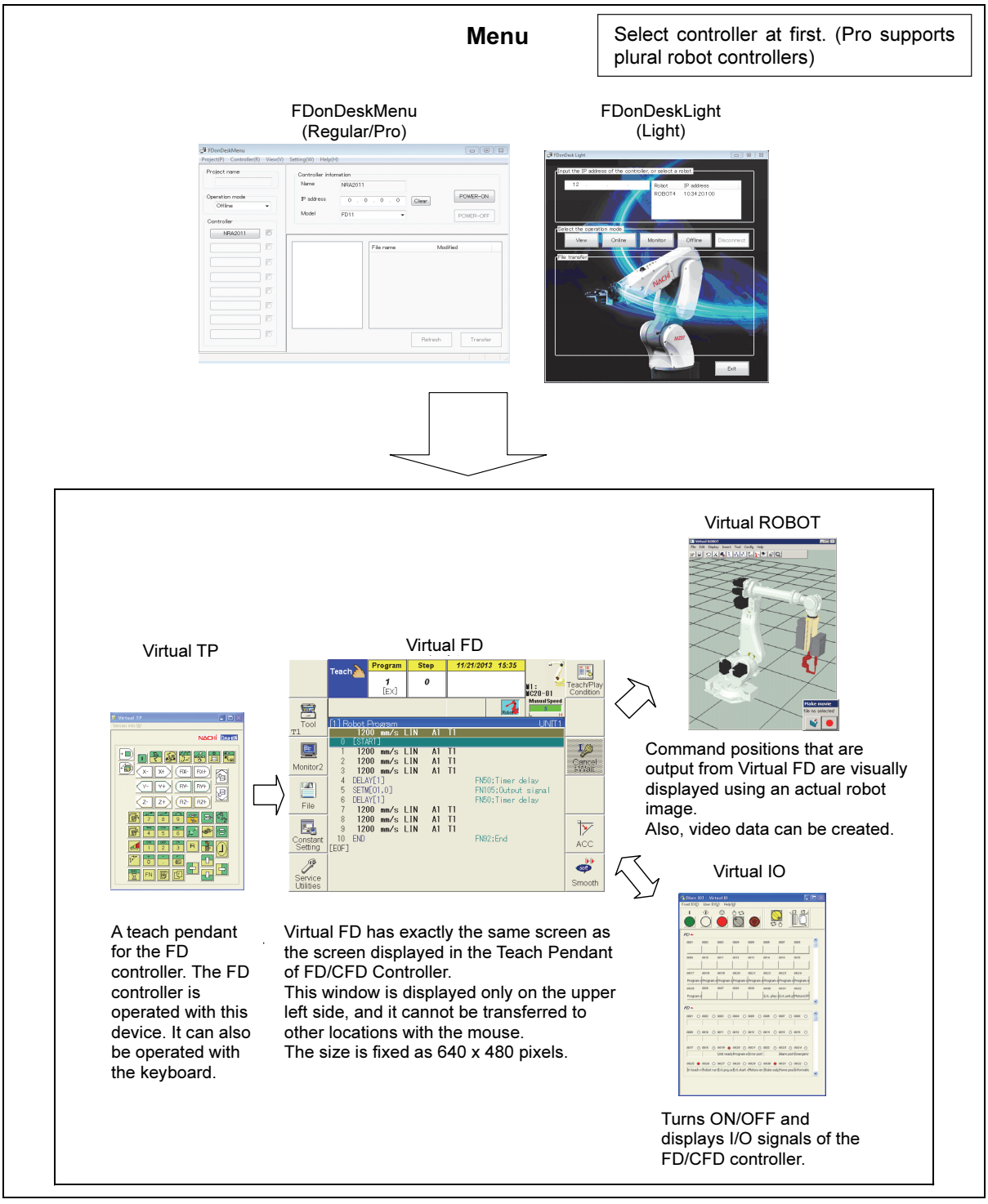


Fig. 2.5 Composition of FD on Desk

POINT

The color and design of FD on Desk may change depending on the desktop theme of PC.

2.2 Operations

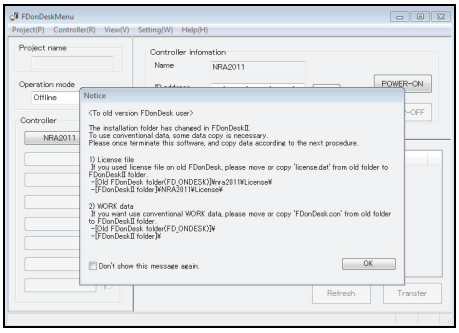
2.2.1 Start / terminate the FD on Desk

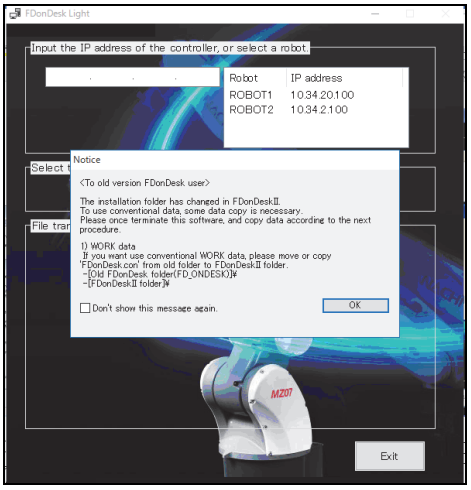
This part explains the startup and termination of FD on Desk.

How to start the FD on Desk

1 **After installation, run FD on Desk or FD on Desk Light in the start menu.**

When the program starts for the first time after installation, the following message dialog boxes appear.





For FD on Desk II, the install folder is not the same as the install folder for conventional FD on Desk. When using the previous license file or WORK data, data needs to be transferred.
Exit FD on Desk once, and transfer data as follows.

- When using the license file (MAC license for PRO/REGULAR)
  Copy or move "license.dat" in [previous FDonDesk folder (FD_ONDESK)]¥nra2011¥License¥ to [FDonDeskII folder]¥NRA2011¥License¥.

- When using the previous WORK data
  Copy or move "FDonDesk.con" in [previous FDonDesk folder (FD_ONDESK)] to [FDonDeskII folder].

POINT

Exit FD on Desk before copying or moving the license file and .con file.

How to terminate the FD on Desk

1 **Click the Close button.**

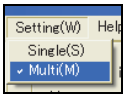
2 Select "OK".
>> FD on Desk will be closed.

2.2.2 Open a new project or the existing project (Only in case of "Pro")

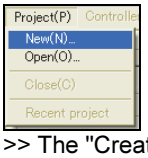
This part explains how to create a new project or how to open an existing project.
(This is available only in case of "Pro" grade.)
When using Regular or Light, setting files cannot be managed using a project.

Creating a new project

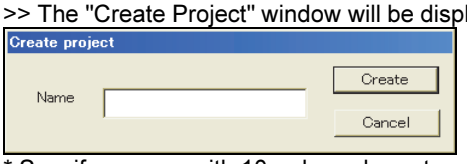
1 Select the menu of <Setting> - [Multi].



2 Select the menu of <Project> - [New(N)].



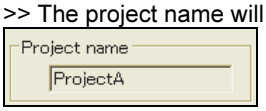
>> The "Create Project" window will be displayed. A project with the entered name will be created.



* Specify a name with 10 or less characters.

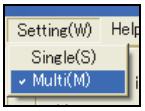
3 Enter the project name and click [Create].

>> The project name will be displayed.

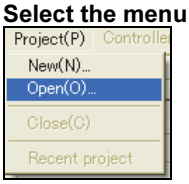


Opening an existing project

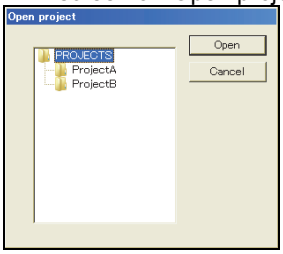
1 Select the menu of <Setting> - [Multi].



2 Select the menu of <Project> - [New(N)].

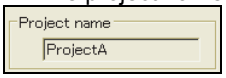


>> A screen of "Open project" will be displayed.

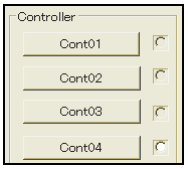


3 Select a project and click "Open".

>> The project name will be displayed.



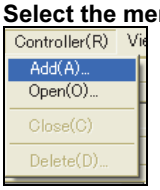
>> The names of the controllers that are included in the project will be displayed.



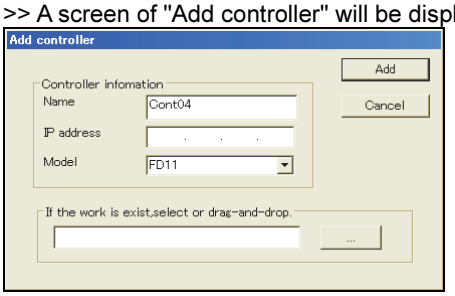
2.2.3 Adding controllers in the project

This section explains how to add/delete a controller using previous FD on Desk.
When using the Multi controller mode, please select a project in advance of this work.

1 **Select the menu of <Controller> - [Add(A)].**

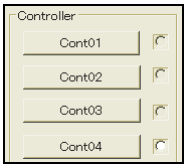


>> A screen of "Add controller" will be displayed.



2 **Enter the controller name. And, if a WORK folder exists, please select the path or drag & drop the folder to import the settings and programs.**
*Specify a name with 10 or less characters.

3 **Click "Add".**
>>The controller is added to the project and the name of the controller is displayed.



POINT

If the IP address is set, it becomes possible to use the following functions;
- VIEW MODE (Remote operation of the controller)
- MONITOR MODE (Receiving the setting files from the controller)
- OFFLINE MODE (Sending/receiving the setting files to/from the controller)

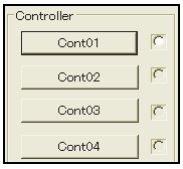
POINT

If a “WORK” folder is not loaded to the FDonDESK,(“drag & drop” operation or select operation) it is necessary to perform the memory format operation from the beginning. For details, refer to the instruction manual “TFDEN-094 Memory format procedure”.
However, please note that when copying a WORK that has been created using FD on Desk into real equipment, it may be not be able to be used in the real equipment if settings not corresponding to the real equipment are configured.

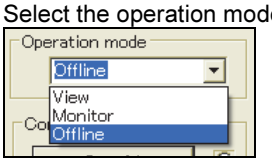
2.2.4 Turning ON/OFF the controller

In case of FDonDeskMenu

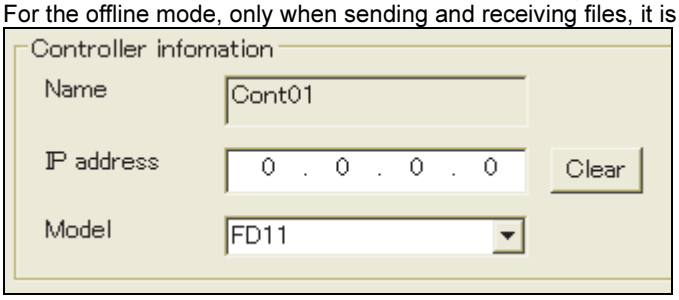
1 **Click the controller button.**
>> The right side lamp tu
ns to white.



2 Select the operation mode.



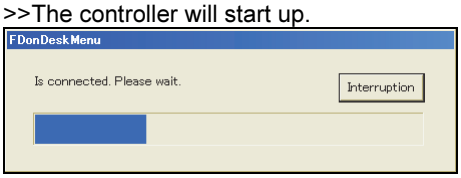
3 **Set the IP address and select the controller type.**
For both the monitor mode and the view mode, it is necessary to connect to a PC. So, inputting the IP address of the PC to be connected is mandatory.
For the offline mode, only when sending and receiving files, it is necessary to set an IP address.



4 **Select the controller type. FD11 or CFD can be selected.**

5 **Click the "POWER-ON".**

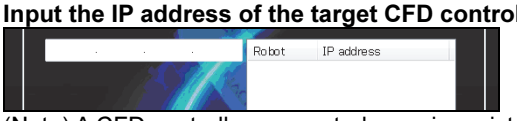
>>The controller will start up.



To exit, press “POWER-OFF” button.

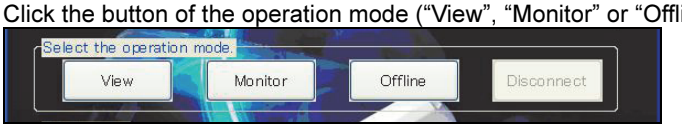
In case of FD on Desk Light

1 **Input the IP address of the target CFD controller.**



(Note) A CFD controller connected once is registered in the list in the upper right. So, you can also establish a connection by clicking the target controller in the list instead of inputting its address.

2 Click the button of the operation mode (“View”, “Monitor” or “Offline”).



>>The controller will start up.

To exit, press “Disconnect” button.

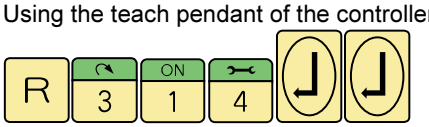
POINT For details of each operation mode, refer to 2.2.5 VIEW MODE, 2.2.6 MONITOR MODE and 2.2.7 OFFLINE MODE.

POINT (In case of the "Pro" grade) When using "Multi controller" mode, it is possible to start a controller while the other controller is operating.

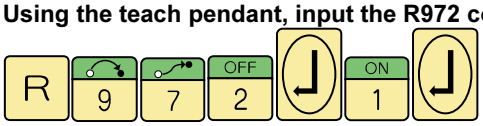
2.2.5 VIEW MODE

How to use the VIEW MODE is described in this section. In the VIEW MODE, the FDonDESK will execute the communication with the robot controller.
For details on how to communicate with the controller, refer to "1.3 Communication setting for the robot controller".

1 Using the teach pendant of the controller, change the operator class to ***EXPERT*** or higher.

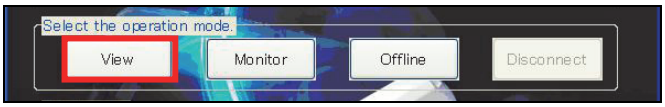


2 **Using the teach pendant, input the R972 command and select “1:Enabled”.**

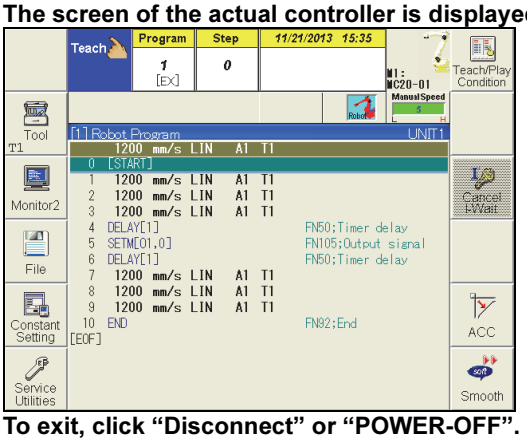


3 Set the IP address and execute the VIEW MODE.

(FDonDeskMenu)



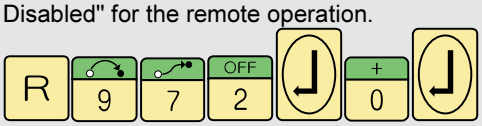
5 **The screen of the actual controller is displayed on the PC.**



To exit, click “Disconnect” or “POWER-OFF”.

POINT

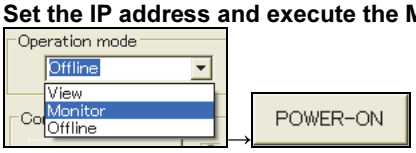
When the VIEW MODE is finished, disable the remote operation of the FD/CFD controller again.
Using the teach pendant of the FD/CFD controller, input the R972 shortcut and set "0: Disabled" for the remote operation.



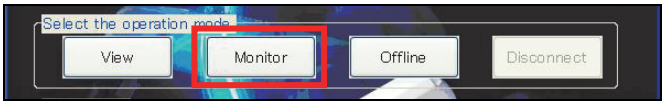
2.2.6 MONITOR MODE

How to use the MONITOR MODE is described in this section. In the MONITOR MODE, the FDonDESK will execute the communication with the robot controller.
For details on how to communicate with the controller, refer to "1.3 Communication setting for the robot controller".

1 **Set the IP address and execute the MONITOR MODE.**

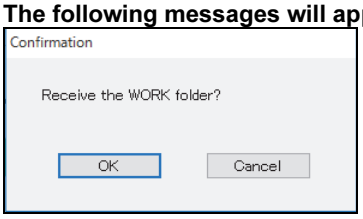


(FDonDeskMenu)

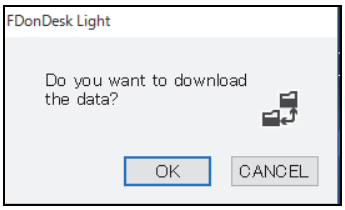


(FDonDeskLight)

2 **The following messages will appear.**



(FDonDeskMenu)



(FDonDeskLight)

3 **When "OK"(YES) is selected**
>> The WORK folder of the connected robot controller will be downloaded to the PC.

When "CANCEL"(NO) is selected
>> The setting data (WORK folder) of the robot controller will not be downloaded to the PC.
Instead, the WORK folder in the install folder of FD on Desk (local data) will be loaded.

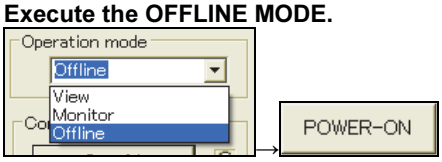
4 **If the download has been finished, the Virtual FD and the Virtual ROBOT will be displayed.**
By opening the Monitor1-4 windows in the Virtual FD, it is possible to check the conditions e.g. the I/O or the PLC etc. from your PC. And, in the Virtual ROBOT, the robot posture is displayed by the 3-D graphic.

To exit, click "Disconnect" or "POWER-OFF".

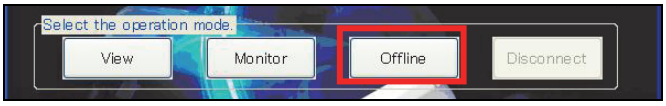
2.2.7 OFFLINE MODE

How to use the OFFLINE MODE is described in this section. In this mode, the FD on Desk can work without communicating with the robot controller. But it is also possible to download/upload the WORK folder from/to the controller in advance.
For details on how to communicate with the controller, refer to "1.3 Communicating with the controller".

1 **Execute the OFFLINE MODE.**

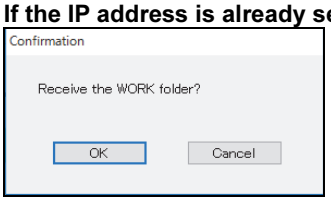


(FDonDeskMenu)

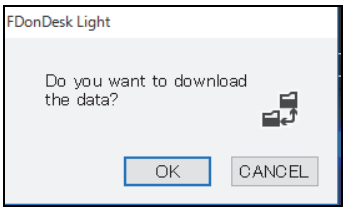


(FDonDeskLight)

2 **If the IP address is already set, the following message will appear.**



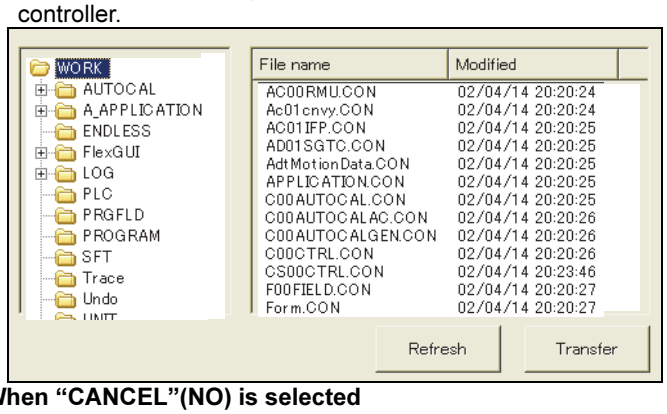
(FDonDeskMenu)



(FDonDeskLight)

3 **When "OK"(YES) is selected**

>> The WORK folder of the connected robot controller will be downloaded to the PC.
>> Using the teach pendant of the robot controller, in the screen opened by selecting <Constant Setting> - [8 Communication] - [2 Ethernet] - [3 FTP], set "Directory Permission" to "Read/Write".
In this state, select any file and click "Transfer", and the file can be copied to the robot controller.



When "CANCEL"(NO) is selected

>> The setting data (WORK folder) of the robot controller will not be downloaded to the PC. Instead, the WORK folder in the install folder of FD on Desk (local data) will be loaded.

4 **The Virtual FD, the Virtual ROBOT, the Virtual TP, and the Virtual IO windows will be displayed. The operations like the followings are available.**

- Offline teaching (teaching in which the real robot is not used)
- Cycle time simulation
- Development of a robot language program and operation check of it
- Operation practice without a real robot

Please be sure that in these operations, the settings in the robot controller are not changed directly even if the PC is connected with an Ethernet cable. To change the settings in the robot controller, it is necessary to upload the setting files. To exit, click "Disconnect" or "POWER-OFF".

2.3 Virtual FD and Virtual ROBOT

2.3.1 Outline

Virtual FD and Virtual ROBOT are the same for both previous FD on Desk and FD on Desk II.
Refer to 1.5 Virtual FD and 1.6 Virtual ROBOT.

2.4 Virtual TP

2.4.1 Outline

Virtual TP has the function equivalent to Teach Pendant of FD Controller. Click on the button (icon) by a mouse.
In the case of simultaneous press with Enable, click on the button after having pressed Enable. Click Enable, it changes to Enable valid (red color). And click again it, it reverts to Enable invalid (green color).

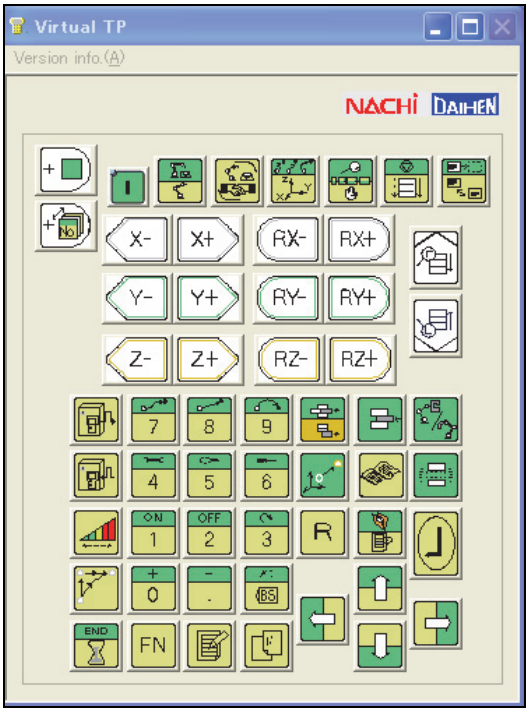


Fig. 2.6 Virtual TP

For the keys of Teach Pendant, see “BASIC OPERATIONS MANUAL”.

POINT

- The [Enable] + [Motors ON] key on the Virtual TP does not work. Please use [Motors ON] button on the Virtual IO window.

2.4.2 Character Input Screen

There are two methods for inputting text using the character input screen of Virtual FD: the soft keyboard and the hard keyboard. Choose an appropriate method based on users' needs.
Change a keyboard to be used by use of F2 key. Press [HARD KEYBOARD], it changed to PC keyboard, while pressing [SOFT KEYBOARD] to the soft keyboard.

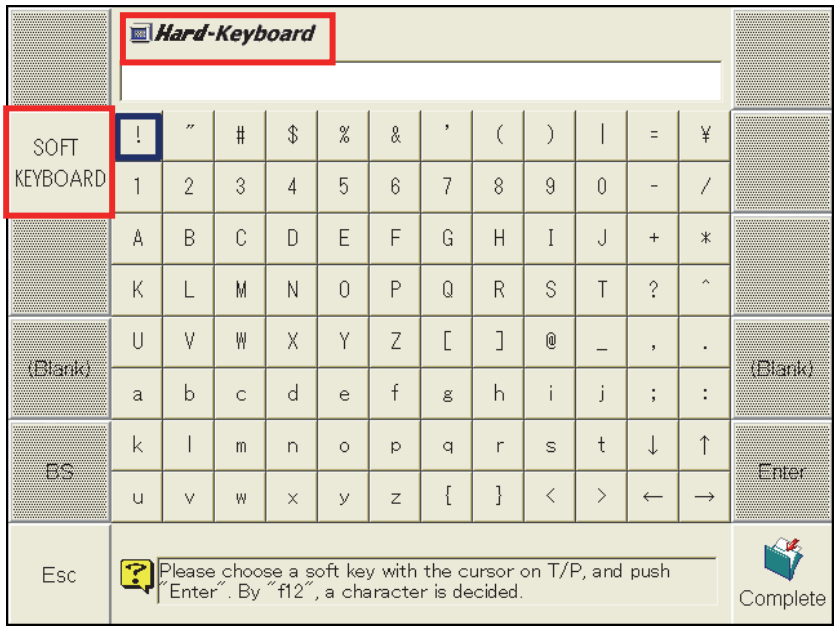


Fig. 2.7 Character input screen

Table 2.4.1 Method for inputting characters

Name	Display	Method for inputting character
SOFT KEYBOARD	Soft-Keyboard	Select characters using the arrow keys on Virtual TP and press the [Enter] key to enter them.
HARD KEYBOARD	Hard-Keyboard	Type characters using the PC keyboard.

2.5 Virtual IO

The Virtual IO Operation Panel consists of three components, namely "[User IO] - Virtual IO", "FD Control Panel", and "FD T/P Switch". These three component windows can be used separately from each other.

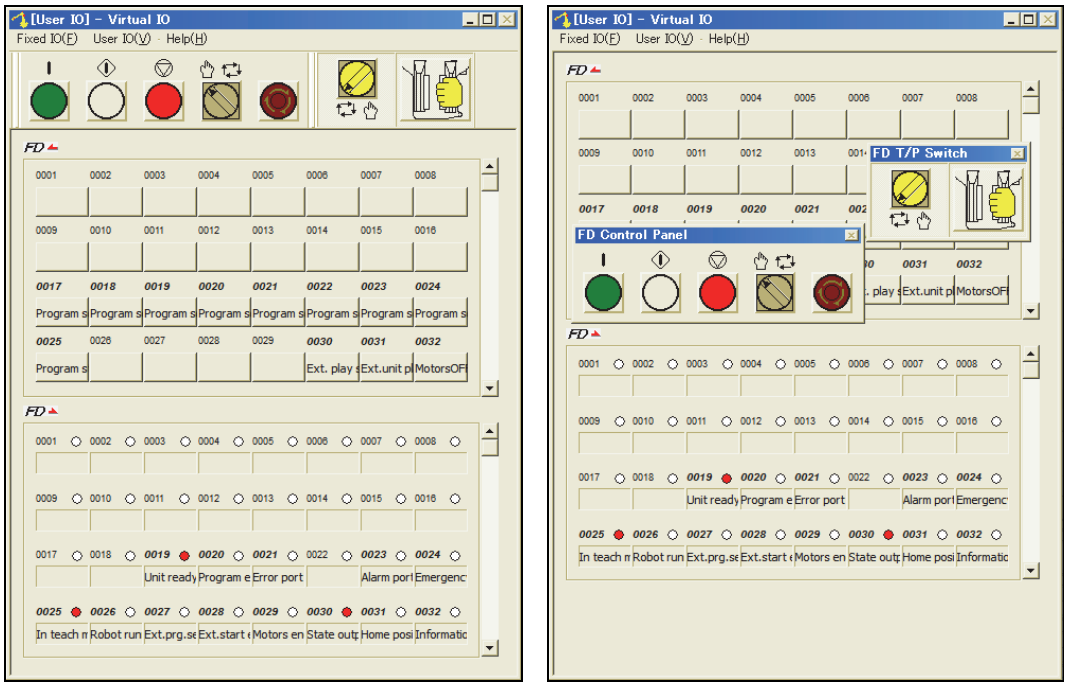


Fig. 2.8 Virtual IO Operational Panel

2.5.1 Virtual I O

Using the main Virtual IO operation panel window, the I/O signal ON/OFF operation is possible.
When "User IO" among 固定入出力(F) 汎用入出力(V) ヘルプ(H) at the window top is clicked, the User I/O signals can be checked and operated. And when "Fixed I/O" is clicked, the Fixed I/O signals can be checked and operated.
FD indicates input signal, while indicates output signal. Click on the buttons (icons) is done by a mouse. Input signal is operated by ON/OFF switch.
The scroll bar located in the right side can display signal 1~2048. The bold numbers indicate signals that are assigned to specific functions e.g. external start signal etc. (The signal name is automatically displayed on the window.) The assignment information of I/O signals is displayed on the Virtual I/O window automatically.

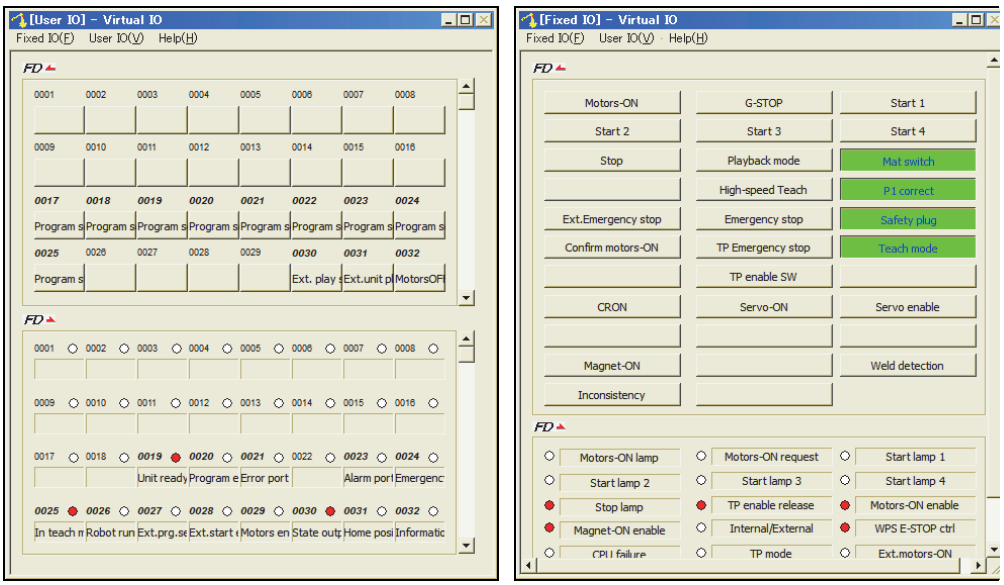


Fig. 2.9 Virtual IO Operational Panel window

2.5.2 Operational Panel

Operational panel located in FD Controller is handled here.

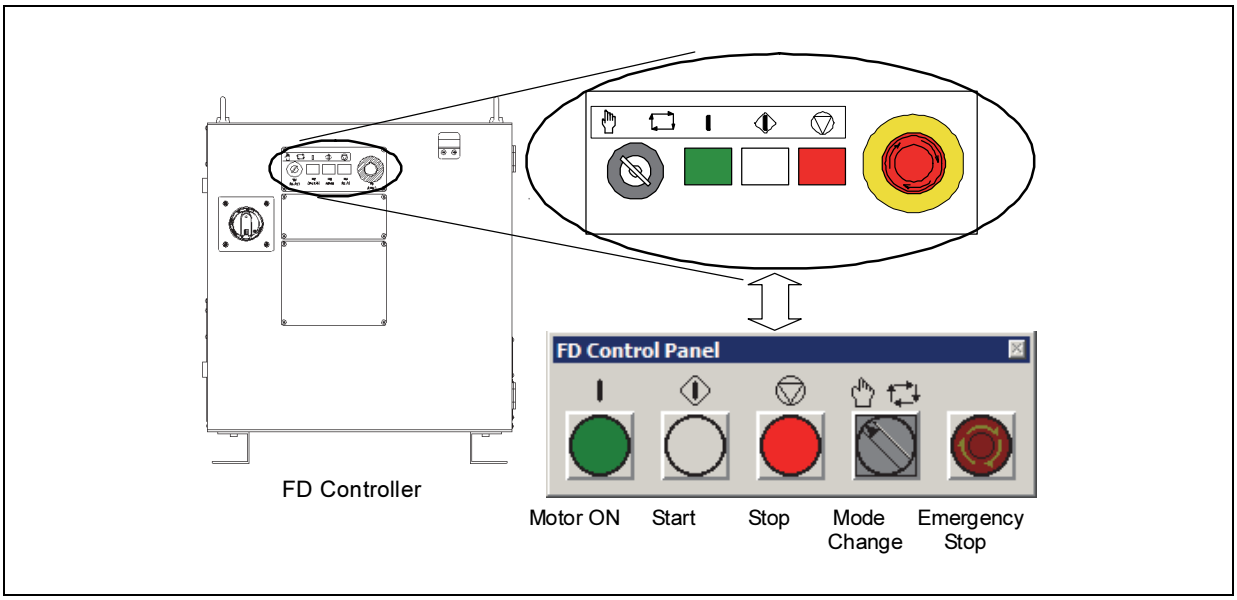
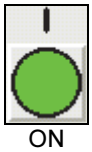
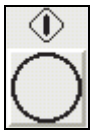
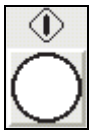
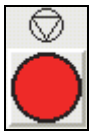


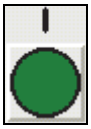
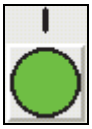
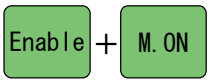
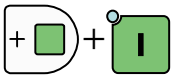
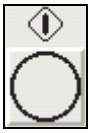
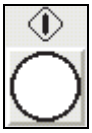
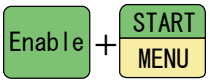
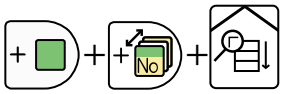
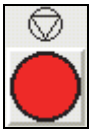
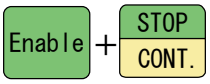
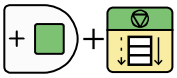
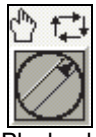
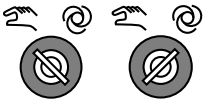
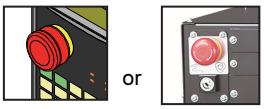
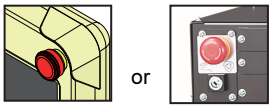
Fig. 2.10 Virtual IO: Operation Panel

Table 2.5.1 Operation panel buttons

Figure		Button name	Motion
 OFF	 ON	MOTOR ON BUTTON	This is used to set the motor power to ON. When it is set to ON, the robot gets ready for operation.
 OFF	 ON	START BUTTON	In the playback mode, this starts the program which has been selected.
 OFF	 ON	STOP BUTTON	In the playback mode, this stops the program which is in running condition.
 Teach	 Playback	MODE CHANGE SWITCH	This is used to select the mode. The Teach or Playback mode can be selected.
 OFF	 ON	EMERGENCY STOP BUTTON	When this is pressed, the condition will change from ON to OFF and the robot is set to emergency stop (The robot cannot move).

(NOTE) For CFD controller users

The buttons/switches on the “FD Control Panel” are equivalent to keys/switches/buttons of the CFD controller shown as below.

Figure		Button name	Compact teach pendant	Smart teach pendant
 OFF	 ON	MOTOR ON BUTTON		
 OFF	 ON	START BUTTON		
 OFF	 ON	STOP BUTTON		
 Teach	 Playback	MODE CHANGE SWITCH		
 OFF	 ON	EMERGENCY STOP BUTTON		

POINT

In the FD on Desk, the “Virtual TP” can not execute the “Motors ON” operation and the “Start” operation. Please use the “FD Control Panel” of the “Virtual IO” window instead.

2.5.3 FD TP SWITCHES

The operation of the “TP SELECTOR SWITCH” and the “ENABLE SWITCH” on the teach pendant can be performed on this window.

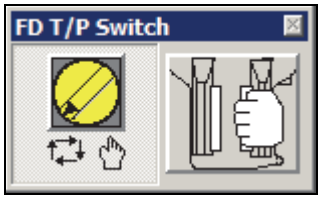
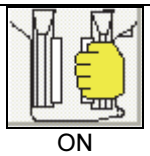


Fig 2.11 FD T/P switches

Table 2.5.2 FD T/P switches

Figure		Button name	Motion
 Playback	 Teach	TP SELECTOR SWITCH	This is used to switch between the Teach mode and the Playback mode in combination with the [MODE SELECT SWITCH] on the Virtual I/O window.
 OFF	 ON	ENABLE SWITCH	Used to manually operate the robot in Teach mode. Only while this switch is ON, the robot can be operated manually. When this switch is OFF, the robot can not move.

2.6 Set of Options

In previous FD on Desk, option settings can be freely changed according to the customer's usage. To change option settings, a ***SPECIALIST*** or higher operator class is required. Concerning the operator class, refer to Chapter 4 in "FD INSTRUCTION MANUAL SET UP".

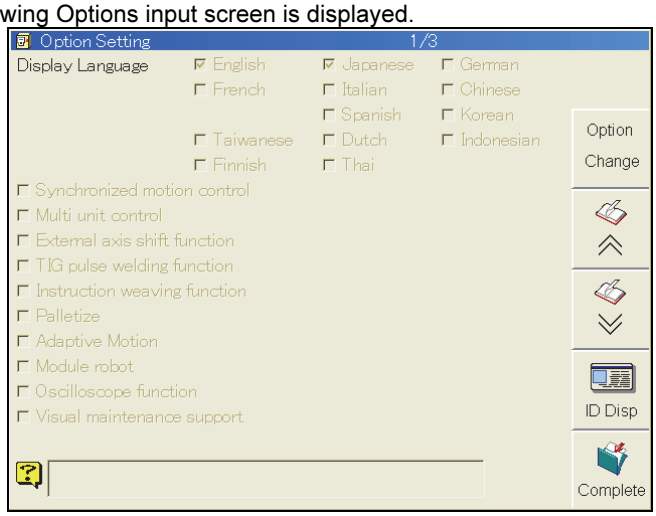
POINT

What is "Operator Qualifications (Operator class)"?
Depending on the operator class (BEGINNER, USER, EXPERT, and SPECIALIST) that is being used, special functions or menus may be omitted on the screen to avoid a careless setting or operations etc.

2.6.1 Operational procedure of setting up of Options

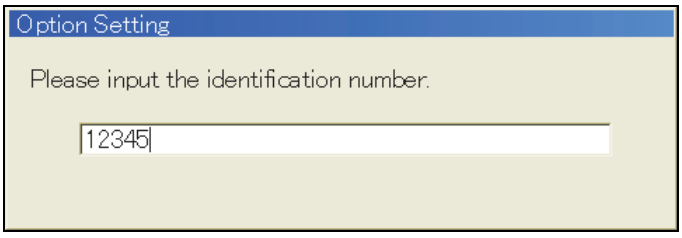
1 **Select the TEACH mode.**

2 **In the Constants Setting menu, select "1. Control Environments", then "5. Options".**
>> The following Options input screen is displayed.

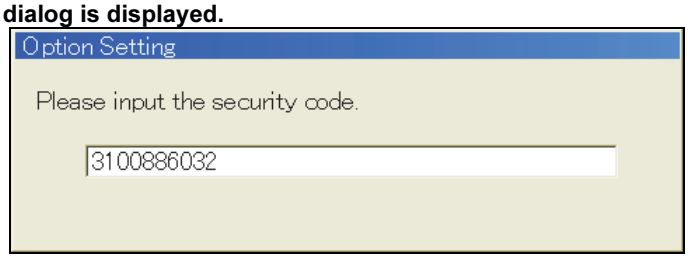


3 **Press f8 key <Option Change>.**

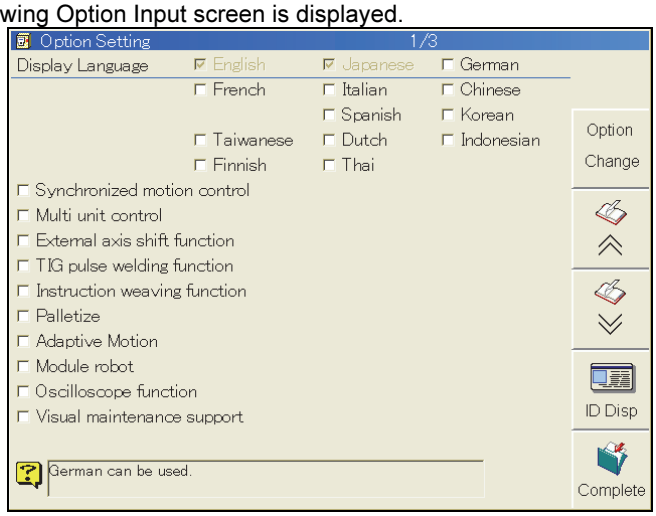
4 **Input numerical values of [12345] and press [Enter], since the following dialog is displayed.**



5 **Next, input numerical values of [3100886032] and press [Enter], since the following dialog is displayed.**

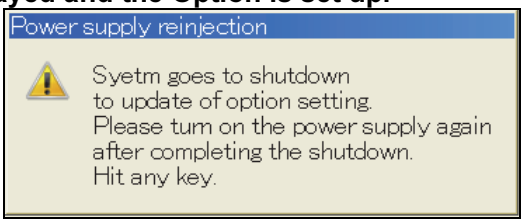


>> The following Option Input screen is displayed.



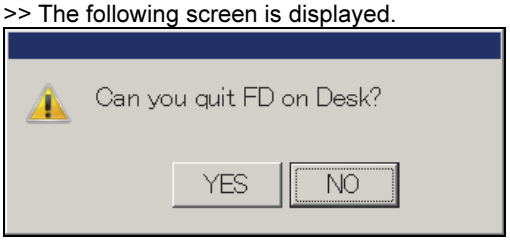
6 **Move the cursor to the Option to be desired and enable the setting to be valid with the key of [Enable + ON] and to be invalid with the key of [Enable + OFF].**

7 **Press f12 key <Complete> after completing the setting. The following dialog is displayed and the Option is set up.**



8 **Press any keys.**

>> The following screen is displayed.



9 **Press [YES] to exit the FD on Desk.**
The option setting will change when restarting the FD on Desk.

2.7 Printing function of PLC program

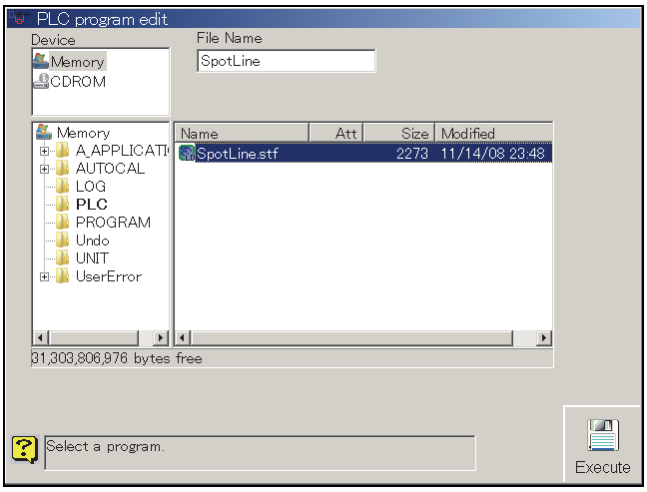
For previous FD on Desk, a created PLC program can be printed using the printer you are using. For editing operation of PLC program and program preparation, see “Software PLC” of instruction Manual of FD Controller.

2.7.1 Printing, Print preview, Setting up of a printer

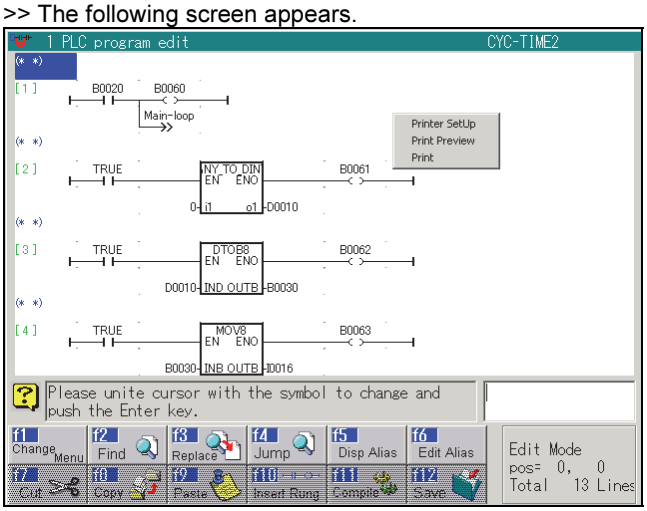
1 **Select the TEACH mode.**

2 **Open the <Service Utilities> menu, select "14. PLC Program", then "1. PLC program edit".**

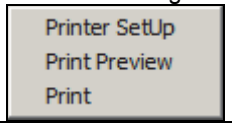
3 **Select a file which is desired to be printed.**



4 **Press f12 key <Execute>.**
>> The following screen appears.



5 **Right click on the window on which the PLC program is displayed.**
>> The following dialog box will be displayed.



6 **Select the menu item and left click.**
>> The selected menu will be executed.

IMPORTANT

More than one PLC programs can not be displayed or printed simultaneously.
Print images and print previews can be different according to models of printers.

2.7.2 Enlarge the PLC program edit screen

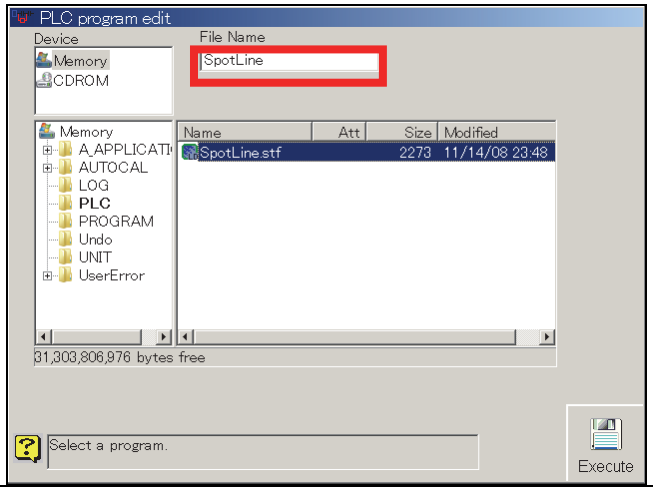
1 **Select the TEACH mode.**

2 **Open the <Service Utilities> menu, select "14. PLC Program", then "1. PLC program edit".**

3 **Select file.**

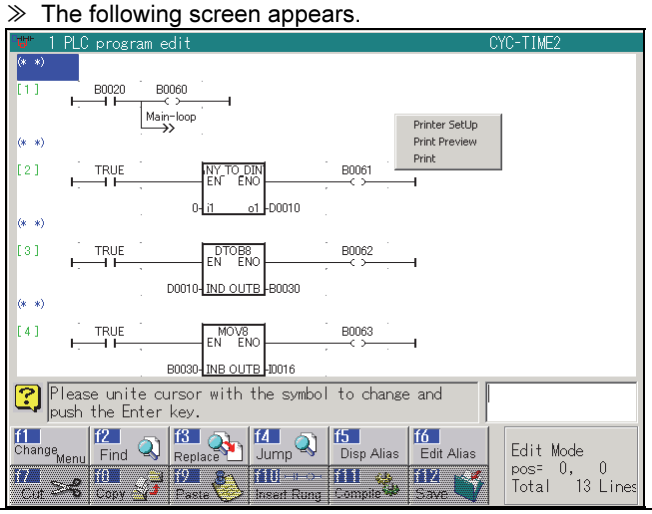
When inputting file name, press edit button with pressing SHIFT key of vertical TP. Or press E button with pressing SHIFT key of keyboard.

When remote connection, press E button with pressing SHIFT key of keyboard because vertical TP is not activated.



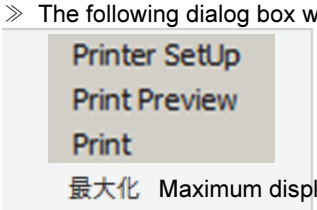
4 **Press f12 key <Execute>.**

≫ The following screen appears.



5 **Right click on PLC program screen.**

≫ The following dialog box will be displayed..



6 **Click "Maximum display" on dialog menu.**

≫ PLC program display is enlarged.

POINT

If you move the position of Virtual FD, PLC program edit screen will be back to the original position.

Chapter 3 Virtual ROBOT

3.1 Outline

3.1.1 Outline of the Virtual Robot

"Virtual Robot" is application software that can display the robots with 3D graphics. This software is equipped with the following features to make it possible to check the layout of the production cell or to make a teaching program for the robot system.

- Creation and edit of simple 3D objects
- Import function for 3D model file like IGES etc.
- Interference detection between 3D models
- Creating "Tag" and robot work program creation using those tags

In this chapter, the basic operations and an example of work-cell are described. For detailed information, refer to the help of the Virtual Robot application software.

3.1.2 The robots supported in the viewer

Concerning the available robots for this software, refer to the list in the install CD.

3.1.3 Restriction of Virtual Robot

Virtual Robot has the following restrictions.

- Functions that require feedback from the real robot or mechanisms (e.g. interference detection based on the feedback from the real motor or encoder, overload detection, etc.) cannot be used.
- I/O signal simulation using "I/O Signal" in FD on Desk II is possible, but because external hardware such as PLC can not be connected, the behavior in conjunction with such hardware cannot be simulated. For example, the waiting status with FN525 WAITI (input signal waiting function) must be released manually by using the "I/O Signal" monitor.
- There are some optional functions that are not available on this software. For details, contact to our sales department when ordering the FD on Desk II.
- There are restrictions with the number of characters of folder name to create the WORK folder at some menu. If using these menus, please make sure to use full width 7 characters or less or half width 15 characters or less.
  - ・I/O setting menu (Operation of peripheral devices)
  - ・Project a curve (Create path)

3.2 Basic operations

3.2.1 Change of the viewpoint

The viewpoint can be moved with the mouse operation.

- Zoom in/ zoom out operation
  Drag the mouse left/right with pressing the center button (wheel).

Zoom in	Drag the mouse to right side with pressing the center button. (F5 key also can be used for this operation)
Zoom out	Drag the mouse to left side with pressing the center button. (F6 key also can be used for this operation)

- Rotation
  Drag the mouse left/right with pressing the center button (wheel) and the right button.

Up/down rotation	Move the mouse up/down. Cursor keys (up/down) can be used for this operation.
Left/right rotation	Move the mouse left/right. Cursor keys (left/right) can be used for this operation.

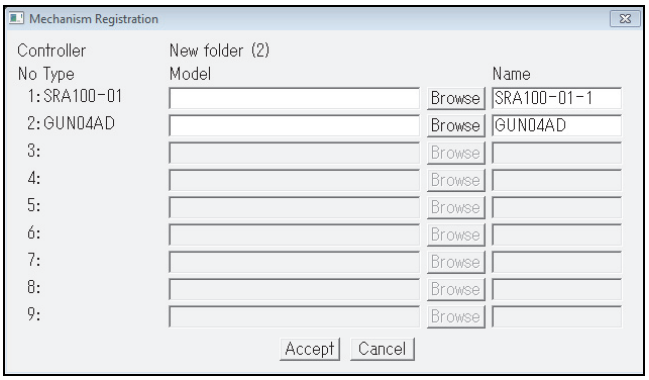
- Parallel movement
  Drag the mouse left/right/up/down with pressing the right button.

The viewpoint change can be done in the menu of [Display] - [View].
For details, refer to the help.

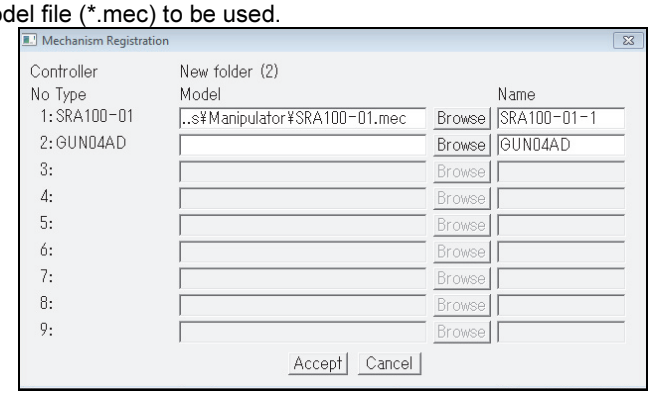
3.2.2 Assignment of the mechanism models

In this example (Robot + Servo gun), mechanism model files (*.mec) are assigned to the respective mechanisms in the virtual FD. The loaded/assigned mechanism models will move referring to the posture of each mechanism in the Virtual FD.

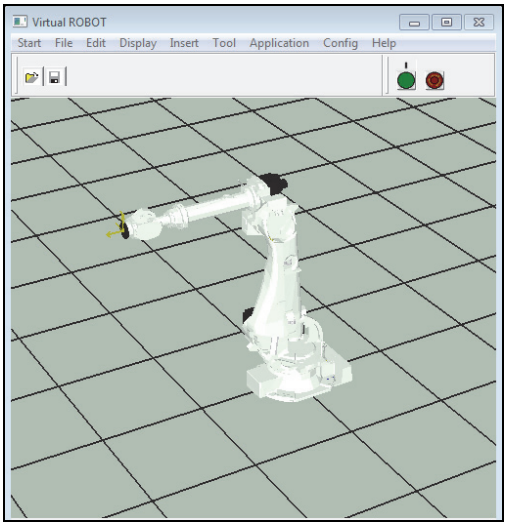
1 **Open <Insert> - [Import Mechanism] - [Manipulator/Aux. Axes (driven by Servo)].**
>> The following window will be displayed.



2 **Select the mechanism model file for the manipulator and other mechanisms.**
>> If [Browse] is clicked, a file selection dialog window will open. Then select the desired mechanism model file (*.mec) to be used.

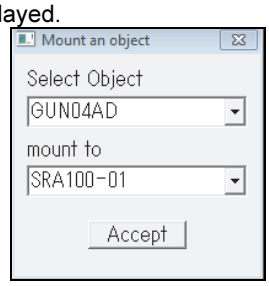


3 **Click the [Accept] button.**
>> The selected mechanism model files will be loaded.

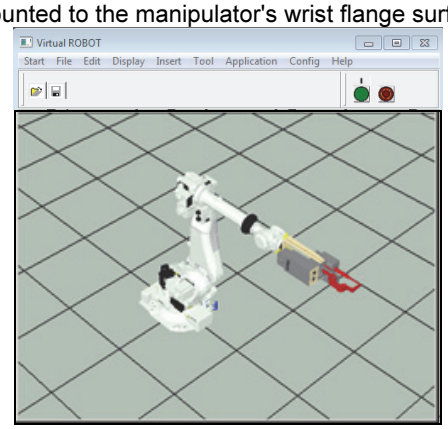


The loaded mechanism model will be placed on the origin of the world coordinate system. To change the layout, please use the menu of [Tool] - [Layout]- [Placement Editor].

4 **Select [Tool] - [Mount].**
>> The following window will be displayed.



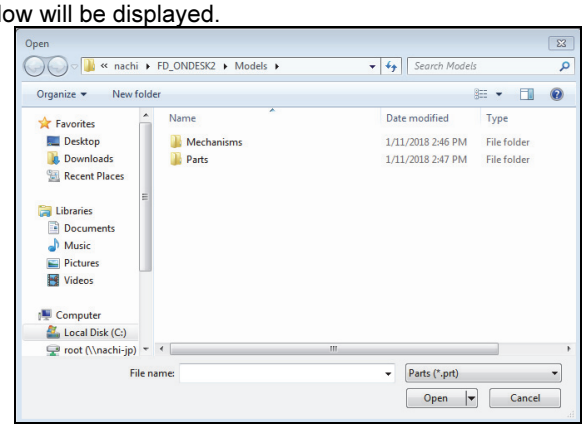
5 **Select the gun for "Select Object" and select the manipulator for "mount to", and then click "Accept".**
>> The servo gun will be mounted to the manipulator's wrist flange surface.



3.2.3 How to import model data

This section explains how to import model data.

1 **Open [File] – [Open].**
>> The following window will be displayed.

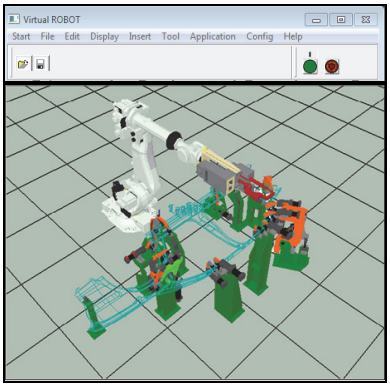


Available file formats are;
- VRML(*.wrl)
- Parts(*.prt)
- IGES(*.igs)
- STEP(*.stp, *.step)
- DXF(*.dxf)
- STL(*.stl)

CAUTION

When the file at the network such as OneDrive is specified, there is a possibility that the error may occur at the time of reading. Please refer to the file at the local disk in your computer.

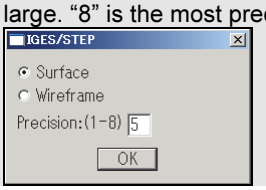
2 **After selecting the file type and the file name, click [Open].**
>> The selected model file will be loaded.



The loaded mechanism model will be placed on the origin of the world coordinate system. To change the layout, please use the menu of [Tool] - [Layout]- [Placement Editor].

POINT

For the STEP/IGES format, when the following dialog box appears, select an import method ("Surface" or "Wire frame") and a level (1 to 8) for "Precision". The accuracy becomes good, as a value become large. “8” is the most precision.



3.3 The environment of the real Robot

When performing off-line teaching, it is necessary to import the environment of the real robot into FD on Desk II. Moreover, it is necessary to use FD on Desk II in creating data and reflecting changes made to a program or parameter in the FD controller.
Here, those methods are explained.

3.3.1 Importing and Editing the settings of the FD controller and FD on Desk II

Import programs and parameters of the FD controller into FD on Desk II.

A folder named "WORK" is created under either of the following folders: a folder (whose name is specified arbitrarily) created by the backup function of FD on Desk II (refer to 1.4.19) or the folder "NRA2001-****-**-**-****" created by the backup function of the FD controller.
When creating a new project (refer to 1.4.3), by selecting the above WORK folder, it is possible to import a set of programs and parameters into FD on Desk II.
Also, it is possible to import such data as an individual program, user task, and posture file through the data transfer function (refer to 1.4.10) from the FD controller.

Export programs and parameters of FD on Desk II to the FD controller.

If a change is made to a program or parameter in the imported "WORK" folder using FD on Desk II, it will be reflected in that folder. When this "WORK" folder is specified through the backup function of FD on Desk II (refer to 1.4.20) or the backup data restore function, a set of programs and parameters created using FD on Desk II will be reflected in the FD controller.
Also, it is possible to export data such as an individual program, user task, and posture file through the data transfer function (refer to 1.4.10) to the FD controller.

POINT

For details on the backup and backup data restore operations using the FD controller, see Chapter 6 in the instruction manual "BASIC OPERATIONS MANUAL".

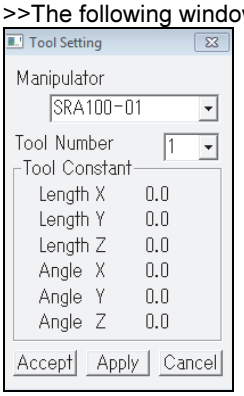
POINT

It is only a setup of virtual FD which can be read by setup of FD control device.
It is necessary to load/assign a mechanism file in Virtual ROBOT separately.

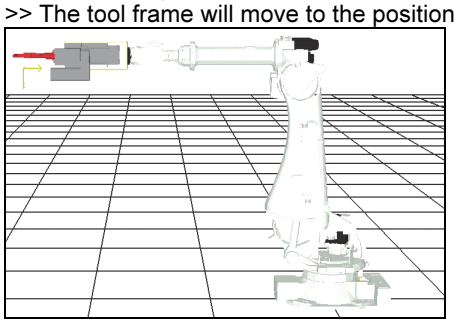
3.3.2 Tool Setting

The tool length and tool angle set with the real robot can be exported into Virtual ROBOT. Refer to Chapter 4 in "FD INSTRUCTION MANUAL SET UP" for details on how to set the tool length and tool angle with the real robot.
If "photography of the real robot and a tool" and "record of the robot posture at the time of photography" are beforehand prepared, you can set up easily.

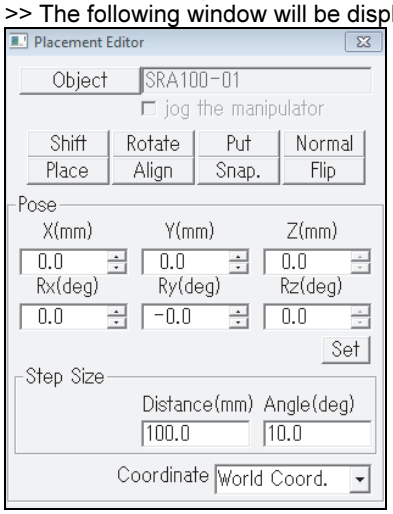
1 **Open [Tool] – [Constant Setting] – [Tool Constants].**
>>The following window will be displayed.



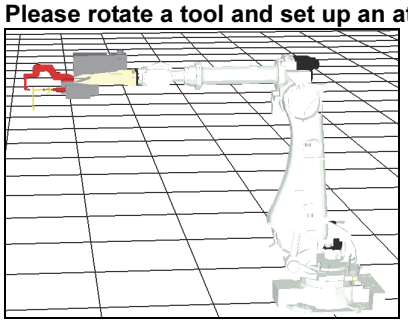
2 **After selecting "Tool Number" and click "Accept".**
>> The tool frame will move to the position that is registered in the Virtual FD's tool constant.



3 **Open [Tool] – [Layout] – [Placement Editor].**
>> The following window will be displayed.



4 **Please rotate a tool and set up an attachment position.**



3.3.3 Calibration

Adjust the spatial relationship of a workpiece (or jig or peripheral device) in Virtual ROBOT based on the real robot.
Please prepare the program which carried out teaching so that it might point to 3 reference positions on a work (a jig, peripheral equipment) at the tool tip with the real robot, before this operation.

POINT

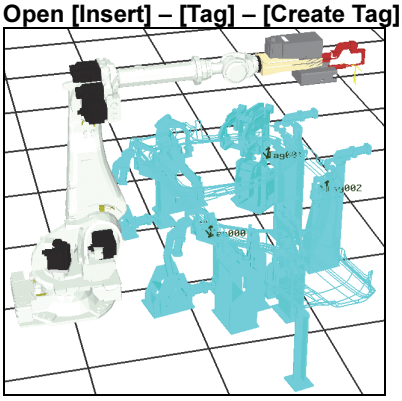
The distance of three reference positions is detached as much as possible. It will become more exact if it is made to become a big range.

POINT

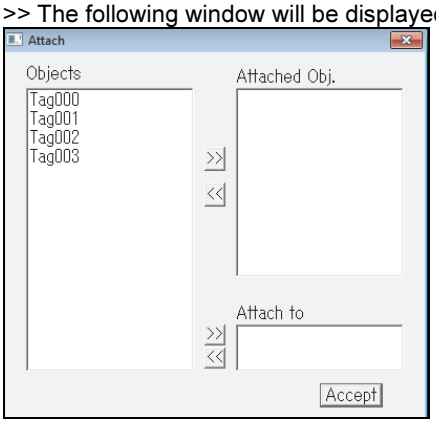
If the thing keenly sharp at the tip of a tool is used, the teaching of the three reference positions can be carried out more correctly.

1 **Import the program and parameter of FD controller, and import a model data.**

2 **Open [Insert] – [Tag] – [Create Tag]. And create tags on 3 reference positions.**

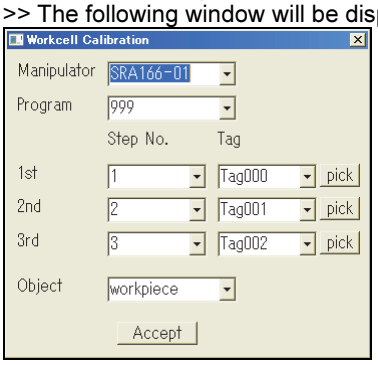


3 **Open [Tool]—[Attach/Detach]—[Attach].**
>> The following window will be displayed.



4 **Set tags on "Attached Obj.", and set the work (or the jig, peripheral equipment) "Attach to". Then, click Accept.**
>> Tag will be attached.

5 **Open [Tool] – [Layout] – [Workcell Calibration].**
>> The following window will be displayed.



6 **Set the "Manipulator", "Program", "Step No.", "Tag", "Object".**
For the "Program", select a program that has 3 reference positions on the work-piece.
For the "Step No." and the "Tag", select each reference step.

7 **Click "Accept".**
>> The following message is displayed.
"Error is 1.2. Do you apply?"

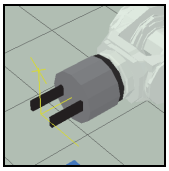
8 **Click [OK].**
>> The position of the work-piece will be moved.

Chapter 4 Operation Example (1) Creating a Work-Cell

This chapter shows an example of how to create a work-cell in "Virtual ROBOT".

4.1 Composition of FD on Desk II

In this example, the robot system is configured like the following.

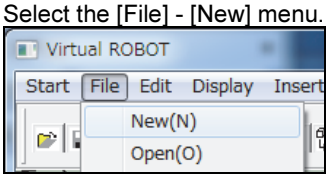
Number of UNIT	1
Number of mechanisms	1 (SRA166-01) 
Tool	Gripper Output signal O1 = ON : Clamp Output signal O1 = OFF : Unclamp Input signal I1 = ON : Clamp Status Input signal I1 = OFF: Unclamp status 

When performing memory format operation on the controller using FD on Desk II (such as defining the unit, mechanism, and robot model), refer to the instruction manual, "Memory format procedure".

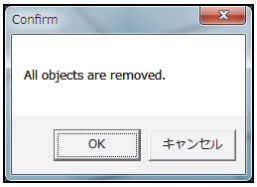
4.2 Creating a workcell

4.2.1 Initialize the workcell

Select the [File] - [New] menu.



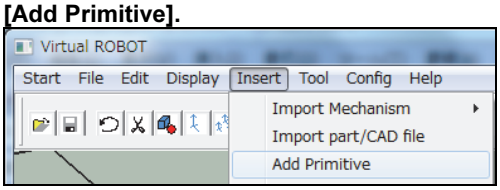
A message of "All objects are removed." will be displayed. Click [OK] to delete the all objects in the work-cell.



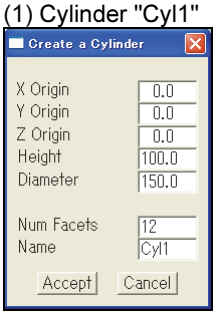
4.2.2 Creating a tool (gripper)

0 **Use [Start], then [Create a Part file] to set a work table for creating a part model.**

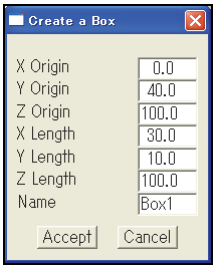
1 **Create models (1), (2), and (3) below in sequence by using [Insert] and [Add Primitive].**



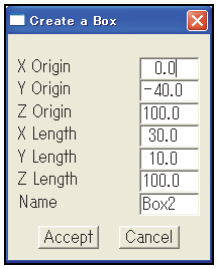
(1) Cylinder "Cyl1"

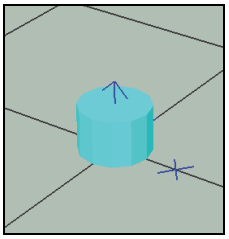


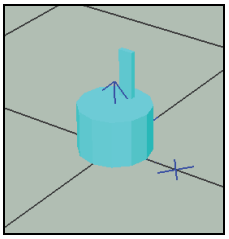
(2) Box "Box1"

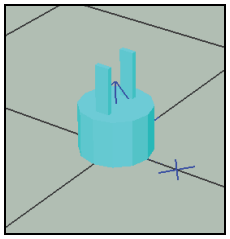


(3) Box "Box2"

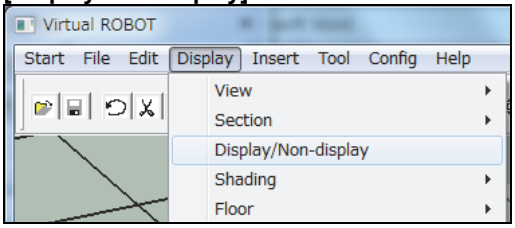






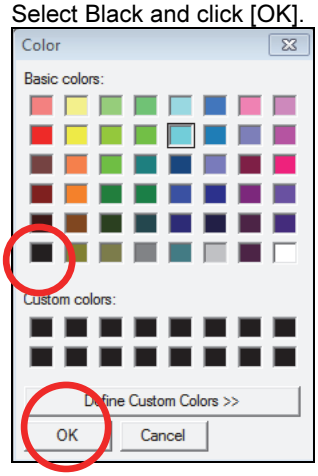


2 **Let's assign colors for the respective objects. Select [Display] – [Display/Non-display].**

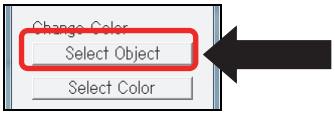


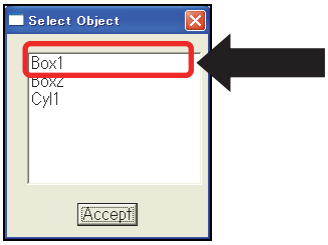
3 **Click [Select Color].**

Select Black and click [OK].

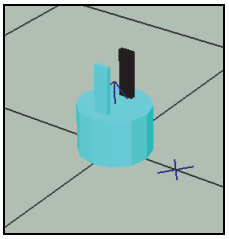


Select "Box1" from the "Select Object".

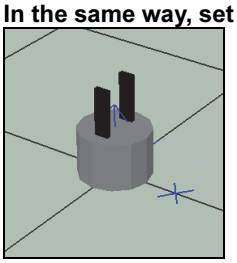




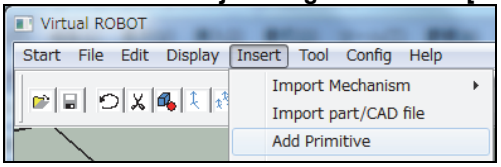
The color of "Box1" turns to black.



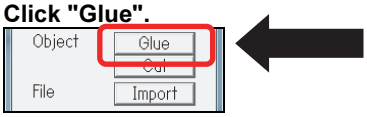
4 **In the same way, set the "Box2" to black and set the "Cyl1" to gray.**



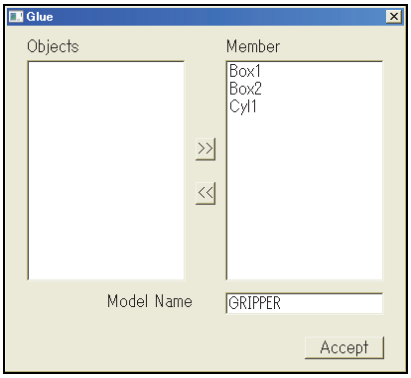
5 **Let's combine 3 objects together. Select [Insert] – [Add Primitive].**



6 **Click "Glue".**

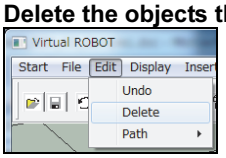


7 **Register the all objects to "Member" using >>. And set the "Model Name" as "GRIPPER".**

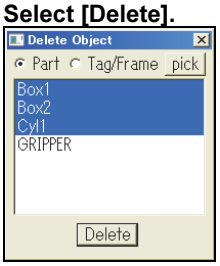


Now a 3D object that consists of "Box1", "Box2", and "Cyl1" was defined.

8 **Delete the objects that are not necessary.**

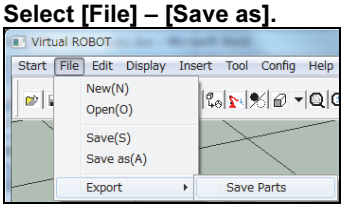


Select [Delete].

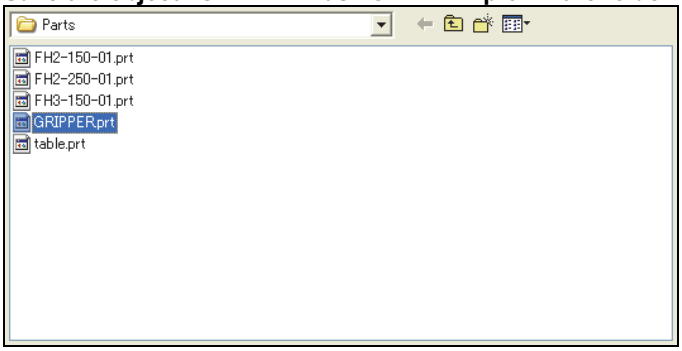


Select Box1, Box2, and Cyl1, and then press the [Delete] button.

9 **Select [File] – [Save as].**



10 **Save the object "GRIPPER" as "GRIPPER.prt" in the folder of "Parts".**



Now a shape of a gripper is created as a part "GRIPPER".

POINT

In this example, the "world coordinate system" in the workcell where the gripper object was defined will be used as a base coordinate system of the gripper.

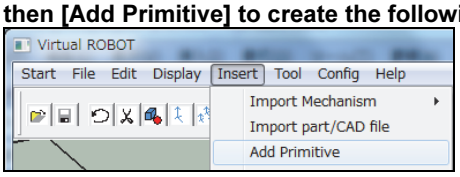
POINT

It is also possible to import a 3D model data like IGES as a tool. In that case, please pay attention to the following points;

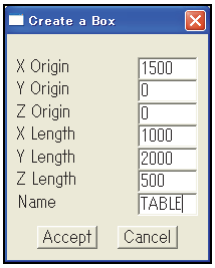
- Simplify the objects (lighten the amount of the data) as much as possible.
- Define the object so that its reference (base) coordinate system becomes the robot's wrist coordinate system.

4.2.3 Creating a work table

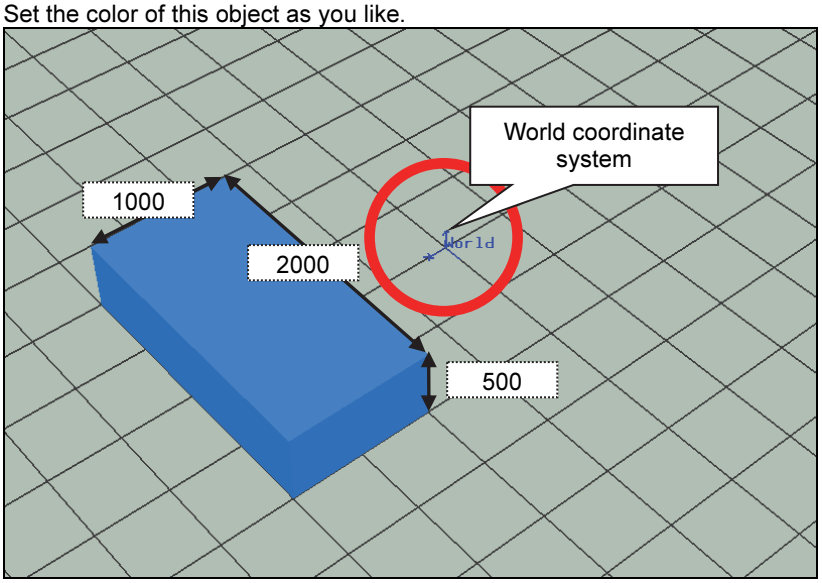
1 **After initializing the work-cell by selecting [File], then [New], use [Insert], then [Add Primitive] to create the following object.**



Box "TABLE"



Set the color of this object as you like.

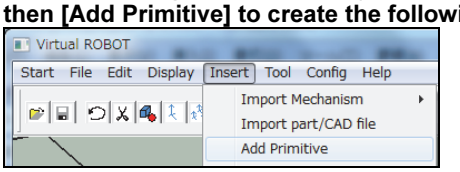


(NOTE)
- In this example, the size of a grid is 500[mm] x 500[mm].
- Because the origin of the TABLE is (1500, 0, 0), this object does not pile up on the world coordinate system.

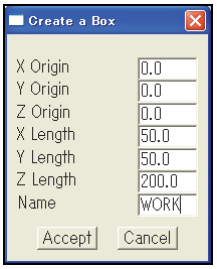
2 **Save this "TABLE" as a part "TABLE.prt" referring to "4.2.2 Creating a tool (gripper)".**

4.2.4 Creating a work-piece

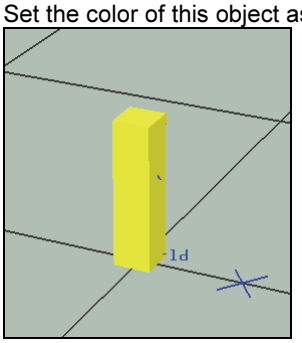
1 **After initializing the work-cell by selecting [File], then [New], use [Insert], then [Add Primitive] to create the following object.**



Box "WORK"



Set the color of this object as you like.

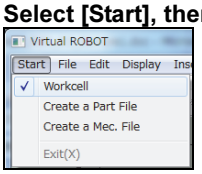


2 **Save this "WORK" as a part "WORK.prt" referring to "4.2.2 Creating a tool (gripper)".**

4.2.5 Placing each object in the workcell

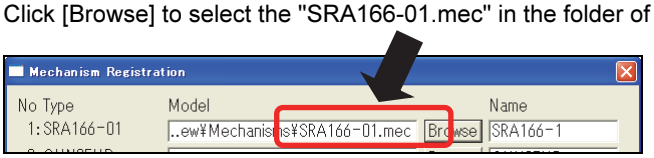
Let's place each part and the robot in the workcell.

0 **Select [Start], then [Workcell].**

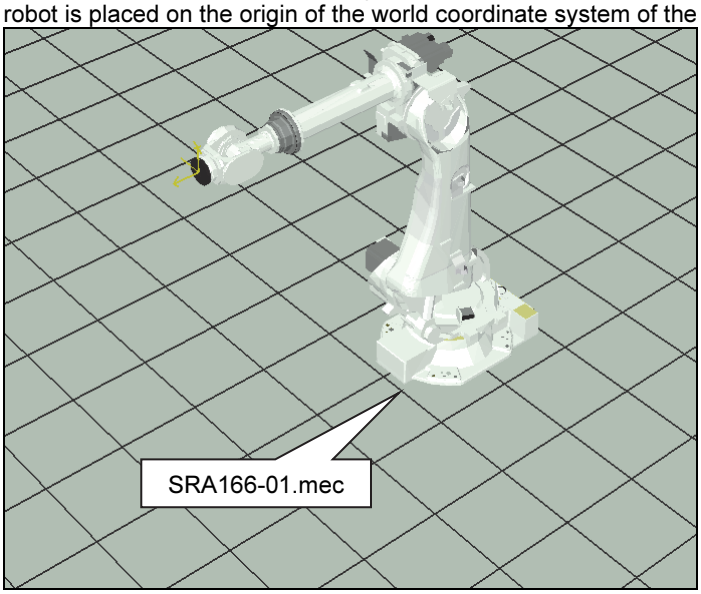


1 **Select [Insert], [Import Mechanism], then [Manipulator / Aux. Axes (driven by Servo)].**

Click [Browse] to select the "SRA166-01.mec" in the folder of "Mechanisms".



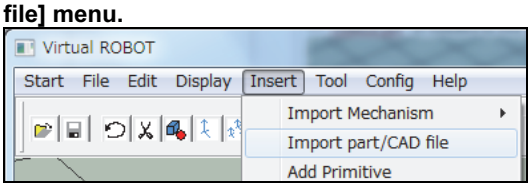
When "Accept" is clicked, a robot model "SRA166-01.mec" is loaded for the mechanism 1. In this case, the origin of the mechanism coordinate system of the robot is placed on the origin of the world coordinate system of the workcell.



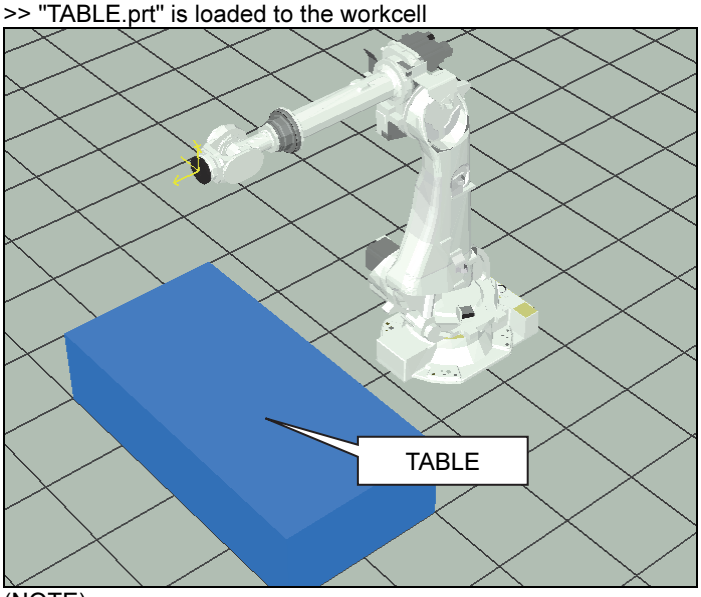
POINT

In case of single robot system, normally, the robot's mechanism coordinate system (base coordinate system) will be placed on the world coordinate system. However, in case of a system in which plural mechanisms try to make a cooperative motion, it is necessary to define the location and the angle of the respective mechanism coordinate systems correctly.

2 **Open the "TABLE.prt" in the "Parts" folder using [Insert] – [Import part/CAD file] menu.**



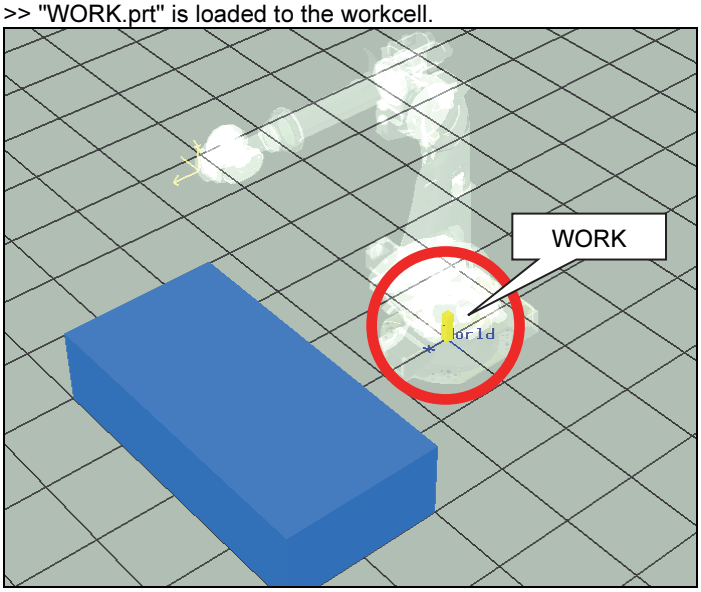
>> "TABLE.prt" is loaded to the workcell



(NOTE)
Because the origin of the "TABLE" is (1500, 0, 0), this object will be placed in a position like this picture.

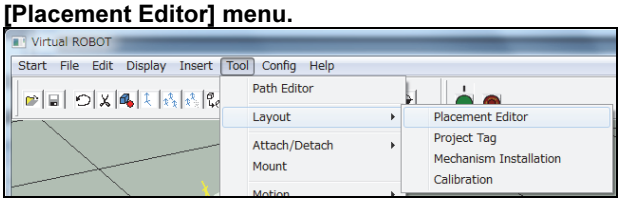
3 **Open the "WORK.prt" in the "Parts" folder using [Insert] – [Import part/CAD file] menu.**

>> "WORK.prt" is loaded to the workcell.

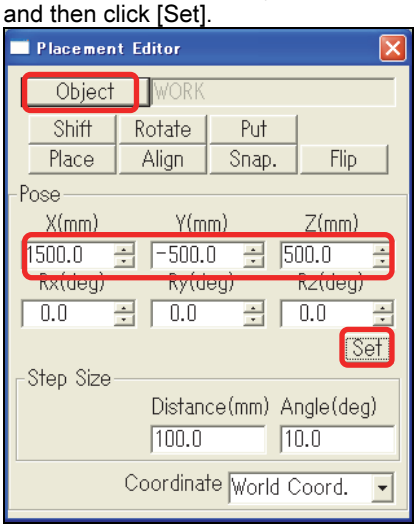


(NOTE)
- Because the origin of the "WORK" is (0, 0, 0), this object will be placed on the origin of the world coordinate system.
- In this picture, the robot color is set to transparent for the explanation. ([Display] – [Display/Non-display] – [Change Transparency])

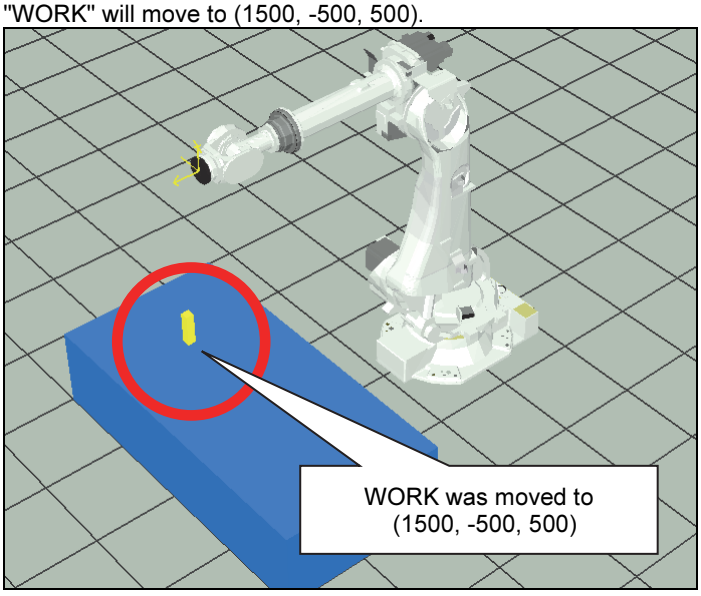
4 **Change the location of the "WORK". Select [Tool] – [Layout] – [Placement Editor] menu.**



Select "WORK" with "Object" button and then enter (1500, -500, 500) for (X, Y, Z) and then click [Set].

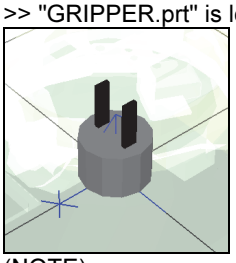


"WORK" will move to (1500, -500, 500).



5 **Open the "GRIPPER.prt" in the "Parts" folder using [Insert] – [Import part/CAD file] menu.**

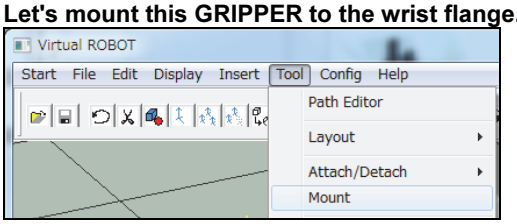
>> "GRIPPER.prt" is loaded to the workcell.



(NOTE)

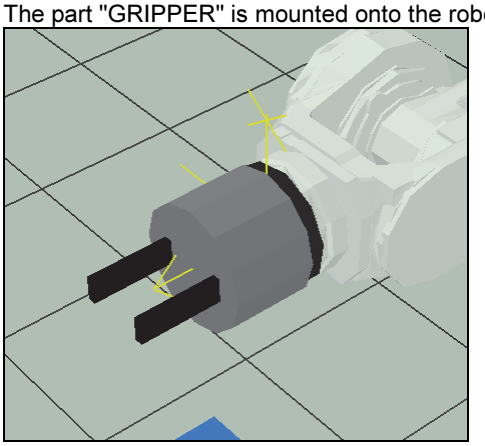
- Because the origin of the "GRIPPER" is (0, 0, 0), this object will be placed on the origin of the world coordinate system.

6 **Let's mount this GRIPPER to the wrist flange. Select [Tool], then [Mount].**

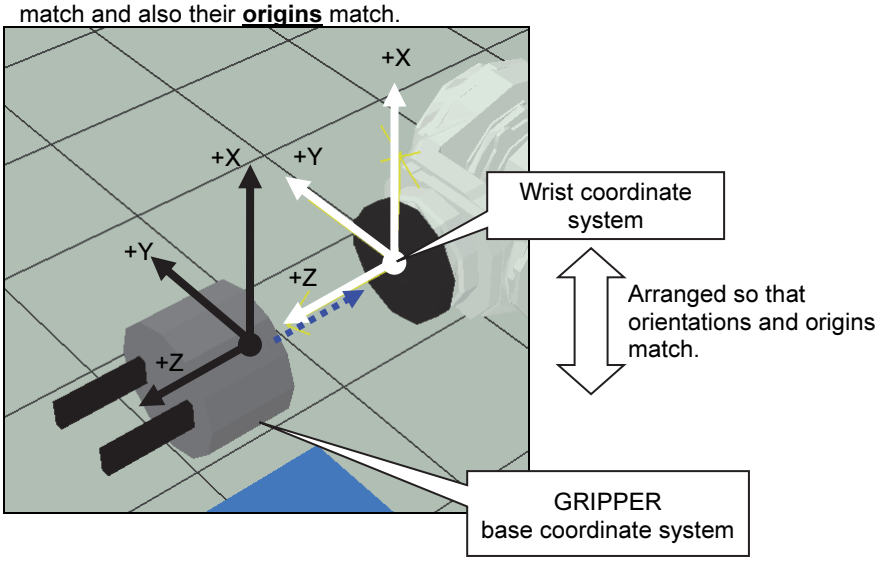


Object: GRIPPER
Mount to: SRA166-01
Set as

The part "GRIPPER" is mounted onto the robot tool flange.

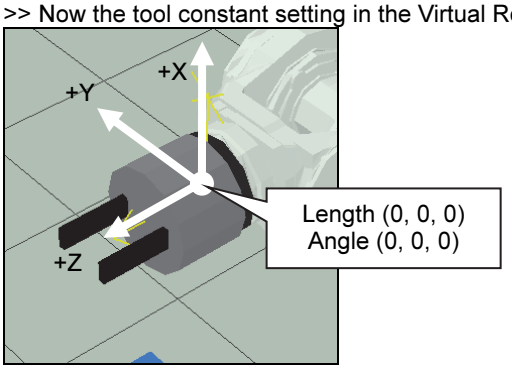


(NOTE)
- When "**Mount**" is executed, the base coordinate system of GRIPPER and the wrist coordinate system at the tool flange are arranged so that their **orientations** match and also their **origins** match.



7 **Next, set the tool constant.**

>> Now the tool constant setting in the Virtual Robot is still default setting.

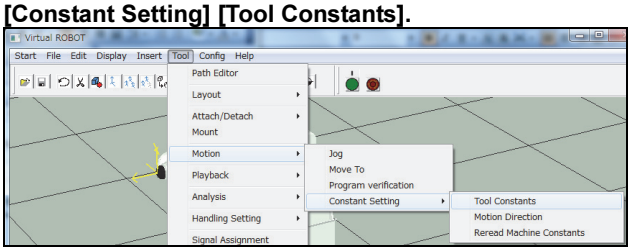


In the Virtual FD screen, set the constant for tool 1 as follows.

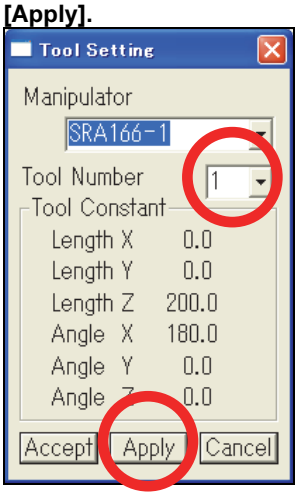
Length	(mm)	x	0.0	y	0.0	z	200.0
Angle	(deg)	x	180.0	y	0.0	z	0.0

(For the detailed operation, refer to the instruction manual "SETUP").

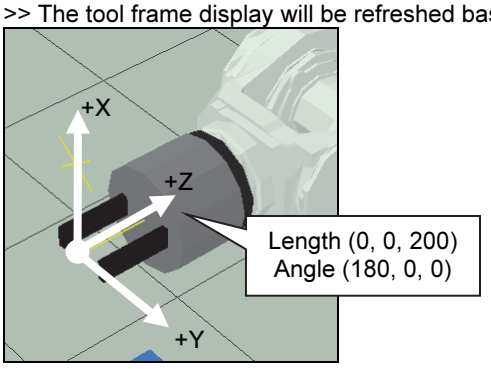
Copy the tool constant on Virtual FD to Virtual Robot. Open <Tool> [Motion] [Constant Setting] [Tool Constants].



After selecting "1" for "Tool Number 1", click [Apply] to load the tool constant on Virtual FD into Virtual ROBOT. After confirming the values, click [Apply].



>> The tool frame display will be refreshed based on the loaded tool constant.

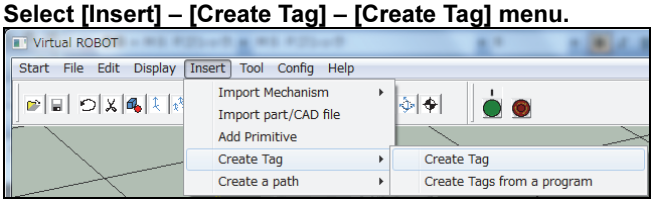


4.3 Creating a program

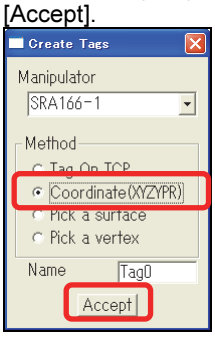
Let's create a simple program in the workcell.
Please select program number 1 on Virtual FD in advance.

4.3.1 Creating a teaching point using a "Tag"

1 **Select [Insert] – [Create Tag] – [Create Tag] menu.**

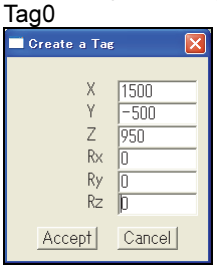


After inputting Tag name and select "Coordinate(XYZRPY)" and then click [Accept].

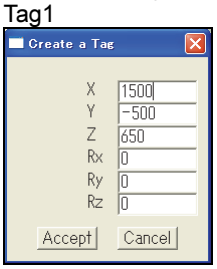


Create Tag0 and Tag1 with the following settings.

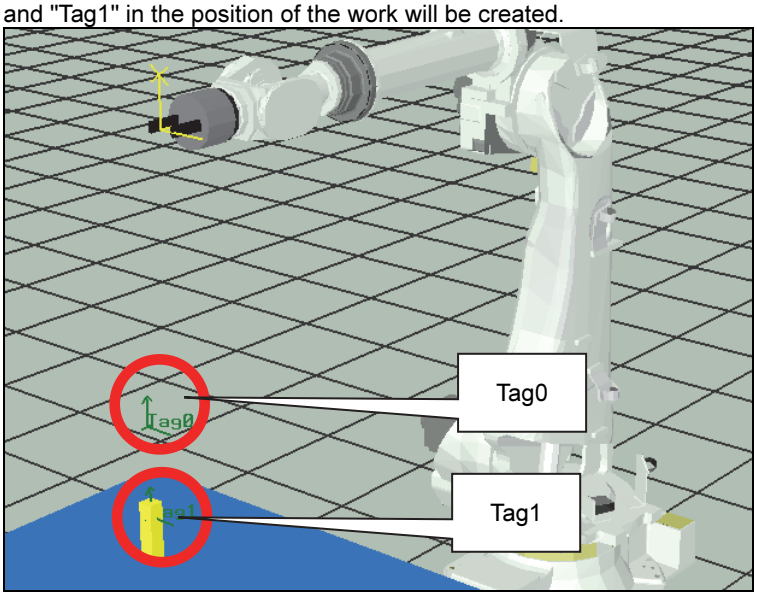
Tag0



Tag1

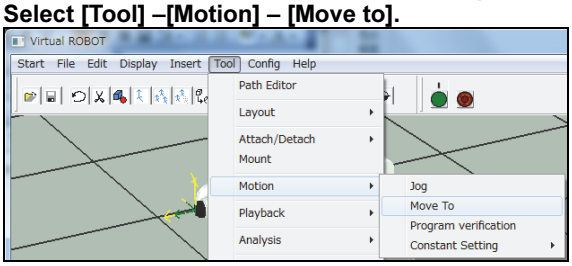


"Tag0" in a position 300mm higher than the work,
and "Tag1" in the position of the work will be created.

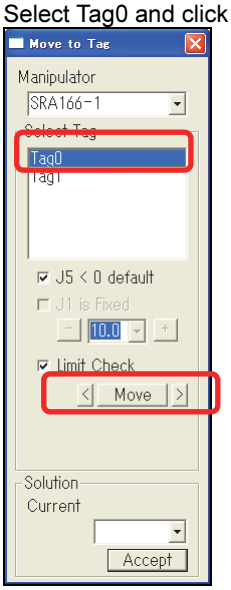


4.3.2 Move the robot to the Tag and record the position in the work program

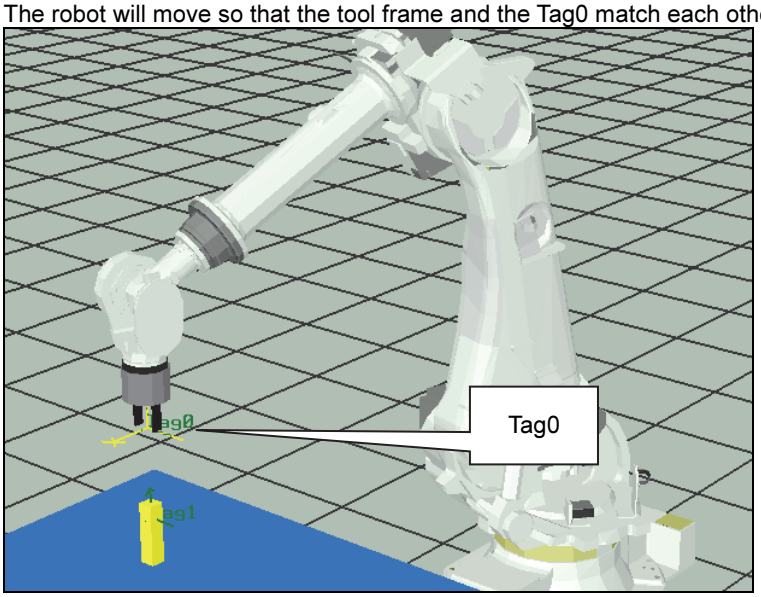
1 **Let's move the robot to the position of Tag0.**
Select [Tool] –[Motion] – [Move to].



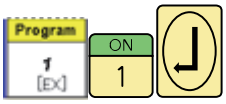
Select Tag0 and click [Move].



The robot will move so that the tool frame and the Tag0 match each other.

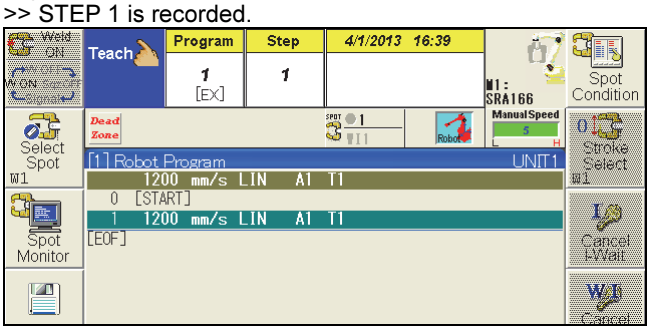


- If the target Tag is placed on a location where the robot can not reach or placed with angle that the robot can not make, error will occur.
- There may be a case where robot can make plural sets of axis angles for 1 Tag. In that case, it is possible to designate one of them for the robot's posture.

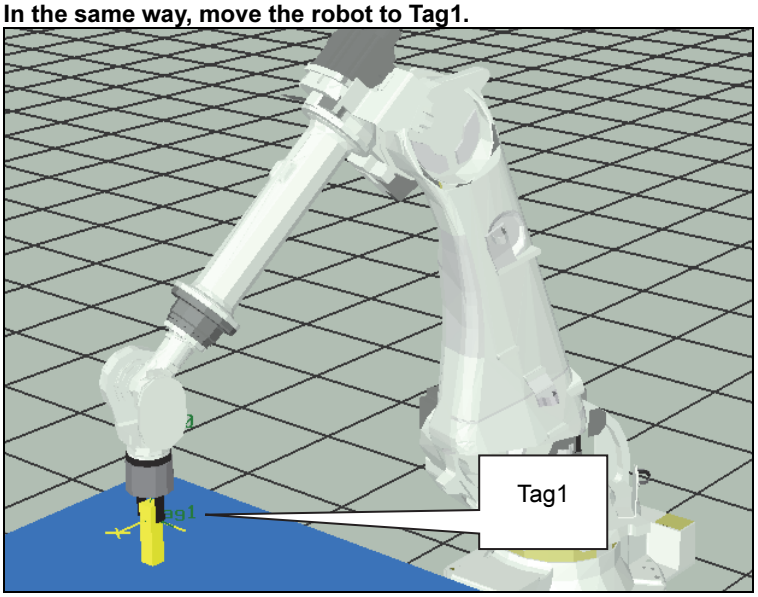


2 **Record this position as STEP 1. Click the "Program" icon on Virtual FD, enter '1' to open program 1, and press the "RECORD" key. ("C" key of the keyboard can be used instead of this)**

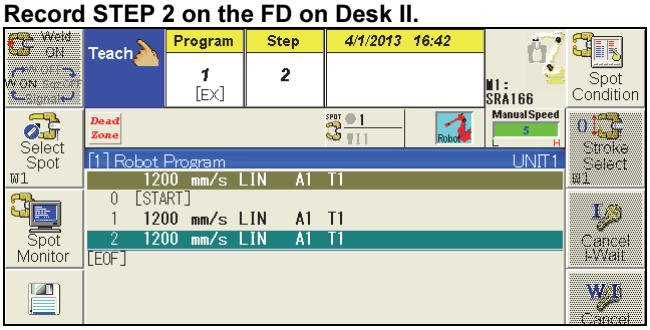
>> STEP 1 is recorded.



3 **In the same way, move the robot to Tag1.**



4 **Record STEP 2 on the FD on Desk II.**



Now 2 teaching points were created in the work program.

4.3.3 Finishing the program

1 **Using the 2 steps created in the previous section, make a program like the following picture. Concerning the details of operation, refer to the instruction manual "BASIC OPERATIONS MANUAL".**

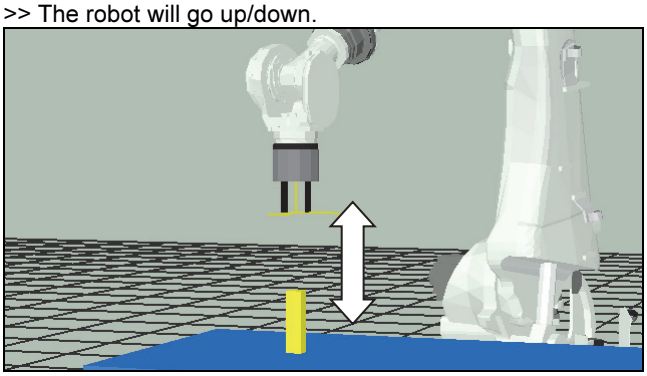
```
      1200 mm/s LIN   A1  T1
  0  [START]
  1   1200 mm/s LIN   A1  T1
  2   1200 mm/s LIN   A1  T1
  3  SETM[01,1]                  FN105;Output signal
  4  WAITI[I1]                   FN525;Wait Input cond
  5   1200 mm/s LIN   A1  T1
  6  DELAY[1]                    FN50;Timer delay
  7   1200 mm/s LIN   A1  T1
  8  SETM[01,0]                  FN105;Output signal
  9  WAITJ[I1]                   FN526;Wait not Input c
 10   1200 mm/s LIN   A1  T1
 11  END                         FN92;End
[EOF]
```

(NOTE)

STEP 1: Record at the position of Tag0
STEP 2: Record at the position of Tag1
STEP 5: Copy of STEP 1
STEP 7: Copy of STEP 2
STEP 10: Copy of STEP 1

2 **Perform CHECK GO operation on the robot operation panel.**

>> The robot will go up/down.

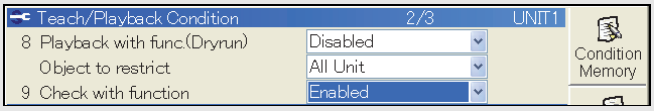


(Supplement) At the step of FN525 and the FN526, use "Cancel I-Wait" key to release the waiting condition for Input Signal.

INFO.

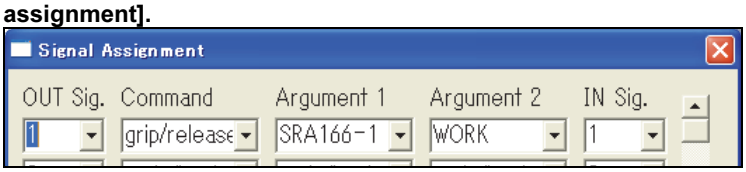
- In "User IO", turn ON input signal 31 (Ext. unit play stop) in advance.

- Please confirm in advance that "Enabled" is selected for "9 Check with function" in the "Teach/Playback Condition" screen. Without the above setting, an applied function such as SETM and DELAY cannot be executed.



4.3.4 How to simulate the movement of a work-piece with I/O signal assignment

1 **When this state continues, even if the robot turns ON/OFF output signal O1, the workpiece ("WORK") remains fixed to the table ("TABLE"), though it should be clamped or unclamped by the gripper. This is unusual. Therefore, make a setting like the following picture in the menu of [Tool] – [Signal assignment].**

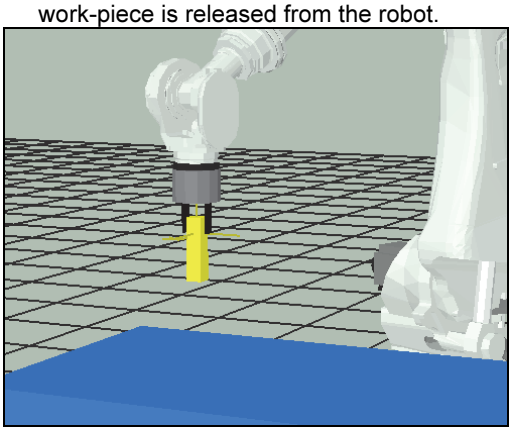


By this setting, the movement of the WORK will be set as following;

■ When output signal O1 is set to ON;
The WORK is attached to the wrist of SRA166-01 robot and follows the movement of the robot.
(Input signal I1 will be set to ON at the same time.)

■ When output signal O1 is set to OFF
The WORK is released from to the wrist of SRA166-01 robot and fixed to the released position.
(Input signal I1 will be set to OFF at the same time.)

2 **After completing this setting, try CHECK GO/BACK operation again.**
>> When the output signal 1 (O1) turns ON, the work-piece is attached to the robot and starts to move with the robot. When the output signal 1 (O1) turns OFF, the work-piece is released from the robot.



Chapter 5 Operation Example (2) Sealing

This chapter introduces the procedure for off-line teaching in FD on Desk II by using a sealing application as an example.

5.1 Outline

In this chapter, the off-line teaching procedure in FD on Desk II is introduced by showing as an example how to create a program for applying a sealing agent to the workpiece indicated in Fig. 5.1.1 Workpiece to which a sealing agent is applied.

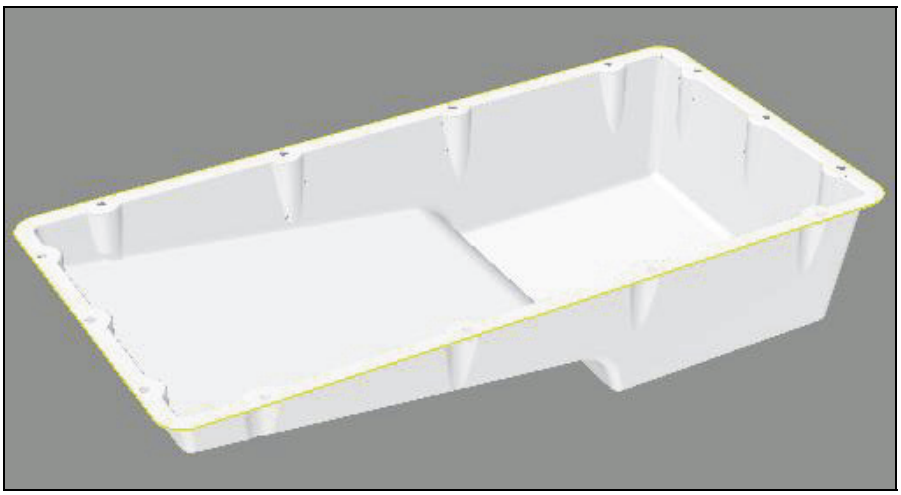
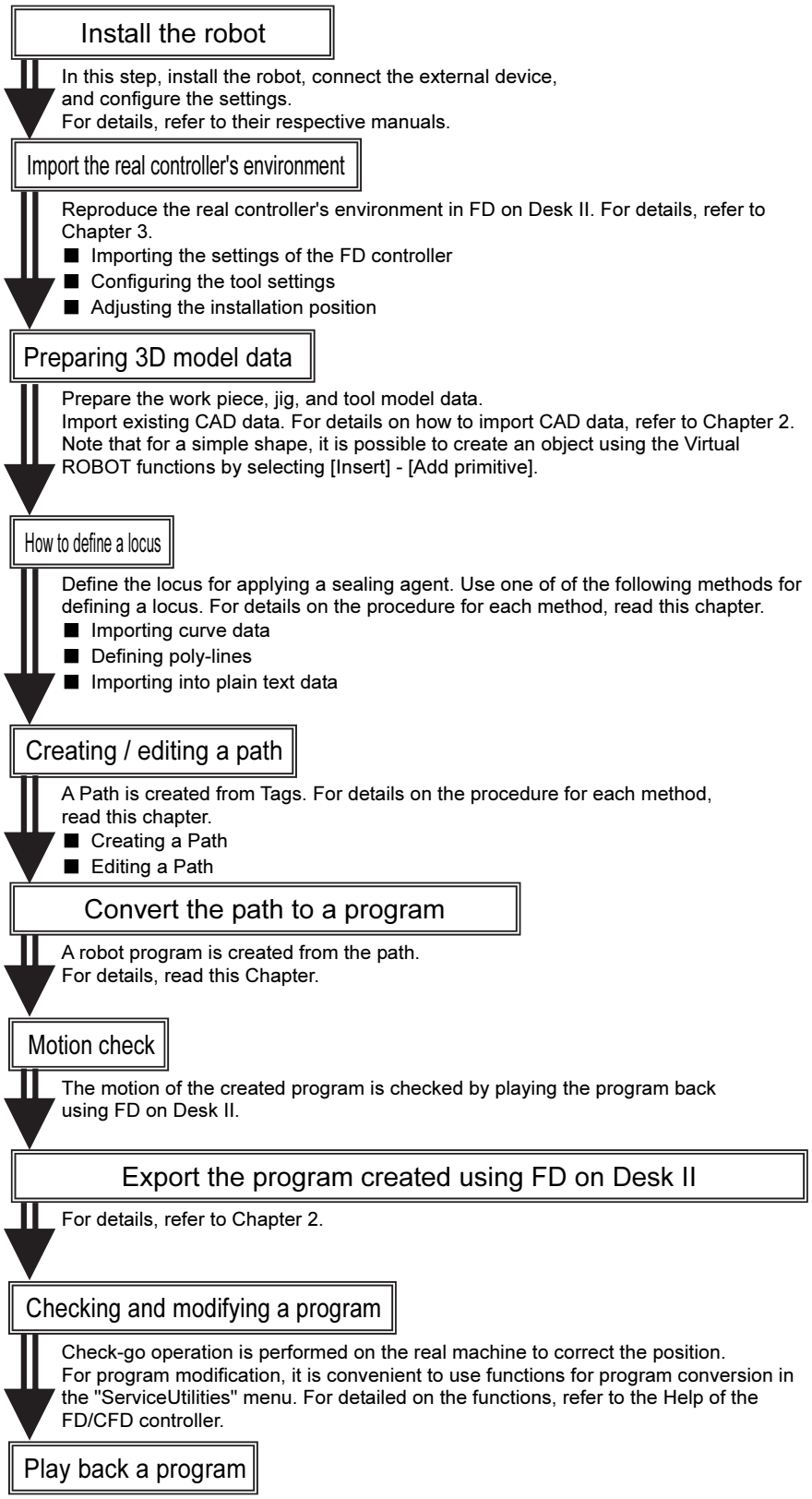


Fig. 5.1.1 Workpiece to which a sealing agent is applied

5.1.1 Procedures



5.2 How to define a locus

In this section, how to define a locus for applying the sealing motion is described.
There are 3 ways to define the locus. Please choose one of these 3 ways.

- Importing curve data
- Picking (clicking) the workpiece model with the mouse
- Importing a plain text data file

Use one of these methods.

The defined locus can be loaded to the Virtual ROBOT window as an object.
For example, a locus object for applying a sealing agent to the workpiece in Fig. 5.1.1 Workpiece to which a sealing agent is applied is displayed in the Virtual ROBOT window as shown in Fig. 4.2-1.

When you select [Insert] - [Add Primitive], and then click [Select Obj], names are displayed as shown in Fig. 4.2-2. By selecting an object here, it is possible to transfer parallel or rotate it. It is also possible to delete it from [Edit] – [Delete] menu.
In the next section, how to create a work-program for a robot using this object is described.

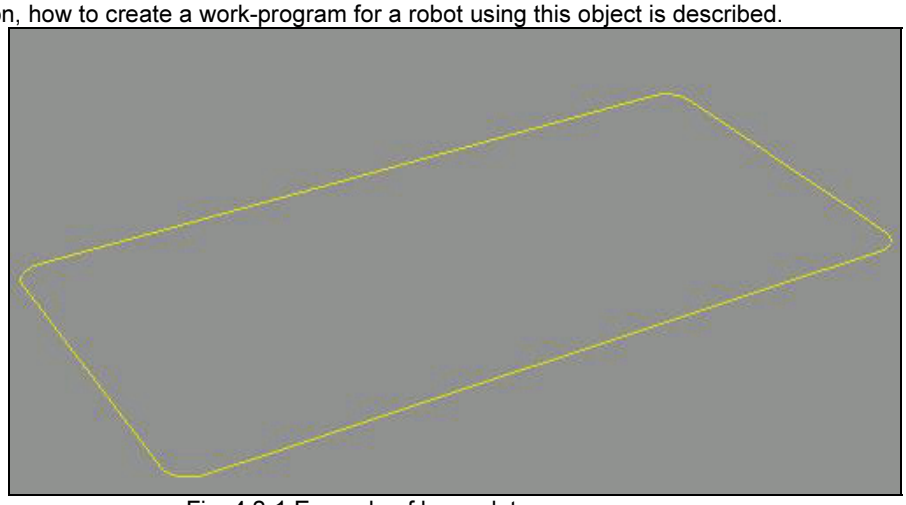


Fig. 4.2-1 Example of locus data

Fig. 5.2.1 Display of object names

5.2.1 Definition by importing a curve data from a file

Using CAD software, a defined TCP locus can be imported to the Virtual ROBOT window.
After making a locus by a curve and a line using CAD software in the market, save it in a STEP, IGES, or DXF format. (STEP is recommended)
And the file can be imported from the menu of [Insert] – [Import part/CAD file]. When importing the file, the object name is set referring to the file name.

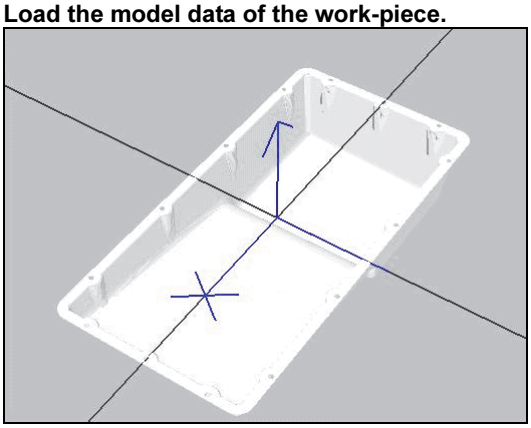
POINT

Concerning “How to import model data”, see the chapter2.

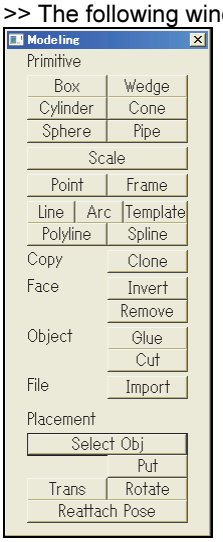
5.2.2 How to define: Picking the work-piece model

In the Virtual ROBOT window, define the locus at the tool tip. By picking (clicking) the edges or the vertexes of a work-piece, create a locus object in a form of poly-line.

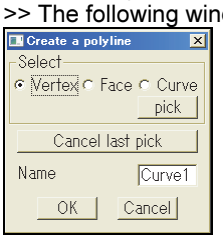
1 **Load the model data of the work-piece.**



2 Open the menu of [Insert] – [Add primitive]
>> The following window will be displayed.



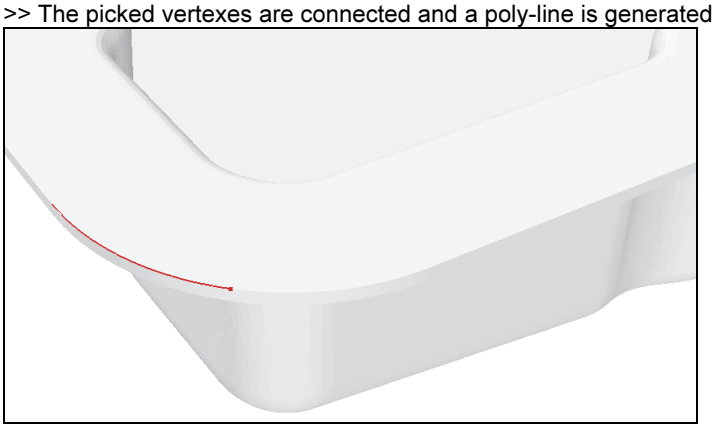
3 **Select [Polyline].**
>> The following window will be displayed.



4 **Select “Vertex”, “Face”, or “Curve” and then click “pick”.**

Item	Outline
Vertex	The vertex of the polyhedron is selected. When picked, the nearest vertex is selected.
Face	An optional vertex on the picked model data is selected.
Curve	If the model data has been loaded as a “curve”, select “Curve”. If the model has been imported as an IGES/STEP format, it is also possible to select the edge.

5 **Pick on the work-piece.**
>> The picked vertexes are connected and a poly-line is generated.



6 **Input the “Name” for the poly-line.**
This name is used as the locus object.

7 **Click “OK”.**
>> A locus object is defined.

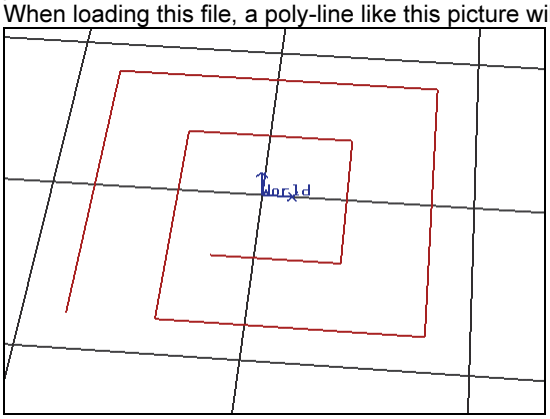
5.2.3 Importing a plain text data file

Prepare a plain text file that includes the array of points that represent the locus.

1 **Prepare text data expressing an array of points.**

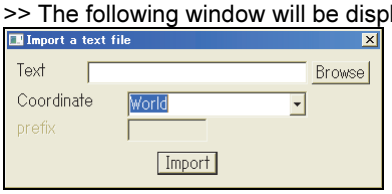
Prepare a plain text file like the following format;
Polyline(“Name of the locus object”)
{
Vertex1:X, Vertex1:Y, Vertex1:Z
Vertex2:X, Vertex2:Y, Vertex2:Z
. . .
VertexN:X, VertexN:Y, VertexN:Z
}
(A poly-line will be made by connecting these points)

(Example)
Polyline("Poly_line ")
{
-800, -800, 0
-800, 800, 0
800, 800, 0
800, -800, 0
-400,-800, 0
-400, 400, 0
400, 400, 0
400, -400, 0
-200, -400, 0
}
When loading this file, a poly-line like this picture will be defined.



2 **Open the menu of [Insert] – [Add primitive].**

3 **Click [Import].**
>> The following window will be displayed.



4 **Click “Browse” and open the prepared text file.**

5 **Click “Import”.**
>> A locus object is defined.

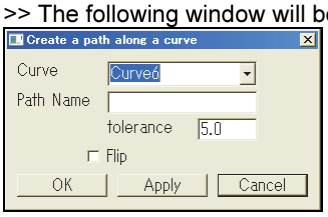
5.3 Creating / editing a path

In Virtual ROBOT, position information and directions are recorded as a "Tag". It is possible to move the robot so that its tool tip position and its posture match a "Tag". A group of "Tags" mentioned above can be defined as a "Path". A "Patch" can be converted into a robot program.
This chapter explains how to create a robot program from a locus object by using a Path.

5.3.1 How to create a path

Create a path from a locus object.

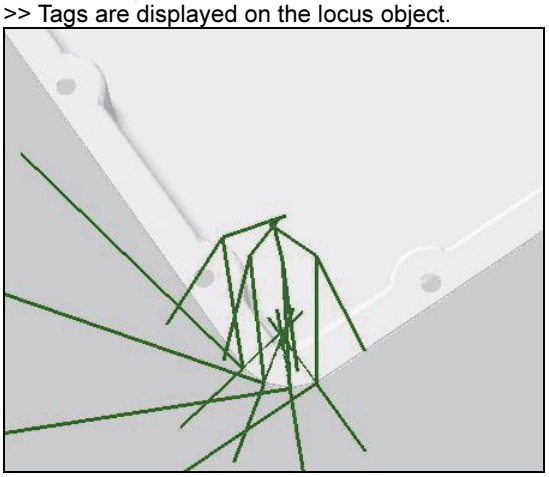
1 Open [Insert] – [Create a path] – [New] – [along a curve].
>> The following window will be displayed.



2 **Set the respective parameters.**

Item	Outline
Curve	Choose the locus object from this pull-down menu.
Path Name	Enter the Path Name.
tolerance	Set the accuracy of the Tags that will be generated. The value is smaller, the accuracy will become more accurate. Because each Tag becomes a MOVE command when converting the path to a work-program, if the accuracy of the Tag becomes accurate, the accuracy of the MOVE command position becomes accurate.

3 **Click “Apply”.**
>> Tags are displayed on the locus object.



4 **Confirm the positions of the Tags, click “OK”.**
>> A new path will be created.

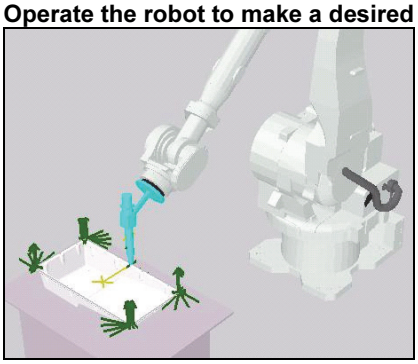
5.3.2 How to choose the posture

The posture of the robot tool in the Tags included in the Path created in the previous section depends on the locus object. Therefore, the robot tool may take unexpected angle and cause strange motion or cable breakage. In a case like that, it is necessary to change the posture of the Tags and avoid the unexpected motion of the robot.
In Virtual ROBOT, when a Tag to be used as a reference is prepared, the posture can be aligned with it. In this section, how to create a reference Tag and how to change the posture of the existing Tags are described.

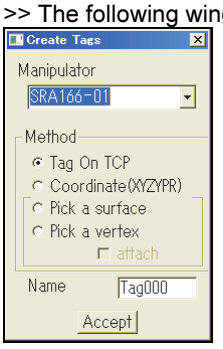
How to create a reference Tag using the robot posture

By this procedure, it is possible to create a Tag which has the same posture (roll, pitch, yaw) with the robot TCP. In this operation, it is not necessary to care about the XYZ coordinates of the Tag.

1 **Operate the robot to make a desired posture (angle).**



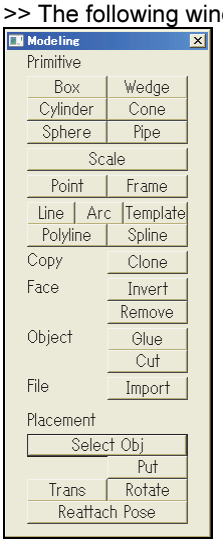
2 **Create a path and open the menu of [Insert] – [Create a tag] – [Create a tag].**
>> The following window will be displayed.



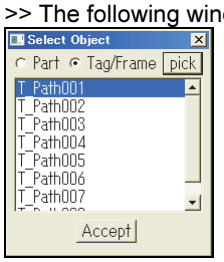
3 **Select “Tag On TCP” and click “Accept”.**
>> A new Tag will be created on the robot TCP position using the tool posture of the robot.

How to create a Tag by inputting the posture directly

1 **Open [Insert] – [Add primitive].**
>> The following window will be displayed.

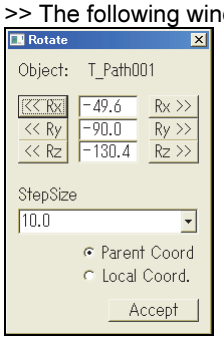


2 **Click the “Select Obj”.**
>> The following window will be displayed.



3 **Select one Tag that is included in the Path created in the previous section and click “Accept”.**

4 **In the Modeling dialog box, click "Rotate".**
>> The following window will be displayed.



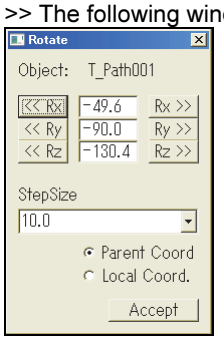
5 **Set the angle of the Tag by inputting the angle directly to the edit boxes or changing the values by the rotation buttons on the window.**

6 **Click “OK”.**
>> The angle of the Tag will be changed.

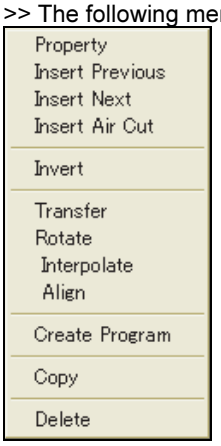
5.3.3 How to align the posture of the Tags in the Path

How to align the posture of Tags included in a Path to the reference Tag is described hereinafter.

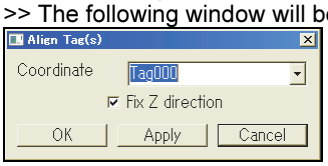
1 **Open [Tool] – [Path editor].**
>> The following window will be displayed.



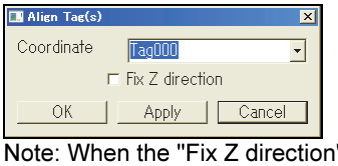
2 **Right-click the Path name in the window.**
>> The following menu is displayed.



3 **Click the “Align”.**
>> The following window will be displayed.



4 **Select the Tag as a reference Tag and remove the check-mark of “Fix Z direction”.**



Note: When the "Fix Z direction" check box is selected, rotation is performed in the X-axis and Y-axis directions with the Z-axis direction fixed. This function is used for applications such as spot welding. When a reference Tag has been prepared as described previously, clear the check box.

5 **Click “Apply”. >>The all Tags in the Path will be aligned to the direction of the reference Tag.**

5.3.4 How to edit the Path

A Path can be edited in the menu of [Tool] – [Path editor].

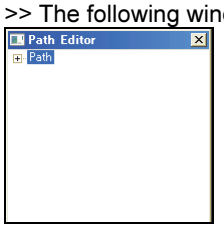
- Insert a Tag
- Invert the order of the Tags
- Transfer the Tags
- Rotate the Tags
- Copy the Paths
- Delete the Tags/paths
- Insert an air cut motion Tag

Operations such as the ones shown above can be performed. For details, see Help for Virtual ROBOT.

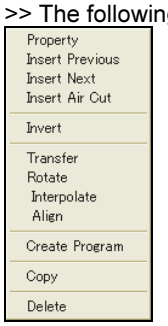
5.3.5 How to create a work-program

A Path in the Virtual ROBOT can be converted to a program for the robot.

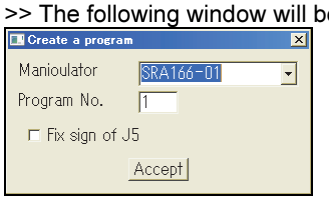
1 Open [Tool] – [Path editor].
>> The following window will be displayed.



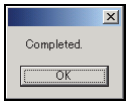
2 **Right-click the Path name in the window.**
>> The following menu is displayed.



3 **Select "Create Program".**
>> The following window will be displayed.

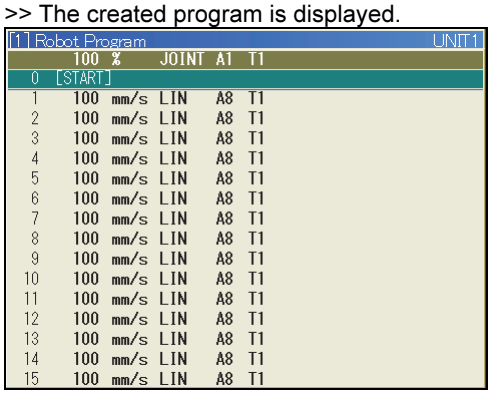


4 **Select the Manipulator (Robot) and input the program number and then click "Accept".**
>> The following window will be displayed.



5 **Click "OK".**

6 **Open the created program in the Virtual FD screen.**
>> The created program is displayed.



POINT

For 1 Tag (x, y, z, roll, pitch, yaw), a robot can take several different postures (combinations of different axis angle set).
In the process of the "Create a program", each step data (MOVE command) for each Tag is generated so that the posture becomes the similar posture to the previous step by referring to it.
However, the 1st step (MOVE command) refers to the present robot posture.
So please do not forget to set a preferred robot posture before executing the function of "Create a program".

NOTE

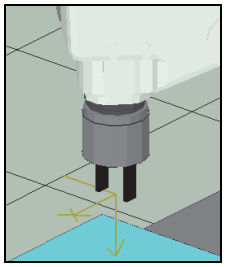
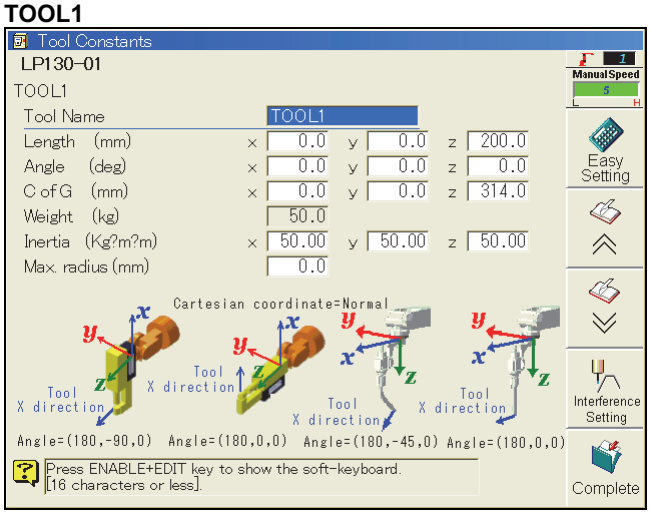
Chapter 6 Example (3) Palletize

In this chapter, a palletize application is created using "Virtual ROBOT". For details, refer to “FD CONTROLLER INSTRUCTION MANUAL Palletize function”. And, because the palletize function is an optional software, it is necessary to setup the optional software in advance.

6.1 Composition of FD on Desk II

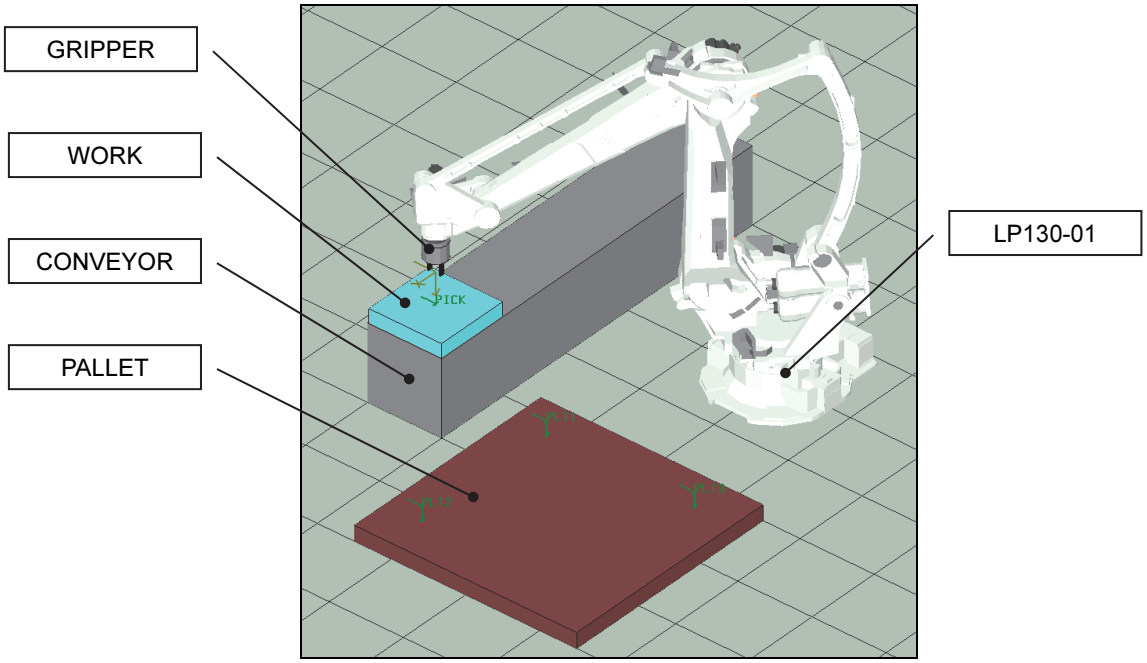
In this example, the robot system is configured like the following.

6.1.1 Robot setting

Number of UNIT	1
Number of mechanisms	1 (LP130-01) 
Tool	Gripper Output signal O2 = ON : Clamp Output signal O1 = ON : Unclamp Input signal I2 = ON : Clamp Status Input signal I1 = ON : Unclamp Status  This 3D model is the same with the “GRIPPER” used in the chapter 3.
Tool Constant	**TOOL1**  For TOOL1, set the weight and center of gravity when not holding a workpiece. Example: 50kg For TOOL2, set the weight and center of gravity when holding a workpiece. For other parameters, set the same values as the values set to TOOL1. Example: 100kg

When performing memory format operation on the controller using FD on Desk II (such as defining the unit, mechanism, and robot model), refer to the instruction manual, "Memory format procedure".

6.1.2 Outline of the Workcell



Object name	X origin	Y origin	Z origin	X length	Y length	Z length
LP130-01	0	0	0	-	-	-
GRIPPER	Attached to LP130-01			-	-	-
WORK	1250	-1250	500	490	490	90
CONVEYOR	250	-1250	0	2500	500	500
PALLET	1750	0	0	1500	1500	100

6.1.3 I/O signals

No.	Name	Description
I1	UNCLAMP CHECK	This is the input from the unclamp sensor on the gripper. This turns ON when the gripper is unclamp status (=open).
I2	CLAMP CHECK	This is the input from the clamp sensor on the gripper. This turns ON when the gripper is clamp status (=close).
I10	WORK READY	Work ready signal This turns ON when a work-piece is set in the pick-up position on the conveyor.
O1	UNCLAMP	This is a signal to open the gripper. (Unclamp)
O2	CLAMP	This is a signal to close the gripper. (Clamp)
O3	CLONE	“Clone” for the work-piece This signal is used for the visual simulation in the Virtual ROBOT window.
O4	RESTORE	“Restore” for the work-piece This signal is used for the visual simulation in the Virtual ROBOT window.
O33 : O34	LAYER NO.	Layer count signal The number of the current layer is outputted with binary signal (2 bits). In this example, the number is from 1 to 3.
O41 : O44	WORK NO.	Work count signal The number of the current work-piece (in the current layer) is outputted with binary signal (4 bits). In this example, the number is from 1 to 9.
O49	COMPLETE	Completion signal When 1 cycle of the palletize pattern has completed, this signal will turn ON. And this signal will turn OFF when the next cycle starts.

6.2 Creating a workcell

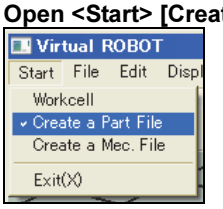
6.2.1 Creating a tool (gripper)

The same tool (GRIPPER) as the tool used in Chapter 4 is used. For details, refer to Chapter 4.

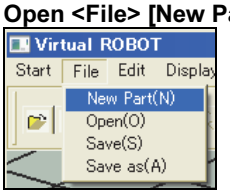
6.2.2 Creating a part: “WORK”

Creating a work-piece

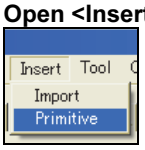
1 **Open <Start> [Create a Part File].**



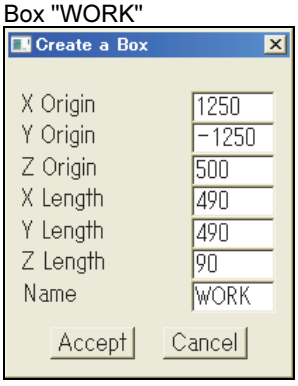
2 **Open <File> [New Part].**



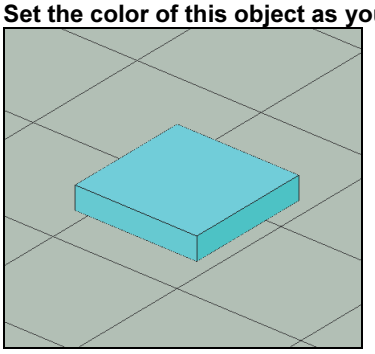
3 **Open <Insert> [Primitive] to create a “Box”.**



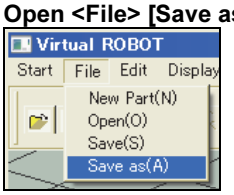
Box "WORK"



4 **Set the color of this object as you like.**



5 **Open <File> [Save as].**



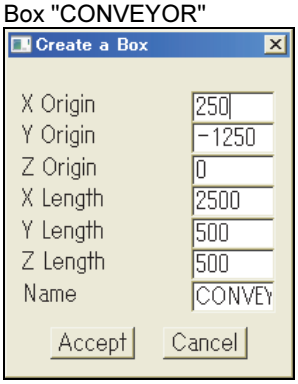
Save the part as `WORK.prt`.

6.2.3 Creating a part: “CONVEYOR”

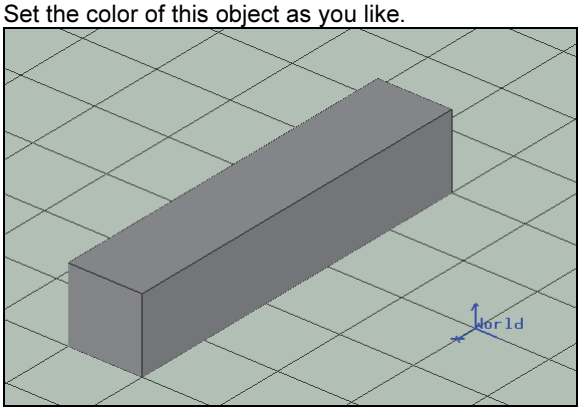
Creating a conveyor

1 **Create a Box like the following picture. (Concerning the detailed procedure, see the previous section.)**

Box "CONVEYOR"



Set the color of this object as you like.



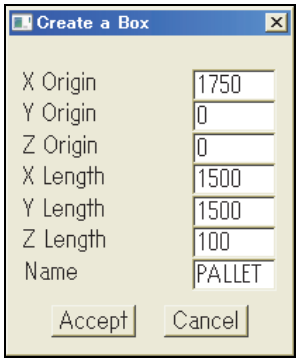
2 Save the data as a file with the filename "`CONVEYOR.prt`".

6.2.4 Creating a part: “PALLET”

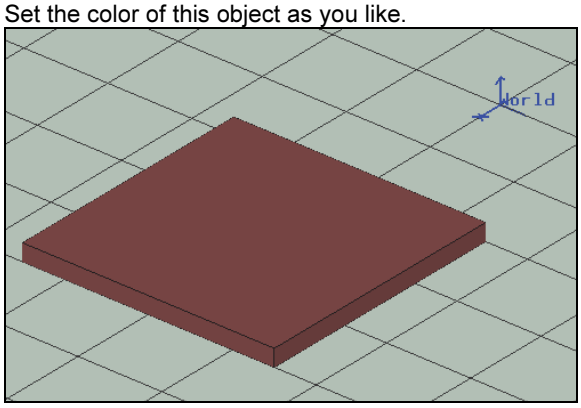
Creating a pallet

1 **Create a Box like the following picture. (Concerning the detailed procedure, see the previous section.)**

Box "PALLET"



Set the color of this object as you like.

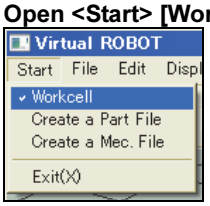


2 Save the part as `PALLET.prt`.

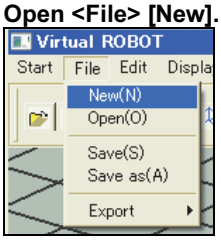
6.2.5 Placing each object in the workcell

Place the respective objects in a work-cell

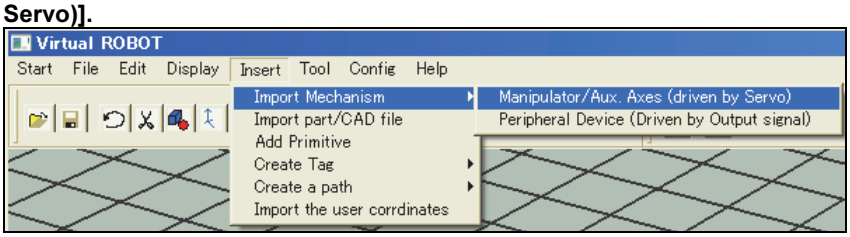
1 **Open <Start> [Workcell].**



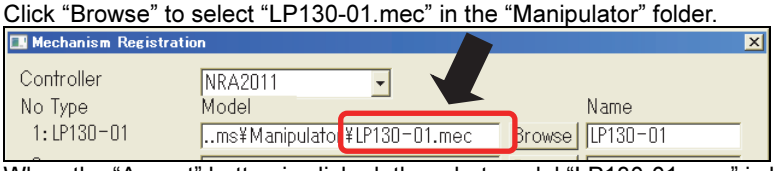
2 **Open <File> [New].**



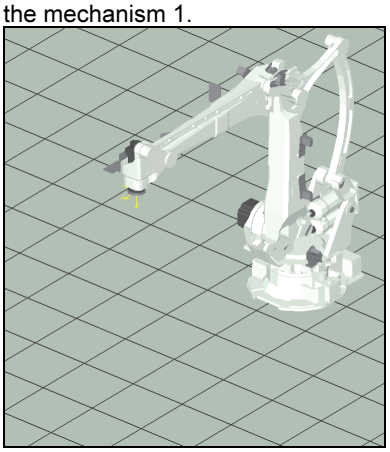
3 **Open <Insert> [Import Mechanism] [Manipulator/Aux. Axes (driven by Servo)].**



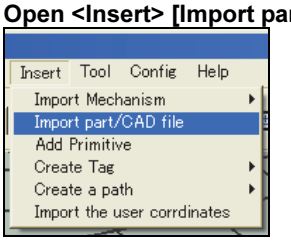
Click “Browse” to select “LP130-01.mec” in the “Manipulator” folder.



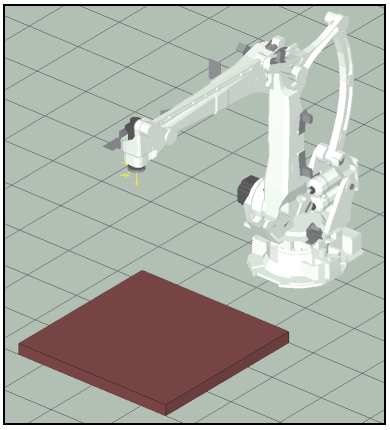
When the “Accept” button is clicked, the robot model “LP130-01.mec” is loaded for the mechanism 1.



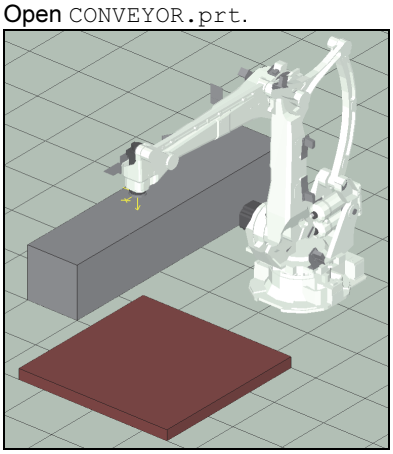
4 **Open <Insert> [Import part/CAD file].**



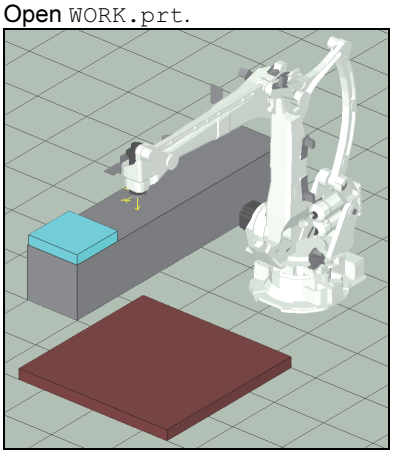
Open `PALLET.prt`.
"`PALLET`" is loaded to the current work-cell.



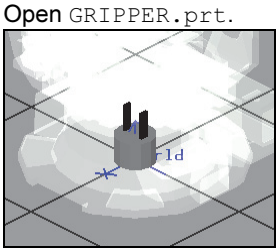
5 Open `CONVEYOR.prt`.



6 Open `WORK.prt`.



7 Open `GRIPPER.prt`.

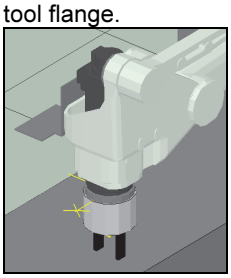


The GRIPPER is placed on the origin of the world coordinate system.

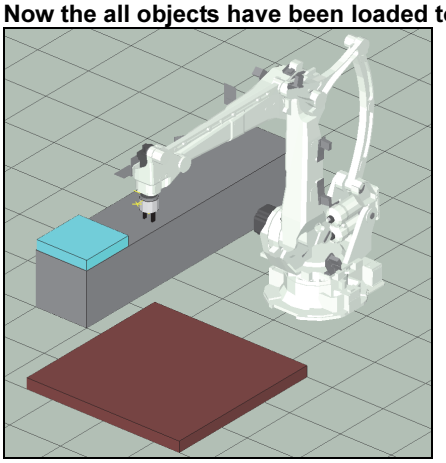
8 **Select [Tool], then [Mount].**

Set the parameters like the following picture.
Select Object: GRIPPER
mount to: LP130-01

When clicking the "Accept" button, the part "`GRIPPER`" is mounted onto the robot tool flange.



9 **Now the all objects have been loaded to the current work-cell.**



Please save this work-cell as a new file.
(Example: `SAMPLE_PALLETIZE.cel`)

6.2.6 Setting the tool constant

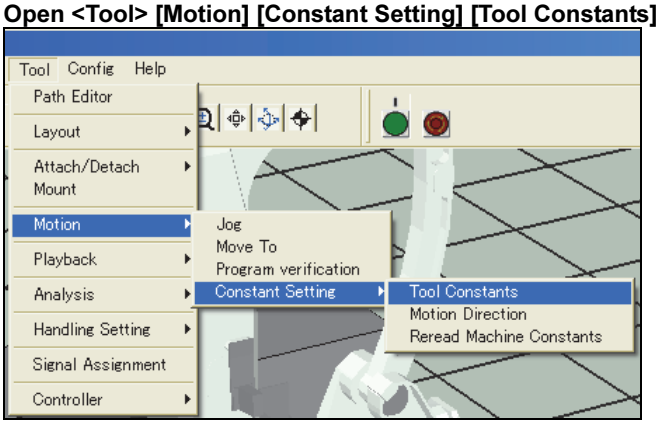
Tool constant setting

1 **In the Virtual FD screen, set the constants for TOOL1 and TOOL2 each as follows.**

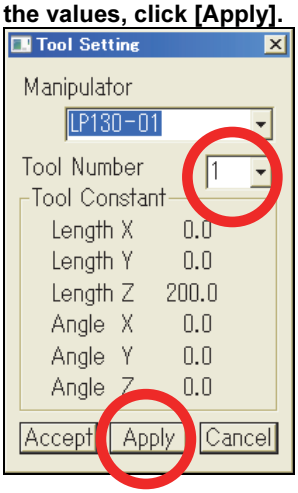
Length	(mm)	x	0.0	y	0.0	z	200.0
Angle	(deg)	x	0.0	y	0.0	z	0.0

(For the detailed operation, refer to the instruction manual "SETUP MANUAL").

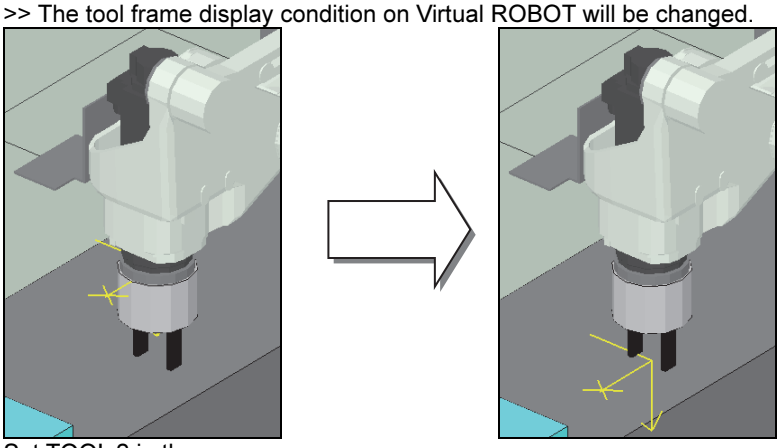
2 **Open <Tool> [Motion] [Constant Setting] [Tool Constants].**



3 **In the displayed window, select "1" for "Tool Number" and click [Apply] to load the tool constants on Virtual FD into Virtual ROBOT. After confirming the values, click [Apply].**



>> The tool frame display condition on Virtual ROBOT will be changed.



Set TOOL 2 in the same way.
Then click “Accept” to close the window.

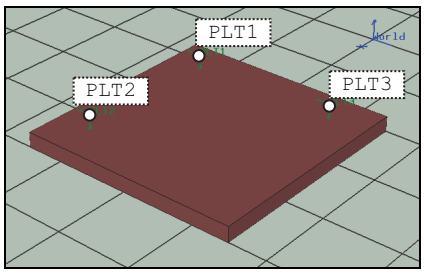
6.3 Creating a program

6.3.1 Pallet and Palletize pattern to be created in advance

As a preparation, the following pallet and the palletize pattern will be created.

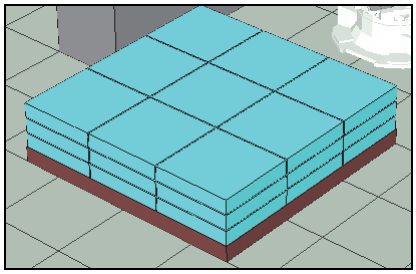
Pallet

Pallet name	Description
PALLET01	Create 3 Tags (PLT1, PLT2, and PLT3) to define the pallet directions and size. And, in this example, the coordinate information of the defined pallet is automatically exported to the program 3.



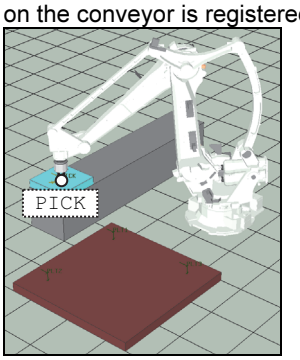
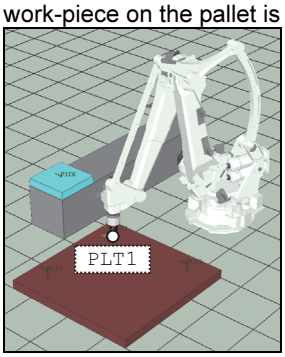
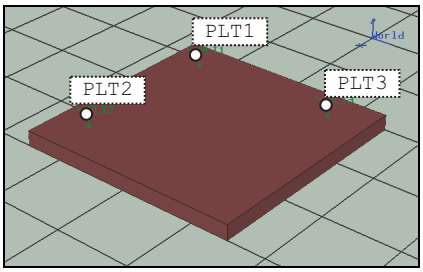
Palletize pattern

Pattern name	Description
Palletize01	9 work-pieces for 1 layer. Total 3 layers.



6.3.2 Program to be created

The programs to be created in this example are listed below.

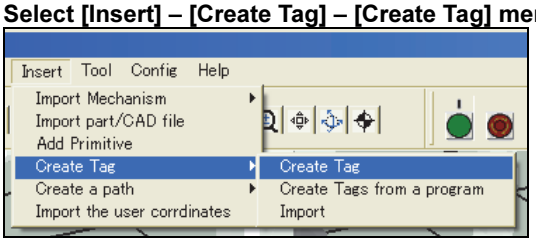
No.	Program name	Description
1	PICK	In this program, a position (Tag name: PICK) for picking up a work-piece on the conveyor is registered as a MOVE command.  See “6.3.4 Creating a program 1 “PICK””.
2	PUT	In this program, a position (Tag name: PLT1) for placing the 1st work-piece on the pallet is registered as a MOVE command.  See “6.3.5 Creating a program 2 “PUT””.
3	PALLET01	In this program, 3 points on the pallet are recorded. (Tag name: PLT1, PLT2, PLT3) This program is automatically generated when defining the pallet.  See “6.3.6 Registering a pallet”.
4	SAMPLE	This is a palletize program that is generated semi-automatically. See “6.3.8 Creating a program 4 “SAMPLE””.
5	SAMPLE VISUAL	This is a program for a visual simulation. This program is created based on the program 4. See “6.4 Visual simulation”.

6.3.3 Creating Tags

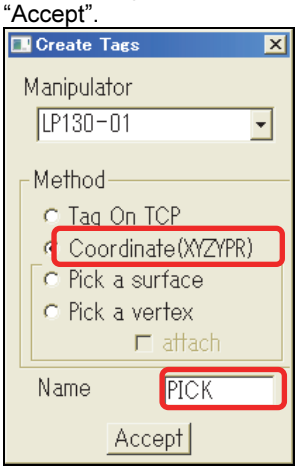
First, create 4 Tags (PICK, PLT1, PLT2, and PLT3) using the following procedure.

Creating Tags

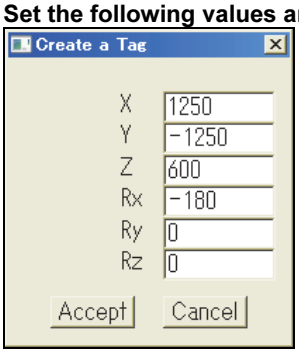
1 **Select [Insert] – [Create Tag] – [Create Tag] menu.**



Input the Tag name (PICK) and then select “Coordinate (XYZYPR)” and click “Accept”.



2 **Set the following values and then click “Accept”.**

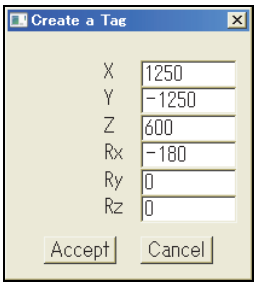


A Tag “PICK” is created at the designated coordinate.
Repeat this operation to create the all Tags shown in the next page.

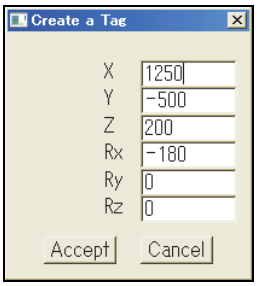
4 Tags to be created

Name	For	X	Y	Z	Rx (yaw)	Ry (pitch)	Rz (roll)
PICK	Picking position	1250	-1250	600	-180	0	0
PLT1	Pallet definition 1 Put position	1250	-500	200	-180	0	0
PLT2	Pallet definition 2	2250	-500	200	-180	0	0
PLT3	Pallet definition 3	1250	500	200	-180	0	0

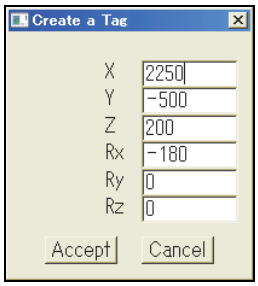
PICK



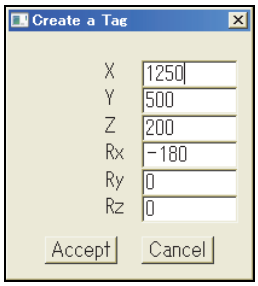
PLT1

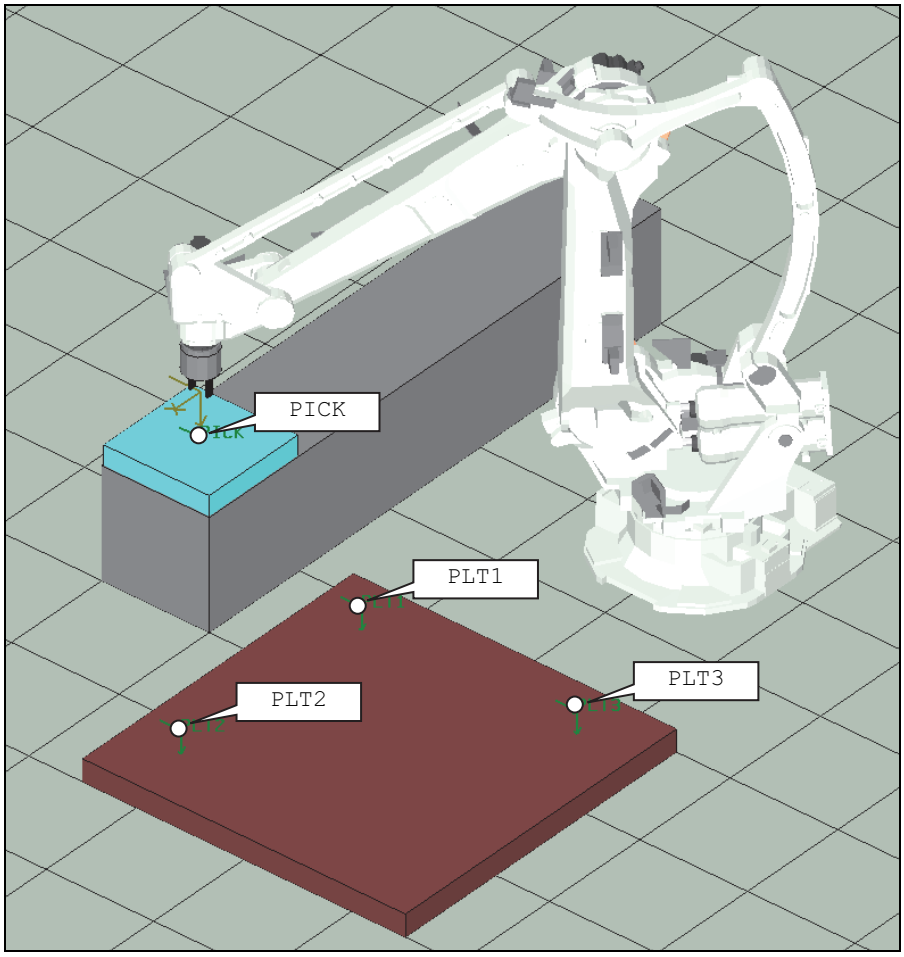


PLT2



PLT3



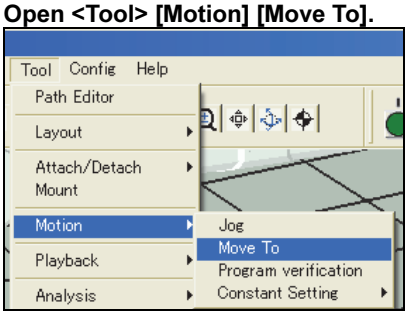


6.3.4 Creating a program 1 “PICK”

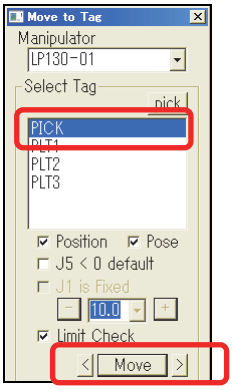
Create program 1 "PICK" using the Tag “PICK”.

Creating the picking program “PICK”

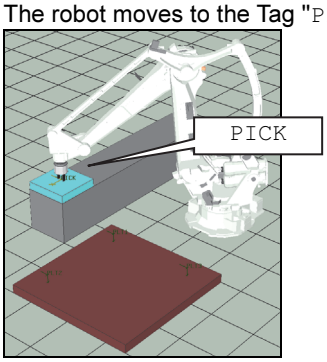
1 **Open <Tool> [Motion] [Move To].**

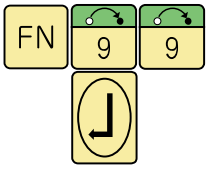


Select “PICK” and click “Move”.



The robot moves to the Tag "PICK".





2 **Select program 1 on Virtual FD in advance and put a name as "PICK" using the FN99 comment function.**

```
      1200 mm/s LIN   A1  T1
  0  [START]
  1  REM["PICK"]
[EOF]
```

3 **Record the current position of the robot as the 2nd step. Press the [Record] key on the "robot operation panel" of FD on Desk II. ("C" key of the keyboard can be used instead of this)**

>> The 2nd step will be recorded.

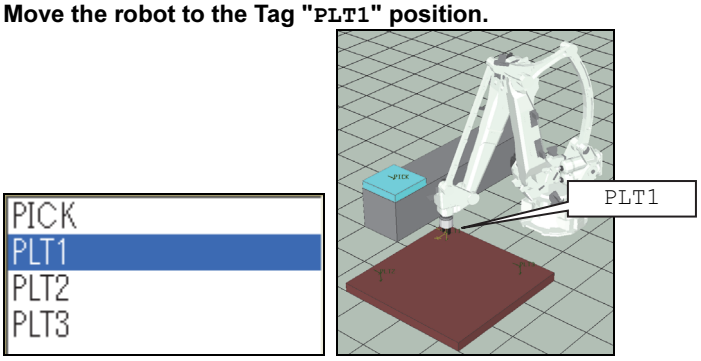
```
      1200 mm/s LIN   A1  T1
  0  [START]
  1  REM["PICK"]
  2   1200 mm/s LIN   A1  T1
[EOF]
```

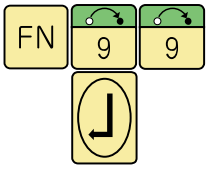
6.3.5 Creating a program 2 “PUT”

Create program 1 "PUT" using the Tag "PLT1".

Creating the program “PUT”

1 **Move the robot to the Tag "PLT1" position.**





2 **Select program 2 on Virtual FD in advance and put a name as "PUT" using the FN99 comment function.**

```
     1200 mm/s LIN   A1  T1
  0  [START]
  1  REM["PUT"]
[EOF]
```

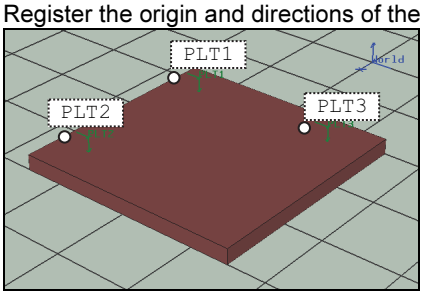
3 **Record the current position of the robot as the 2nd step. Press the [Record] key on the "robot operation panel" of FD on Desk II. ("C" key of the keyboard can be used instead of this)**

>> The 2nd step will be recorded.

```
     1200 mm/s LIN   A1  T1
  0  [START]
  1  REM["PUT"]
  2   1200 mm/s LIN   A1  T1
[EOF]
```

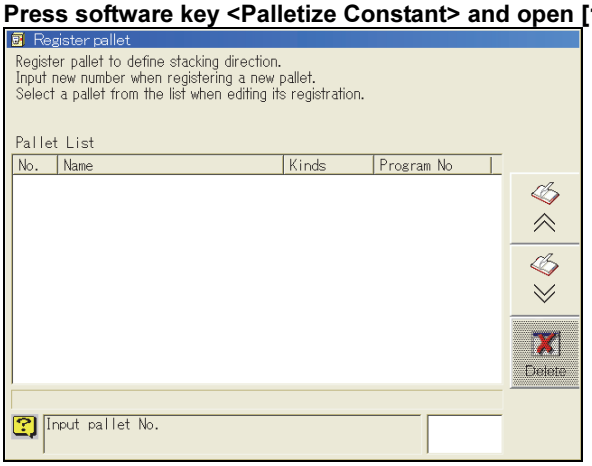
6.3.6 Registering a pallet

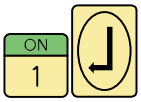
Register the origin and directions of the pallet using the Tags (PLT1, PLT2, and PLT3).



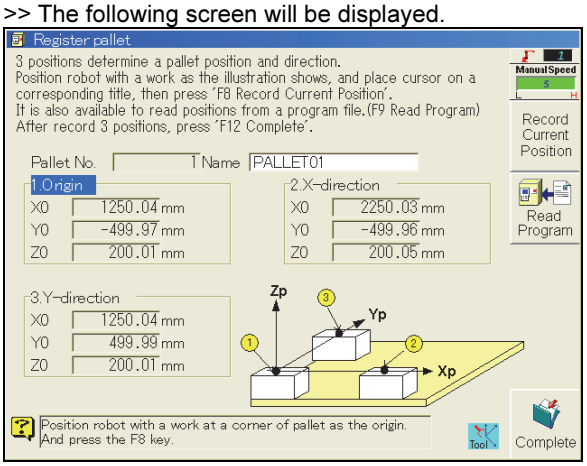
Registering a pallet

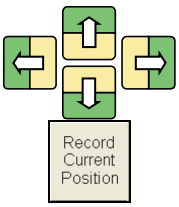
1 **Press software key <Palletize Constant> and open [1 Register pallet].**



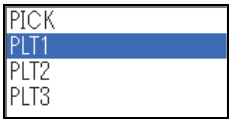


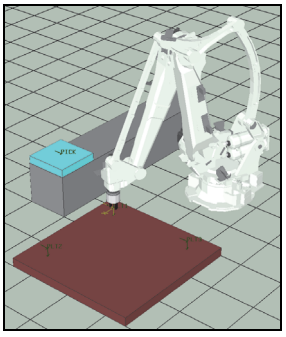
2 **Input “1” as the pallet number and press [Enter].**
>> The following screen will be displayed.

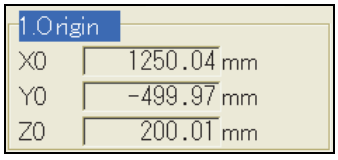


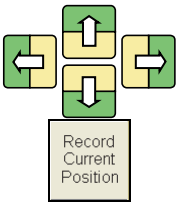


3 **Move the robot to the Tag "PLT1" position, move the cursor over "1. Origin" in the Virtual FD screen, and then press the software key <Record Current Position>.**

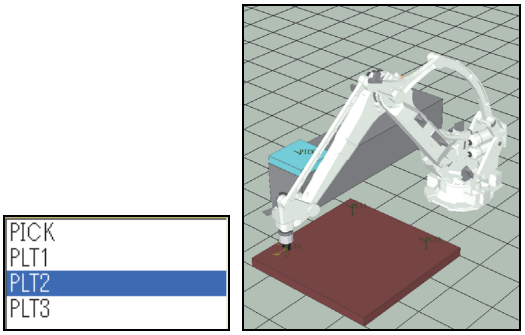


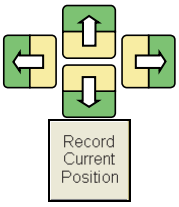




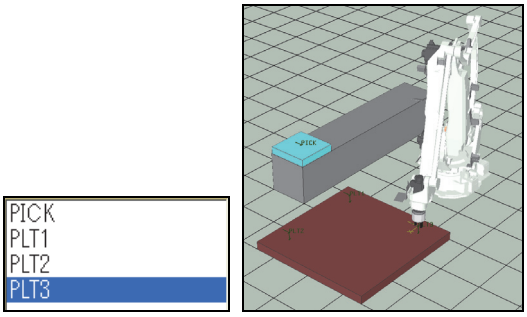


4 **Move the robot to the Tag "PLT2" position, move the cursor over "2. X-direction" in the Virtual FD screen, and then press the software key <Record Current Position>.**

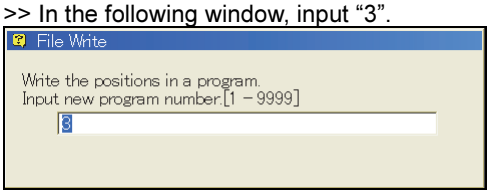




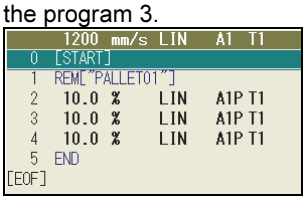
5 **Move the robot to the Tag "PLT3" position, move the cursor over "3. Y-direction" in the Virtual FD screen, and then press the software key <Record Current Position>.**



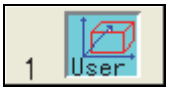
6 **Press <Complete>.**
>> In the following window, input “3”.

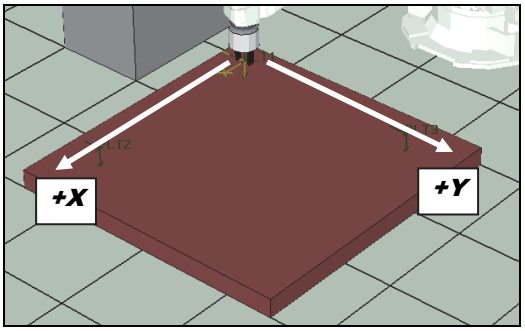


Now the pallet has been defined and the coordinate information has been stored in the program 3.



7 The pallet 1 is registered as the user coordinate system 1. When <Select Pallet> key is pressed, it is possible to select the user coordinate system for the manual operation of the robot.



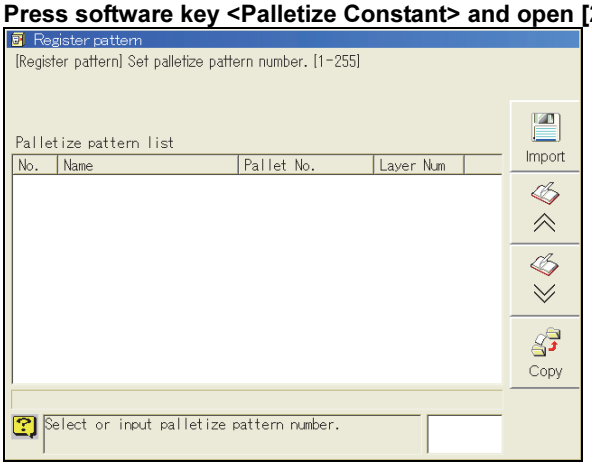


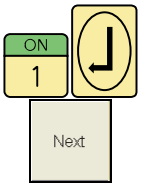
6.3.7 Registering a palletize pattern

Register data for palletize pattern 1 by using the following procedure.

Registering a palletize pattern

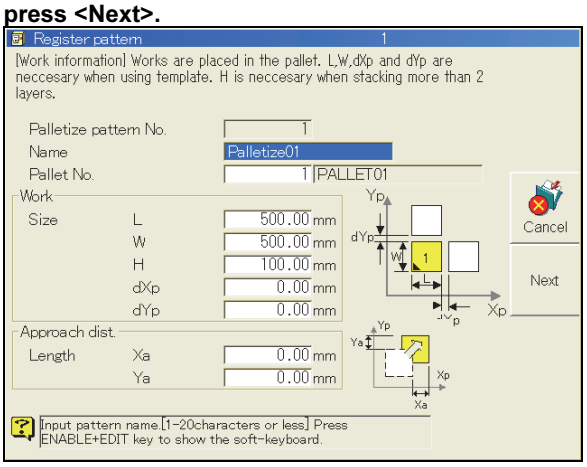
1 **Press software key <Palletize Constant> and open [2 Register pattern].**



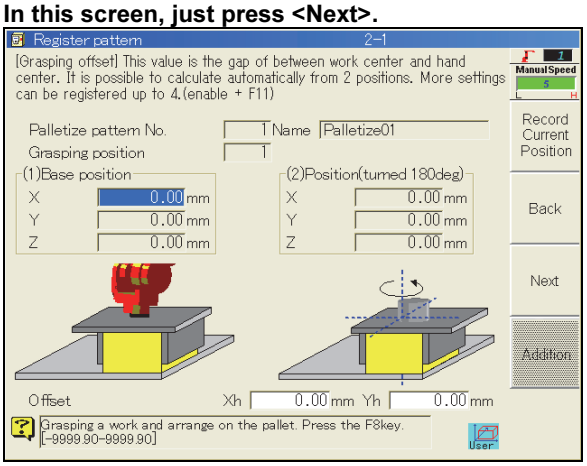


2 **Input “1” as the pattern number and press [Enter].**

3 **In the displayed screen, set the parameters like the following picture and press <Next>.**

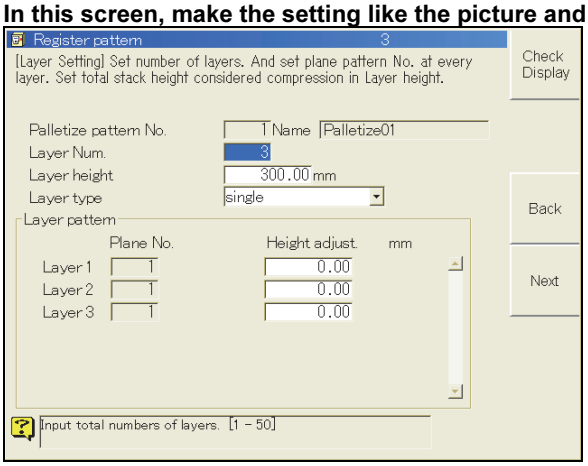


4 **In this screen, just press <Next>.**



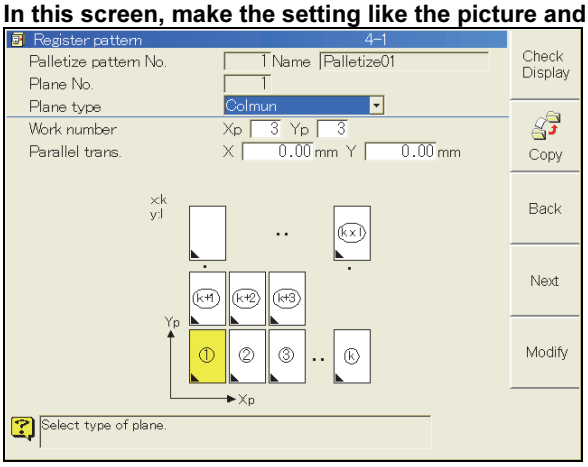
Next

5 **In this screen, make the setting like the picture and press <Next>.**



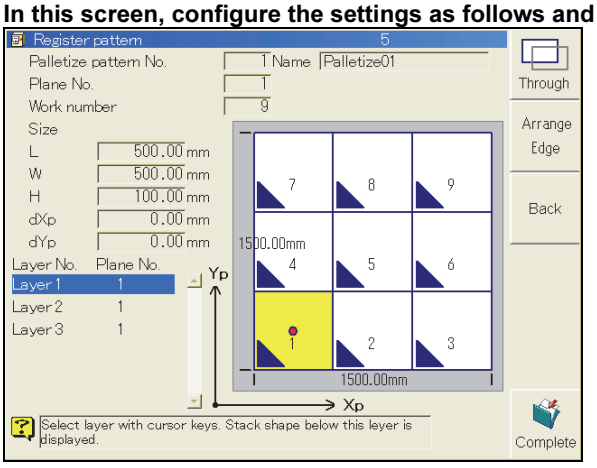
Next

6 **In this screen, make the setting like the picture and press <Next>.**



Complete

7 **In this screen, configure the settings as follows and press <Complete>.**



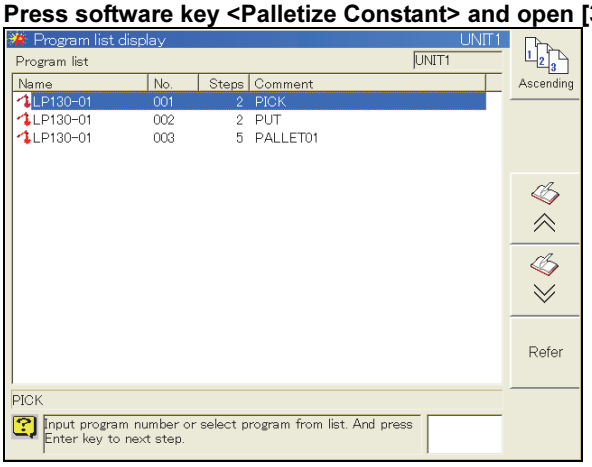
Now the palletize pattern 1 has been defined.

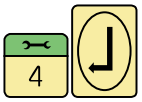
6.3.8 Creating a program 4 “SAMPLE”

Create a palletize program using the pallet and the palletize pattern that have been registered in advance.

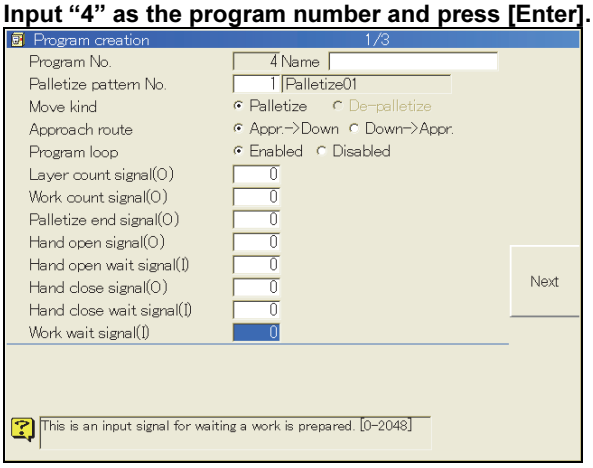
Creating a palletize program

1 **Press software key <Palletize Constant> and open [3 Program creation].**

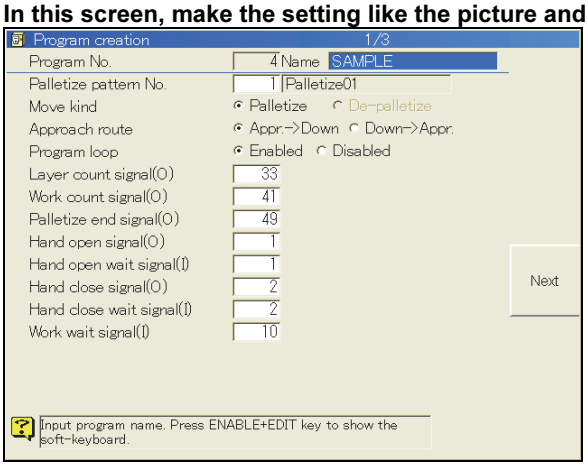




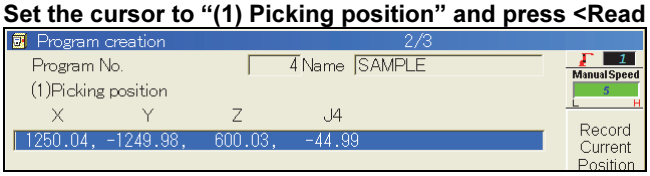
2 **Input “4” as the program number and press [Enter].**

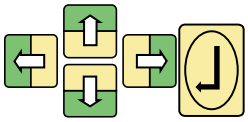


3 **In this screen, make the setting like the picture and press <Next>.**

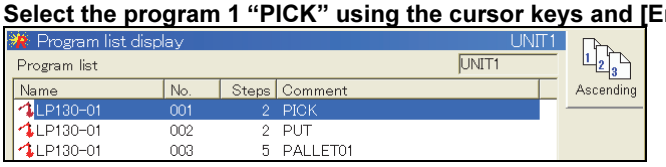


4 **Set the cursor to “(1) Picking position” and press <Read Program>.**

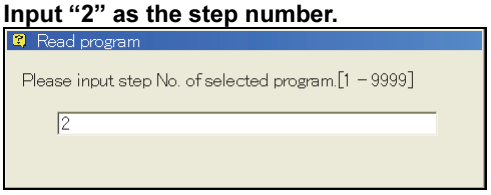




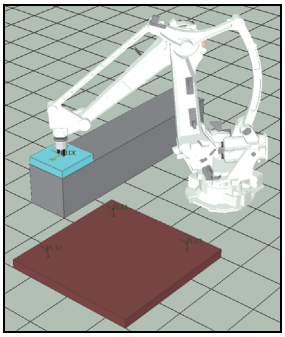
Select the program 1 “PICK” using the cursor keys and [Enter] key.



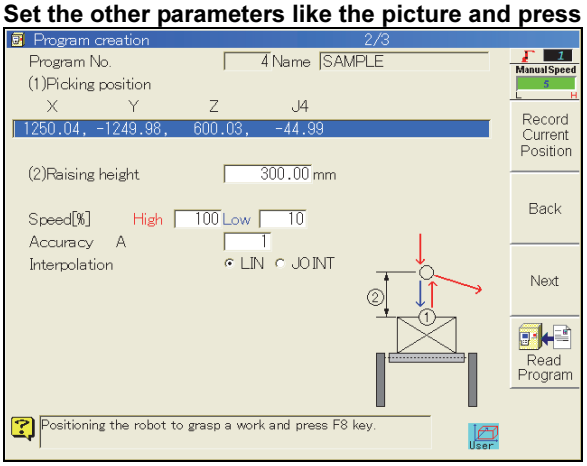
Input “2” as the step number.



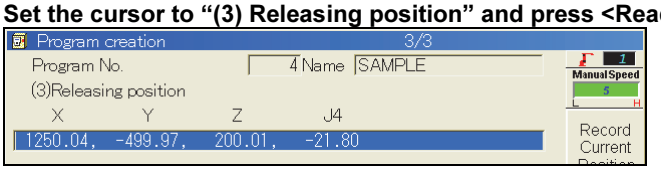
The coordinates of the Tag "PICK" are set for "Picking position".



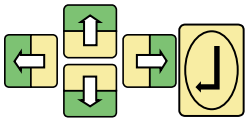
5 **Set the other parameters like the picture and press <Next>.**

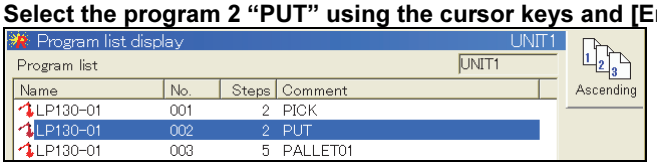


6 **Set the cursor to “(3) Releasing position” and press <Read Program>.**

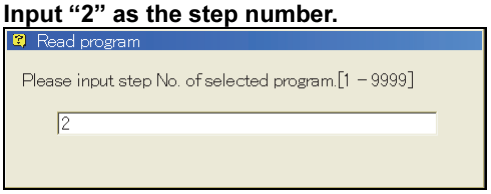


Select the program 2 “PUT” using the cursor keys and [Enter] key.

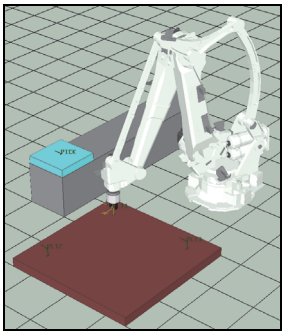




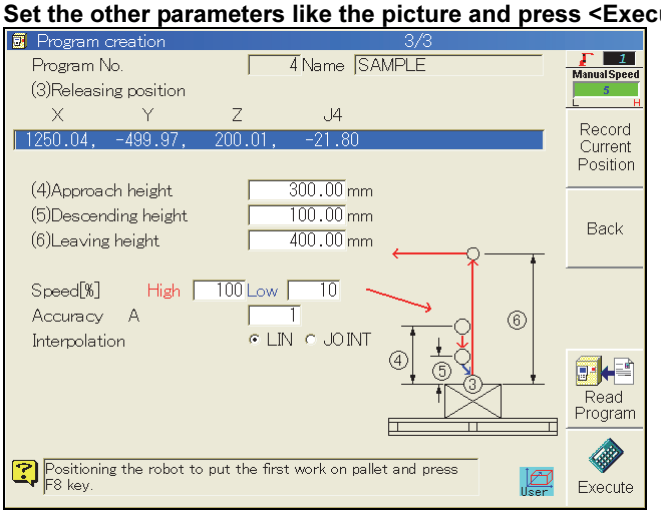
Input “2” as the step number.



The coordinates of the Tag "`PLT1`" are set for "Put position".



7 **Set the other parameters like the picture and press <Execute>.**



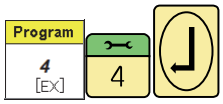
A palletize program is automatically generated in the program 4.

Generated program

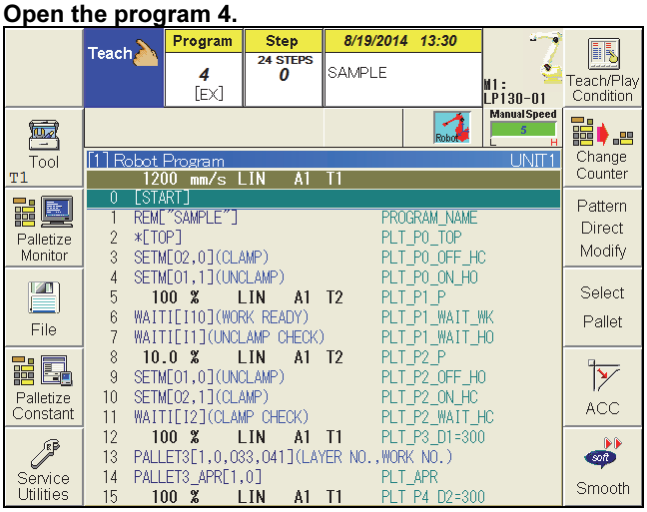
```
   0  [START]
   1  REM["SAMPLE"]                          PROGRAM_NAME
   2  *[TOP]                                 PLT_P0_TOP
   3  SETM[O2,0](CLAMP)                      PLT_P0_OFF_HC
   4  SETM[O1,1](UNCLAMP)                    PLT_P0_ON_HO
   5    100 %     LIN    A1  T2             PLT_P1_P
   6  WAITI[I10](WORK READY)                 PLT_P1_WAIT_WK
   7  WAITI[I1](UNCLAMP CHECK)               PLT_P1_WAIT_HO
   8   10.0 %     LIN    A1  T2             PLT_P2_P
   9  SETM[O1,0](UNCLAMP)                    PLT_P2_OFF_HO
  10  SETM[O2,1](CLAMP)                      PLT_P2_ON_HC
  11  WAITI[I2](CLAMP CHECK)                 PLT_P2_WAIT_HC
  12    100 %     LIN    A1  T1             PLT_P3_D1=300
  13  PALLET3[1,0,O33,O41](LAYER NO.,WORK NO.)
  14  PALLET3_APR[1,0]                       PLT_APR
  15    100 %     LIN    A1  T1             PLT_P4_D2=300
  16    100 %     LIN    A1  T1             PLT_P5_D3=100
  17   10.0 %     LIN    A1  T1             PLT_P6_P
  18  SETM[O2,0](CLAMP)                      PLT_P6_OFF_HC
  19  SETM[O1,1](UNCLAMP)                    PLT_P6_ON_HO
  20    100 %     LIN    A1  T2             PLT_P7_D4=400
  21  PALLET3_END[1,O49](COMPLETE)           PLT_END
  22    100 %     LIN    A1  T2             PLT_P8_P
  23  GOTO[*TOP]                             PLT_P8_JP
  24  END                                    PROGRAM_END
[EOF]
```

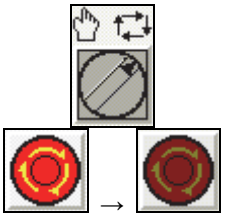
6.3.9 Let's run the program 4 "SAMPLE"

How to run the program 4 "SAMPLE"



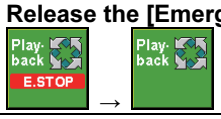
1 **Open the program 4.**

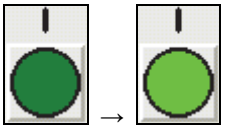




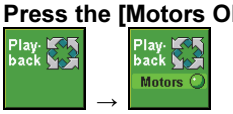
4 **Select the "Playback" mode using the "robot operation panel" window.**

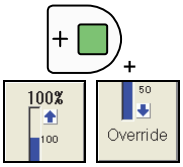
5 **Release the [Emergency Stop Button].**



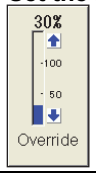


6 **Press the [Motors ON] button to turn the motors ON.**

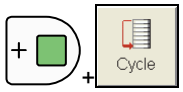




7 **Set the Playback speed override. At this time, select 30%.**

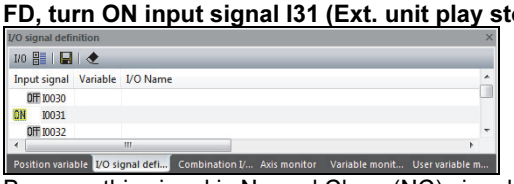


(NOTE) When using a real robot, 10% is recommended for safer operation.

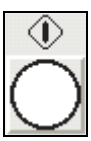


8 **Select the playback mode. In this case, select "Cycle".**

9 **For "I/O signal definition" in FD on Desk II or "Input Signal Monitor" in Virtual FD, turn ON input signal I31 (Ext. unit play stop).**



Because this signal is Normal Close (NC) signal, the robot cannot move while this signal is OFF.



10 **Press [Start] button.**
>> The program 4 will start.

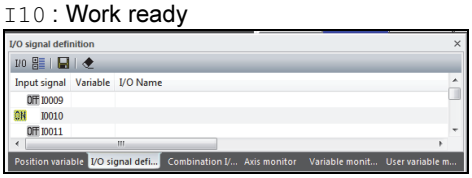
11 **In steps where the robot is temporarily stopped by the WAITI function, please release the waiting condition by using "I/O signal definition" in FD on Desk II or "Input Signal Monitor" in Virtual FD.**

<Input signals used by `WAITI` function>

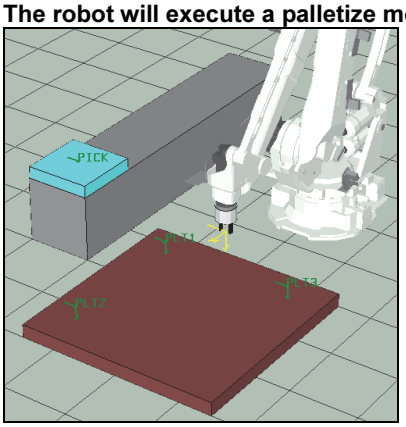
`I1` : Unclamp check

`I2` : Clamp check

`I10` : Work ready

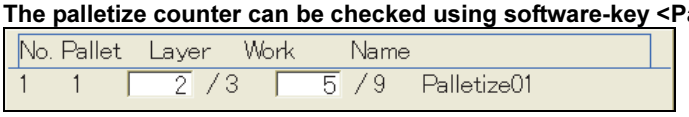


12 **The robot will execute a palletize motion following the program 4.**

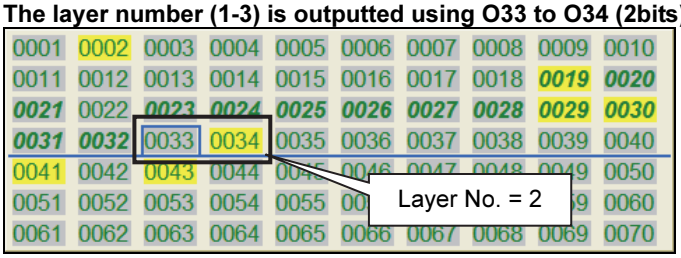


But, in this case, only the robot will move. To simulate the motion of the work-piece, see the next section.

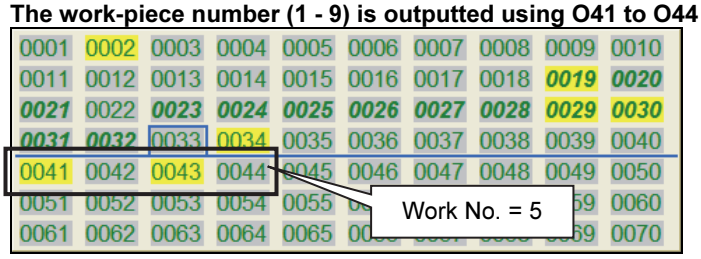
13 **The palletize counter can be checked using software-key <Palletize Monitor>.**



14 **The layer number (1-3) is outputted using O33 to O34 (2bits).**



15 **The work-piece number (1 - 9) is outputted using O41 to O44 (4 bits).**



16 **When releasing the 9th work-piece of the 3rd layer, O49 (Complete) will be turned ON.**

O49 will be turned OFF when executing PALLET3 function. (This means that the next palletize cycle starts)

17 **Because the “Program loop” setting is enabled when generating the palletize program, the robot will repeat the palletize motion.**
See “6.3.8 Creating a program 4 “SAMPLE””.

6.4 Visual simulation

This section visually simulates how a workpiece is palletized.

6.4.1 Modifying a program

Copy the program 4 to 5 and modify the program 5 like the following.
The portions enclosed in [ ] are modified/added portions using the program screen editor.

```
      1200 mm/s LIN   A1  T1
  0  [START]
  1  REM["SAMPLE VISUAL"](1)          PROGRAM_NAME
  2  *[TOP]                           PLT_P0_TOP
  3  SETM[O2,0](CLAMP)          (2)   PLT_P0_OFF_HC
  4  WAITJ[I2](CLAMP CHECK)           FN526;Wait not Input c
  5    100 %    LIN   A1  T2         PLT_P1_P
  6   10.0 %    LIN   A1  T2         PLT_P2_P
  7  SETM[O2,1](CLAMP)          (2)   PLT_P2_ON_HC
  8  WAITI[I2](CLAMP CHECK)           PLT_P2_WAIT_HC
  9    100 %    LIN   A1  T1         PLT_P3_D1=300
 10  PALLET3[1,0,O33,O41](LAYER NO.,WORK NO.)
 11  PALLET3_APR[1,0]                 PLT_APR
 12    100 %    LIN   A1  T1         PLT_P4_D2=300
 13    100 %    LIN   A1  T1         PLT_P5_D3=100
 14   10.0 %    LIN   A1  T1         PLT_P6_P
 15  SETM[O2,0](CLAMP)          (2)   PLT_P6_OFF_HC
 16  WAITJ[I2](CLAMP CHECK)           FN526;Wait not Input c
 17  SETM[O3,1](CLONE)                FN105;Output signal
 18  WAITI[I3](CLONE CHECK)     (3)   FN525;Wait Input cond
 19  SETM[O3,0](CLONE)                FN105;Output signal
 20  SETM[O4,1](RESTORE)              FN105;Output signal
 21  WAITI[I4](RESTORE CHECK)   (4)   FN525;Wait Input cond
 22  SETM[O4,0](RESTORE)              FN105;Output signal
 23    100 %    LIN   A1  T2         PLT_P7_D4=400
 24  PALLET3_END[1,O49](COMPLETE)     PLT_END
 25    100 %    LIN   A1  T2         PLT_P8_P
 26  GOTO[*TOP]                       PLT_P8_JP
 27  END                              PROGRAM_END
[EOF]
```

(1) The program name should be changed to "SAMPLE VISUAL" in advance.

(2) In this case, the clamp/unclamp motion for the work-piece is controlled only by turning output signal O2 ON/OFF. So O1 ON/OFF commands (FN105 SETM) and its ON/OFF check commands (FN525 WAITI) are deleted.

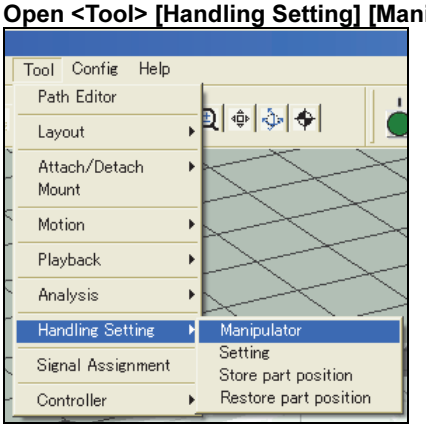
(3),(4) When the work-piece on the pallet is placed, the "Clone" and "Restore" operations are executed. To synchronize the program and the Virtual ROBOT window, WAITI function is used. (STEP 16, 18, 21)

6.4.2 Setup of the handling menu

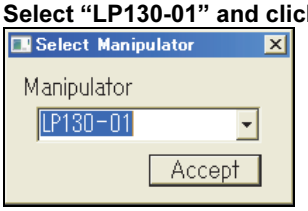
Setup the Virtual ROBOT window for the visual simulation of the 3D object “WORK”.

Setup

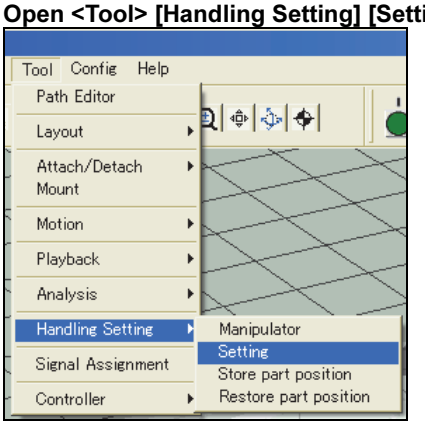
1 **Open <Tool> [Handling Setting] [Manipulator].**



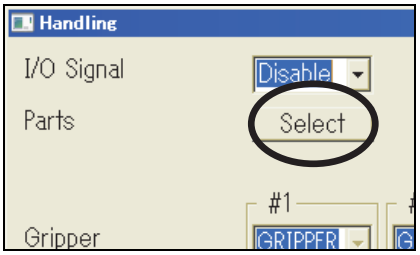
2 **Select “LP130-01” and click “Accept”.**



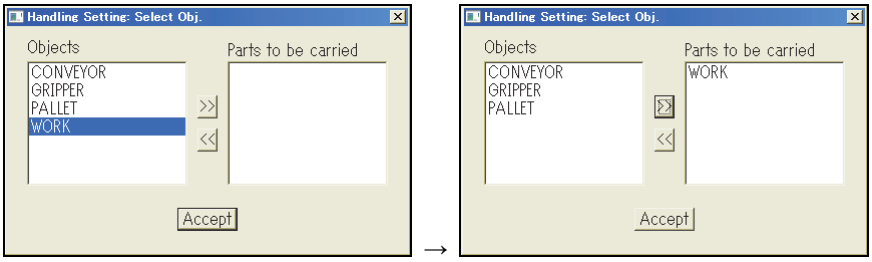
3 **Open <Tool> [Handling Setting] [Setting].**



4 **Click “Select” button.**



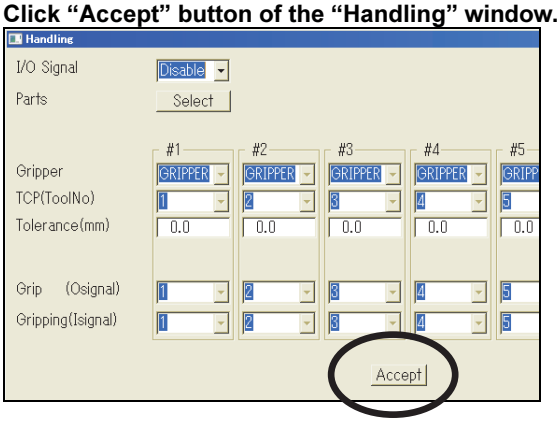
5 **Select “WORK” and click “>>” button.**



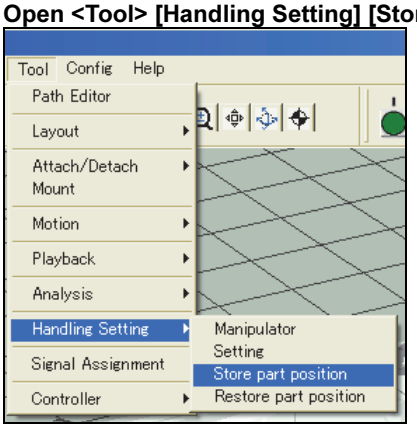
>> “WORK” is set to the box of “Parts to be carried”.

6 **Click “OK”.**
>> The setting is saved.

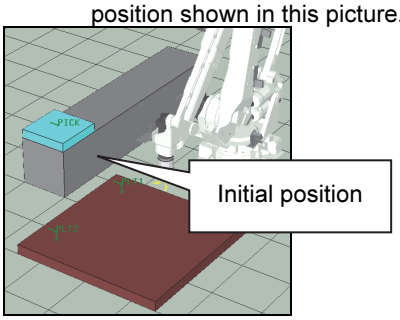
7 **Click “Accept” button of the “Handling” window.**



8 **Open <Tool> [Handling Setting] [Store part position].**

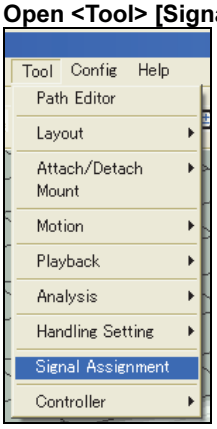


(NOTE) Before executing this operation, the WORK object must be placed in the position shown in this picture.

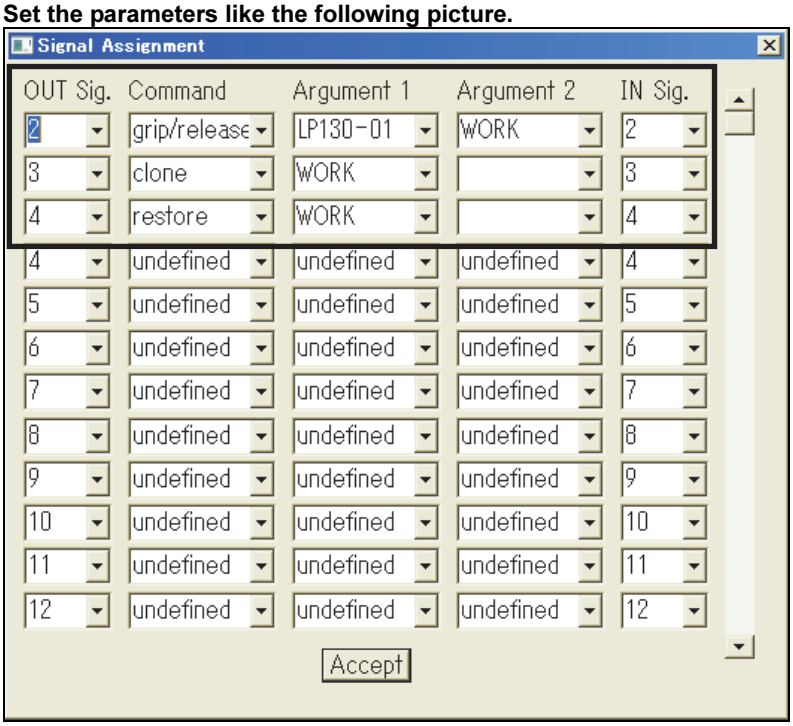


9 **The current coordinate of the WORK is stored as the initial position. Click “OK”.**

10 **Open <Tool> [Signal Assignment].**

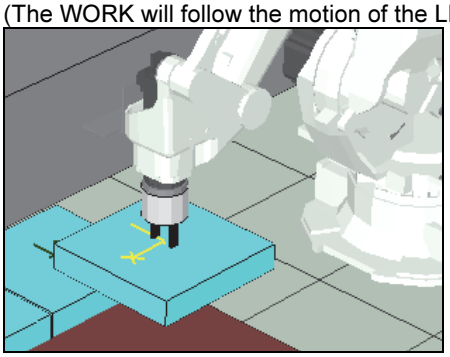
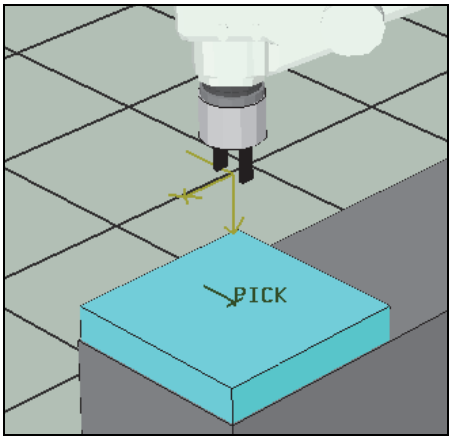


11 **Set the parameters like the following picture.**



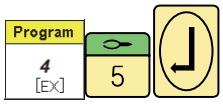
12 **Click “Accept”.**
>> The setting is saved.

Explanations for the signals

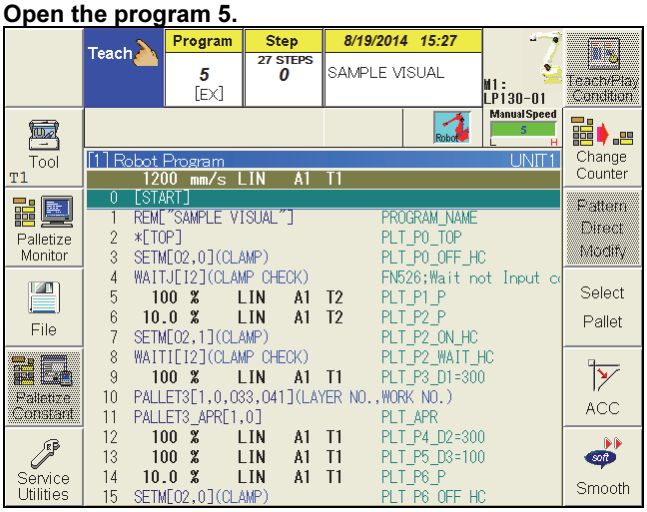
No.	Name	Description
O2	CLAMP	ON: The WORK is connected to the tool of LP130-01. (The WORK will follow the motion of the LP130-01.)  OFF: The WORK is released from the tool of LP130-01. 
O3	CLONE	<"clone" operation for the WORK> When this signal is turned ON, a copy of the WORK will be created to the present position. And the copied object is automatically named like "WORK-1".
O4	RESTORE	<"restore" operation for the WORK> When this signal is turned ON, the position of the WORK will be set to the initial position. (This is "restore" operation) The initial position should be set in advance.
I2	CLAMP CHECK	ON: The WORK is connected to the tool of LP130-01 OFF: The WORK is not connected to the tool of LP130-01.
I3	CLONE CHECK	This signal turns ON when the clone operation (caused by the O3 signal ON) for the WORK is completed. This is necessary to make synchronization between the robot program and the Virtual ROBOT window.
I4	RESTORE CHECK	This signal turns ON when the restore operation (caused by the O4 signal ON) for the WORK is completed. This is necessary to make synchronization between the robot program and the Virtual ROBOT window.

6.4.3 Let’s run the program 5 “SAMPLE VISUAL”

How to run the program 5 “SAMPLE VISUAL”

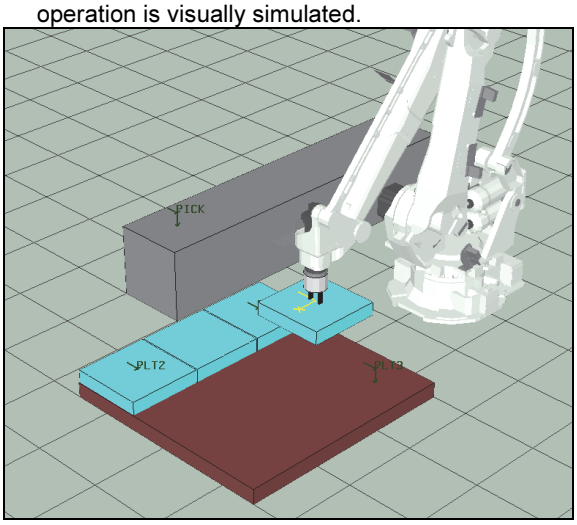


1 **Open the program 5.**



2 **Start running the program by using the same procedure as the procedure described in "6.3.9 Let’s run the program 4 “SAMPLE”".**

>> Workpieces are created one after another on the pallet, and the palletizing operation is visually simulated.



Point 1

When picking the work-piece at the position of Tag “PICK”, the following operations are executed.

- The WORK is connected to the tool of the LP130-01. (Processing by output signal O2)
- Clamp operation check is done using the I2 signal.

Point 2

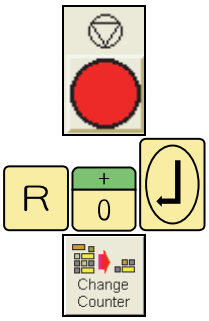
When putting the work-piece on the pallet, the following operations are executed.

- The WORK is released from the tool of the LP130-01. (Processing by output signal O2)
- A copy of WORK is generated in the present position. (Processing by output signal O3)
- The WORK will return to its initial position. (Processing by output signal O4)

6.4.4 How to restart the halted program from the beginning

To stop a palletize program halfway and start it again from the beginning, it is necessary to perform several operations. The following shows an operation example.

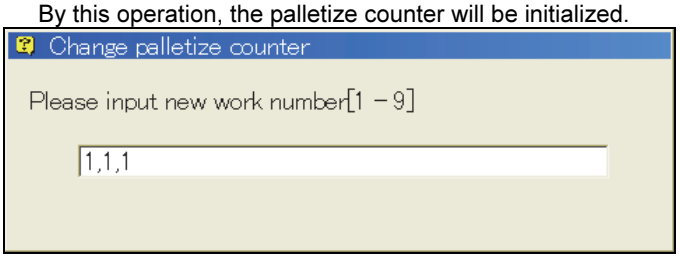
Restarting the palletize program

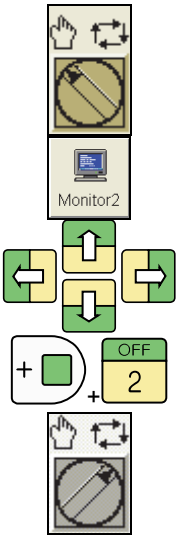


1 **Press [Stop] button while the robot is running.**
>> The program will stop.

2 **Press [R] [0] [Enter].**
>> The step counter will be reset.

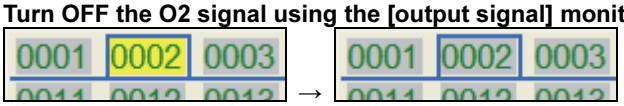
3 **Press the software key <Change Counter>.**
>> The following window will be displayed. Input [1] [Enter] [1] [Enter] [1] [Enter].
By this operation, the palletize counter will be initialized.





4 **Select the TEACH mode.**

5 **Turn OFF the O2 signal using the [output signal] monitor window.**

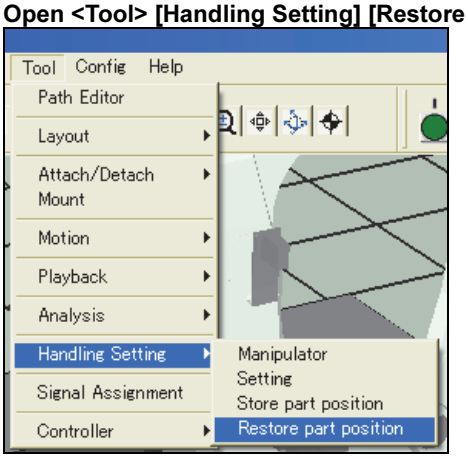


>> The WORK is released from the tool.

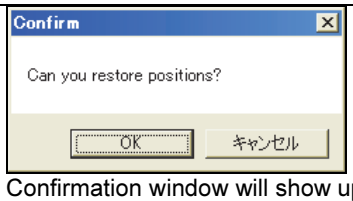
(NOTE)
When executing this operation using a real robot, be careful. Because the work-piece may fall.

6 **Select "Playback" mode using the Virtual IO window.**

7 **Open <Tool> [Handling Setting] [Restore part position].**



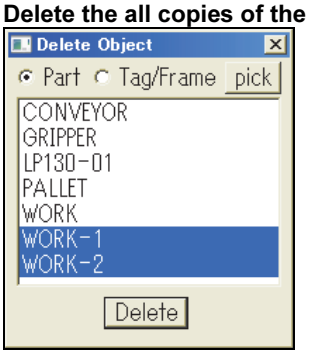
8



Confirmation window will show up. Click “OK”.
>> The WORK will return to the initial position.

9 **Open <Edit> [Delete].**

10 **Delete the all copies of the WORK created by “clone” function.**



11 **Start running the program by using the same procedure as the procedure described in "6.3.9 Let’s run the program 4 “SAMPLE”".**
>> The palletize motion will restart from the 1st work-piece of the 1st layer.

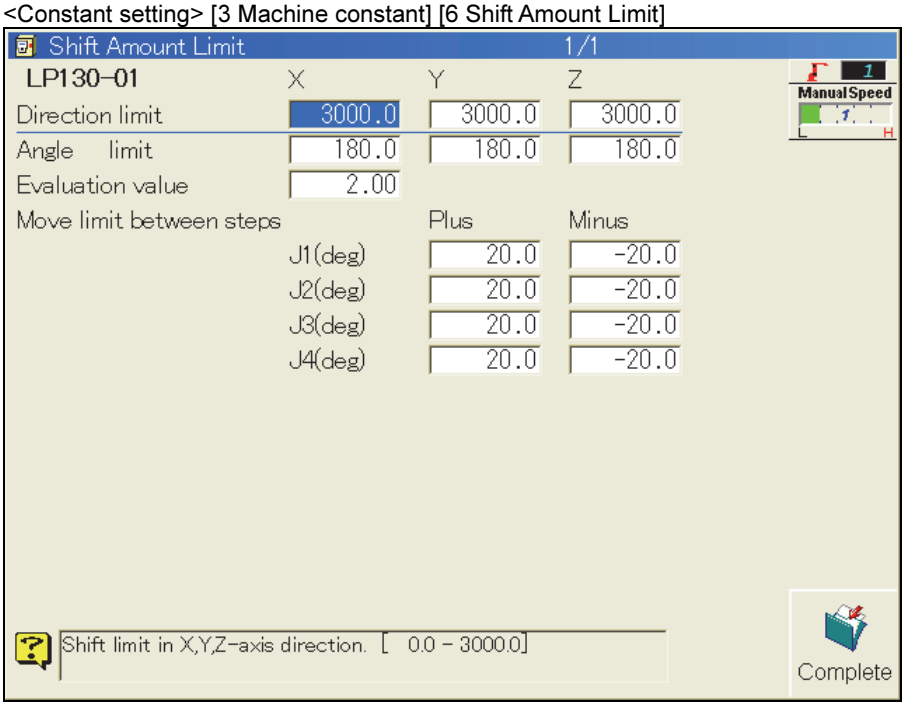
6.4.5 How to change the shift amount limit setting

The palletize function is using the “Shift function”. When the calculated shift value exceeds the “Shift Amount Limit”, an error message like the following will be displayed.

“A2173 Shift value limit exceeded.”

In a case like this, please try to change the shift value limit setting in the following screen. To open this screen, an operator class of ***EXPERT*** or higher is required. Select such a class using the shortcut keys "R314" in advance.

<Constant setting> [3 Machine constant] [6 Shift Amount Limit]



Direction limit
The limit values along the X, Y, and Z axes. (Unit: mm)

Angle limit
The rotational shift value limit around the X, Y, and Z axis. (unit is [deg])

Evaluation value
This is a parameter to make the wrist postures before and after the shift calculation match. (0.0 to 10.0)
This is a parameter for the convergence calculation. Do not change this value.

Move limit between steps
Set the movement amount limit for each axis while executing the shift operation. (unit is [deg])

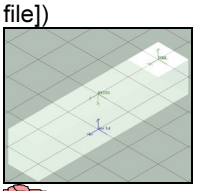
Chapter 7 Example (4) How to move a device in the work-cell using I/O control

In this chapter, how to move a conveyor mechanism that is defined as 1 joint mechanism using I/O signals is explained. (NOTE: This chapter explains only how to operate external device using I/O signals. Please note that the conveyor tracking function cannot be simulated in FD on Desk II.)

7.1 Outline of the settings

Creating a conveyor mechanism	1	Creating a conveyor mechanism

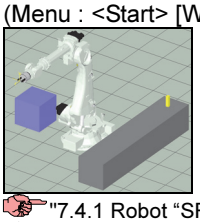
Create a conveyor as 1 axis mechanism in the mechanism creation mode of the Virtual ROBOT window. (Menu : <Start> [Create a Mec. file])



"7.3.1 Defining the conveyor as 1 axis mechanism"

Creating a work-cell	2	Creating a workcell

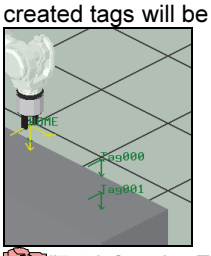
Import (load) the robot model and the conveyor model to the work-cell in the Workcell mode of the virtual ROBOT window. (Menu : <Start> [Workcell)



"7.4.1 Robot “SRA166-01.mec”"
"7.4.2 Gripper “GRIPPER.prt”"
"7.4.3 Conveyor “CONVEYOR.mec”"
"7.4.4 A tool to be mounted on the conveyor (“CVTAB”)"
"7.4.5 Creating a work-piece and a table"

	3	Creating Tags

Create tags at the point of pick point or release point etc. The created tags will be used later for teaching operation.



"7.4.6 Creating Tags"

	4	Settings for the handling and the I/O signals

Perform the setting for the visual simulation on the Virtual ROBOT.

"7.4.7 Setup of the handling menu"
"7.4.8 I/O setting"

Creating and playing back a program	5	Creating a robot program

- Create a robot program by recording movement commands and application commands (FN).

"7.5.1 Creating a temporary program"

- By using the tags that were created in advance, modify the position data of each movement command.

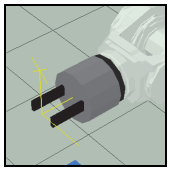
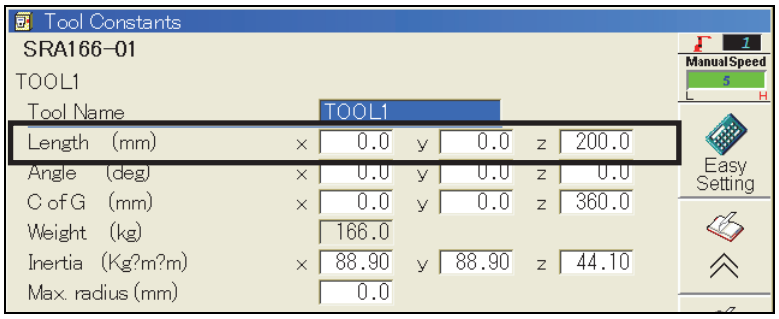
"7.5.2 Modification of the recorded position of the robot"

- Play back the completed program to check its motion.

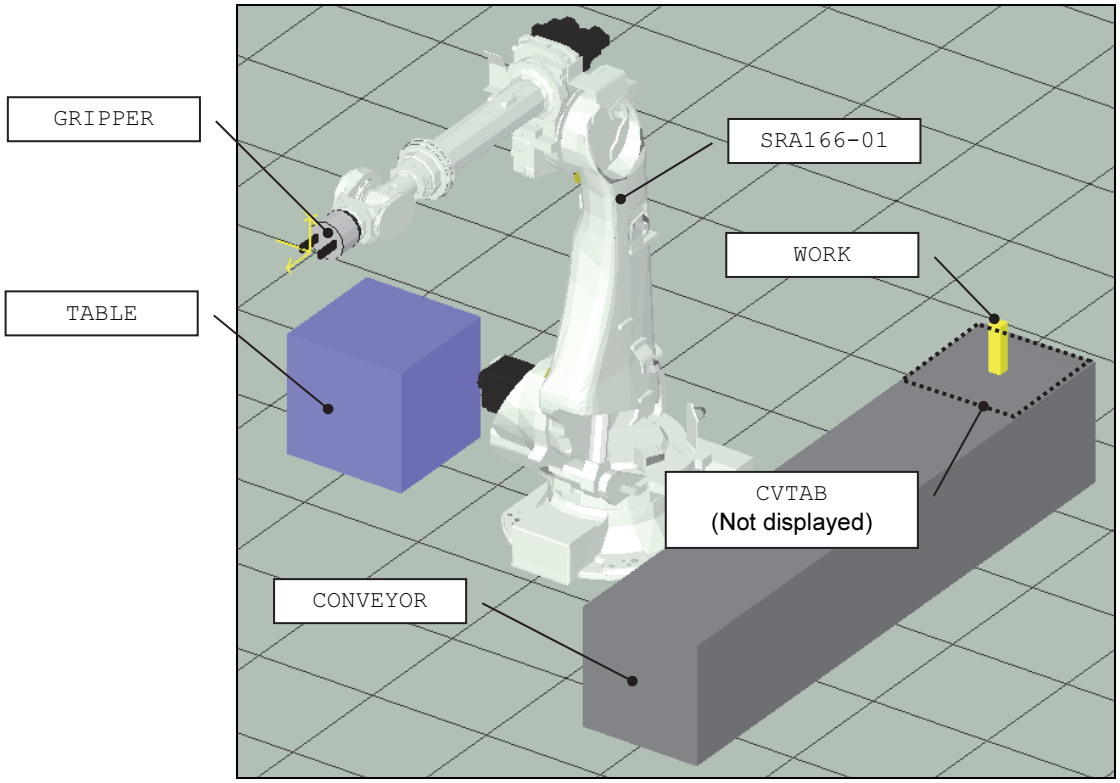
"7.5.3 Let’s run the program"

7.2 Composition of FD on Desk II

7.2.1 The outline of the system

Number of UNIT	1
Number of mechanisms	1 (SRA166-01) 
Tool	Gripper Output signal O1 = ON : Clamp Output signal O1 = OFF : Unclamp Input signal I1 = ON : Clamp Status Input signal I1 = OFF: Unclamp status 
Tool Constant	**TOOL1** Length (x,y,z) = (0, 0, 200) 

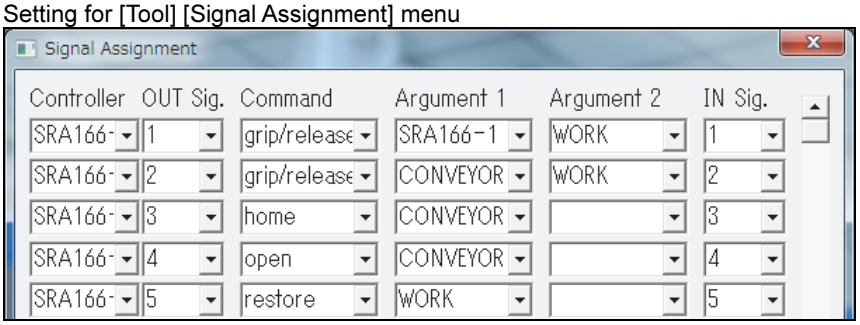
7.2.2 Outline of the Workcell



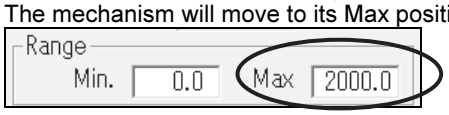
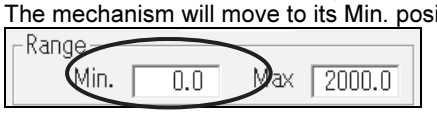
Object name	Description	X origin	Y origin	Z origin	X length	Y length	Z length
SRA166-01	Robot	0	0	0	-	-	-
GRIPPER	Tool to be mounted on the robot	Attached to the SRA166-01			-	-	-
WORK	Work-piece	-1000	1000	500	50	50	200
CONVEYOR	CONVEYOR Base Part	0	-1000	0	2500	500	500
TABLE	Table for the work-piece	0	-1000	0	500	500	500
CVTAB	Tool to be mounted on the CONVEYOR	Attached to the CONVEYOR			-	-	-

7.2.3 I/O signals

Setting for [Tool] [Signal Assignment] menu



- In the Virtual ROBOT window, the following functions can be executed using output signals.
- Up to 32 settings can be defined at maximum.
- When the function has been finished, the defined Input signal will turn ON. To make the robot program and the Virtual ROBOT window display synchronize, it is necessary to make an interlock using the input signal and the “FN525 WAITI” or “FN526 WAITJ”. If the interlock is not used, the display timing between the Virtual ROBOT and the Virtual FD may not synchronize each other.

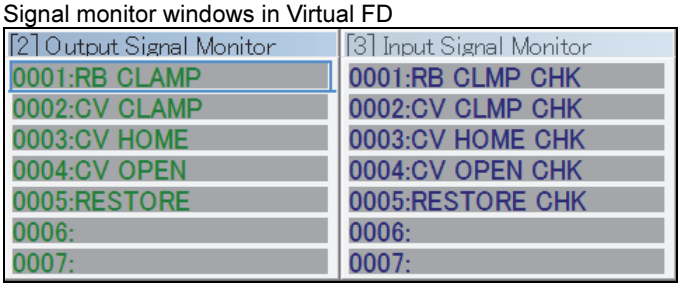
Command	Description
undefined	Nothing is executed.
open	1 axis mechanism set in the Argument 1 will move. The mechanism will move to its Max position using the pre-defined speed. 
home	1 axis mechanism set in the Argument 1 will move. The mechanism will move to its home position using the pre-defined speed.
close	1 axis mechanism set in the Argument 1 will move. The mechanism will move to its Min. position using the pre-defined speed. 
grip / release	Grip the object of Argument 2 using the tool mounted on the mechanism of Argument 1. When the output signal is ON, clamp (grip) will be executed. When the output signal is OFF, unclamp (release) will be executed. When the clamp operation has been completed, the assigned input signal will turn ON.
show	The object designated by the Argument 1 will be shown.
hide	The object designated by the Argument 1 will be hidden.
Restore	The object that is registered as a handling object will return to the pre-defined initial position. (See the section 6.4.2)
clone	A copy of the object designated by the Argument 1 will be generated at the position where this command is executed.

For the motion speed of the 1 axis mechanism that is controlled by the output signal in the Virtual ROBOT window, the following parameter will be used. (However, the servo control mechanism, which is explained in the next chapter, does not use this setting but uses the relevant parameter in the constant file.)

- To use the “grip/release” command, a tool must be mounted on the mechanism of the Argument 1. A mechanism that does not have tool cannot use this command. In this example, both the robot and the conveyor have a tool on them.

- To delete objects created by the "clone" operation, please use the menu items [Edit] and [Delete]. (Also refer to "6.4.4 How to restart the halted program from the beginning".)

Signal monitor windows in Virtual FD



No.	Name	Description
I1	RB_CLMP_CHK	This signal turns ON when the gripper of the robot clamps the work-piece.
I2	CV_CLMP_CHK	This signal turns ON when the work-piece is fixed on the conveyor.
I3	CV_HOME_CHK	This signal turns ON when the conveyor has returned to the home position.
I4	CV_OPEN_CHK	This signals turns ON when the conveyor reaches the + side limit.
I5	RESTORE_CHK	This signal turns ON when the restore operation of the work-piece position has been completed.
O1	RB_CLAMP	ON : The work-piece is fixed on the gripper of the robot. (=clamp) OFF :The work-piece is released from the gripper (=unclamp).
O2	CV_CLAMP	ON : The work-piece is fixed on the conveyor. (=clamp) OFF :The work-piece is released from the gripper (=unclamp).
O3	CV_HOME	Move the conveyor to the 0 [mm] position (home position).
O4	CV_OPEN	Move the conveyor to the + side limit. (+2,000 [mm])
O5	WORK_RESTORE	Restore the position of the work-piece (return to the initial position).

- The signal monitor window can be opened by the following shortcut commands.

  Output Signal Monitor: [R] [2] [4] [6] [Enter] [8] [Enter]
  Input Signal Monitor: [R] [2] [4] [7] [Enter] [7] [Enter]

- To display the I/O signal name on the monitor window, press  the [EDIT] key (=the "e" key on the PC keyboard), and then switch the display style using the following ICON. (The signal name should be set manually in advance.)

- The signal names can be edited in the following menu.
  <Constant Setting > [6 Signals] [7 Signal Attribute] [1 Input signal]
  <Constant Setting > [6 Signals] [7 Signal Attribute] [2 Output signal]

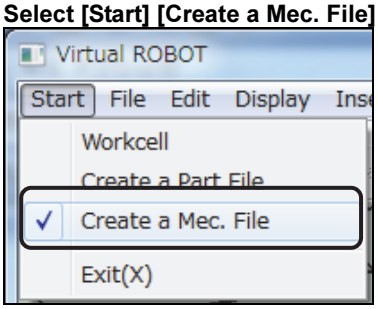
7.3 Creating a conveyor mechanism

7.3.1 Defining the conveyor as 1 axis mechanism

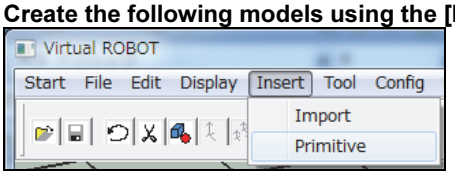
In this section, a conveyor is created as a mechanism model that has 1 joint. This model can be used for the simulation in which a work-piece is placed on the conveyor and is moved by using I/O signal in the Virtual ROBOT window.

- In this chapter, the conveyor mechanism is controlled by I/O signals. Also, a 1 axis mechanism operated by the servo motor can be defined in the same way (such as a traverse axis (slider), servo gun, and servo positioner).
- Using this way, it is also possible to simulate the motion of a sliding door of a process machine using the I/O signals.

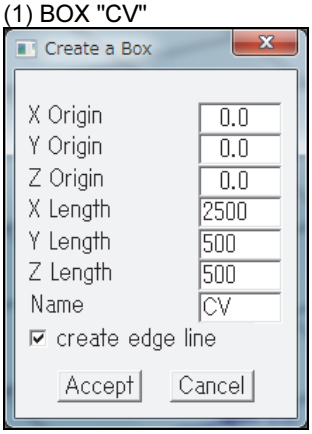
1 **Select [Start] [Create a Mec. File] menu.**



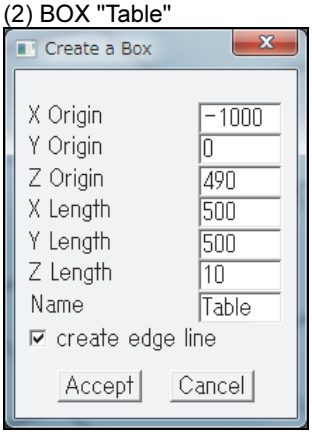
2 **Create the following models using the [Insert] [Primitive] menu.**

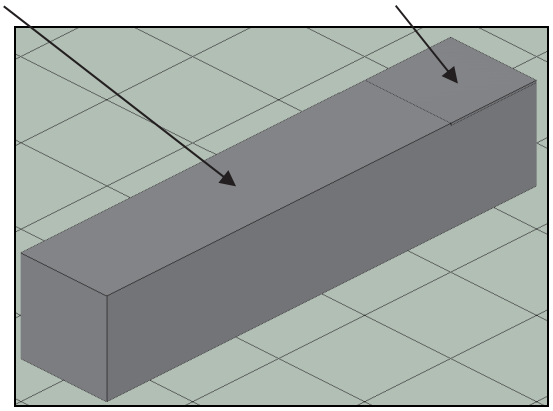


(1) BOX "CV"



(2) BOX "Table"

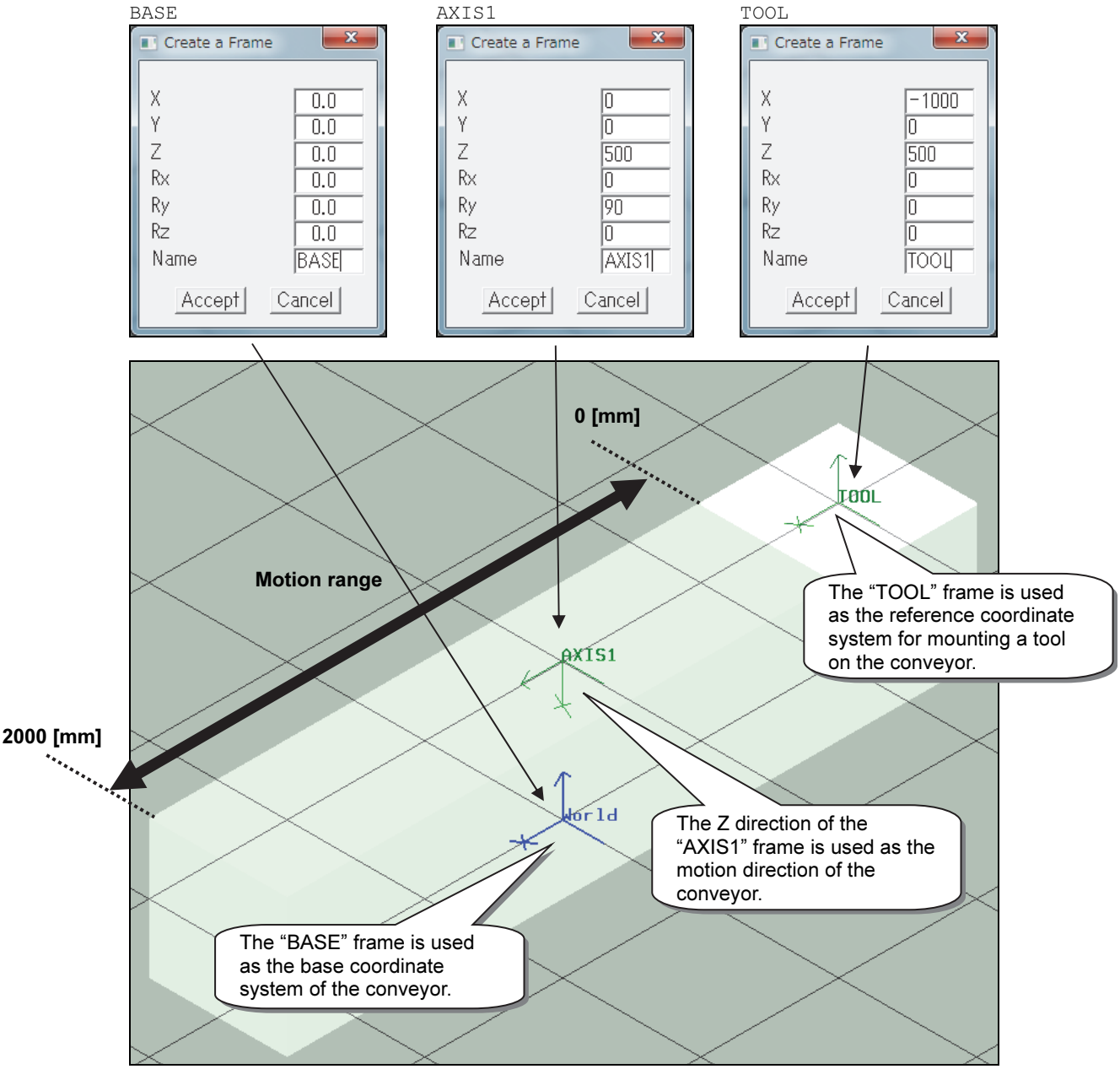




3 **Then, create the following frames from the menu of [Insert] [Primitive] [Frame].**

Frames to be created

Name	For	X	Y	Z	Rx (yaw)	Ry (pitch)	Rz (roll)
BASE	CONVEYOR BaseFrame	0	0	0	0	0	0
AXIS1	Frame to define the motion direction	0	0	500	0	90	0
TOOL	CONVEYOR ToolFrame	-1000	0	500	0	0	0



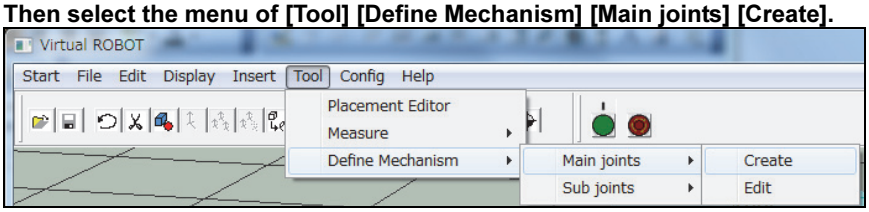
POINT

To define the motion direction of a joint, use “Frame”.
Prismatic joint: The joint moves linearly along the Z axis of the frame.
Rotational joint: The joint rotates around the Z axis of the frame.

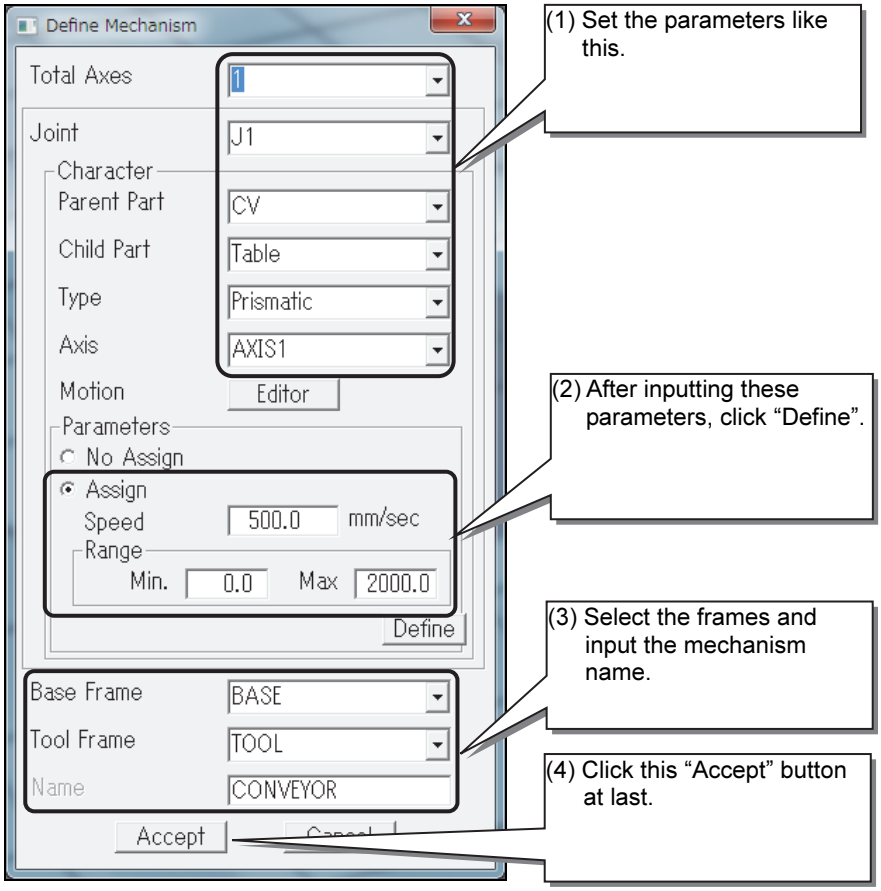
POINT

The BASE frame is used as the reference coordinate system that is used when placing a mechanism in a work-cell.
The TOOL frame is used as the reference coordinate system that is used when mounting a tool onto a mechanism.

4 **Then select the menu of [Tool] [Define Mechanism] [Main joints] [Create].**



5 **Set the parameter like the following picture.**



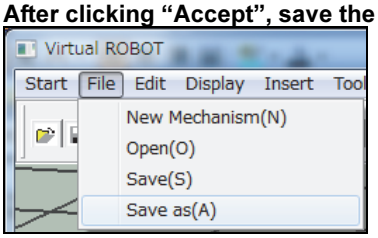
INFO.

Controller	OUT Sig.	Command	Argument 1
SRA166-	1	home	CONVEYOR
SRA166-	2	open	CONVEYOR
SRA166-	3	close	CONVEYOR

The following data that are used when defining a mechanism are used in the “[Tool] [Signal assignment]” of the Virtual ROBOT.

Speed: This is used as the conveyor speed in the Virtual ROBOT window.
Initial position of the child part:
This is used for the "home" operation.
Range "Max": This is used for the "open" operation.
Range "Min": This is used for the "close" operation.

6 **After clicking “Accept”, save the mechanism.**



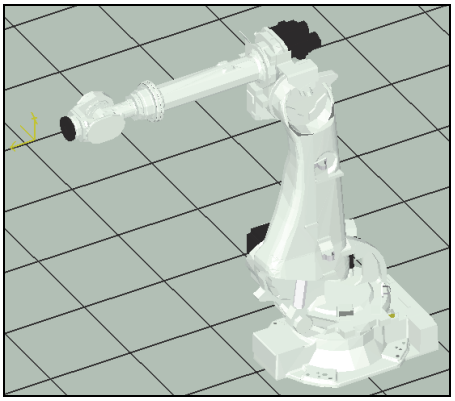
Save the mechanism as “**CONVEYOR.mec**”.

7.4 Creating a workcell

After creating a new work-cell, import the following objects by referring to the chapter3.

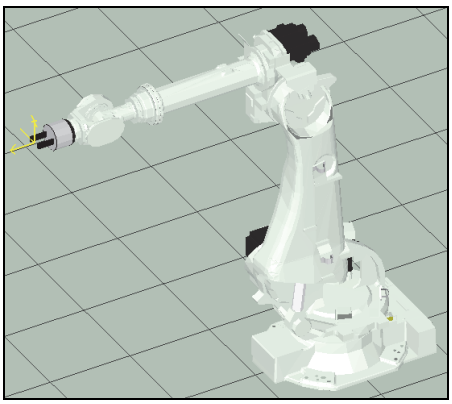
7.4.1 Robot “SRA166-01.mec”

See the section “4.2.5 Placing each object in the workcell”.



7.4.2 Gripper “GRIPPER.prt”

The gripper created in the Chapter 4 is used here. Concerning the procedure how to import a part to the work-cell, please refer to “4.2.5 Placing each object in the workcell”.

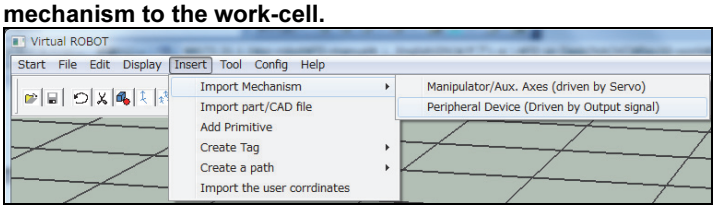


POINT

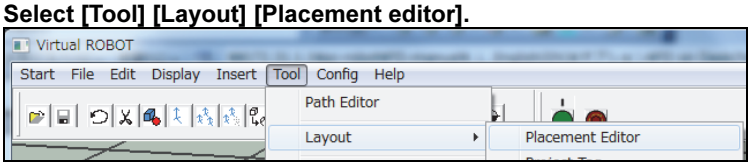
- Mount the GRIPPER onto the SRA166-01.
- Set up the tool length in advance by selecting <Constant Setting> - [3 Machine constants] - [1 Tool Constants]. (Also refer to the parameter in "7.2.1 The outline of the system".

7.4.3 Conveyor “CONVEYOR.mec”

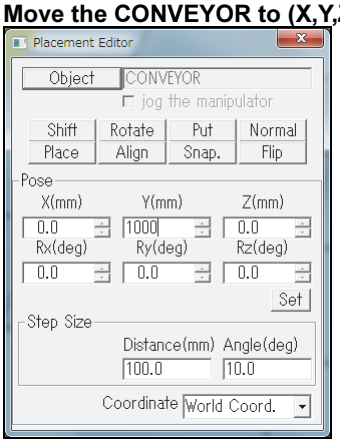
1 **Select [Insert] [Import mechanism] [Peripheral Device (Driven by Output signal)] to import the “CONVEYOR.mec” created with 7.3 Creating a conveyor mechanism to the work-cell.**

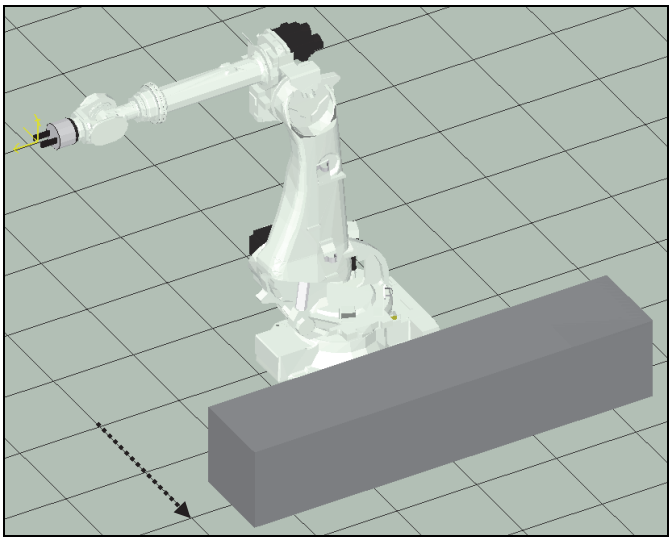


2 **Select [Tool] [Layout] [Placement editor].**



Move the CONVEYOR to (X,Y,Z) = (0, 1000, 0).

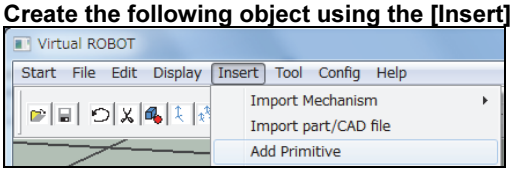


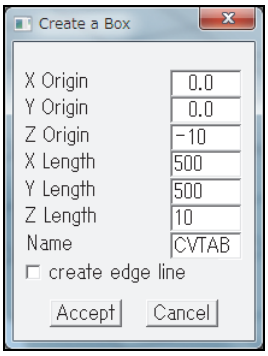


7.4.4 A tool to be mounted on the conveyor (“CVTAB”)

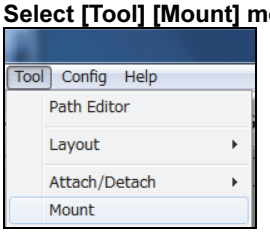
The object created here "CVTAB" is used as a tool to be mounted on the conveyor.
By mounting this tool on the conveyor, it becomes possible to place a work-piece on the conveyor or to release it from the conveyor.
Because there is no need to display the CVTAB object, it is better to set the display setting for the object to OFF.

1 **Create the following object using the [Insert] [Add primitive] menu.**

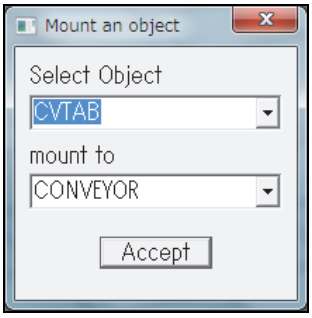




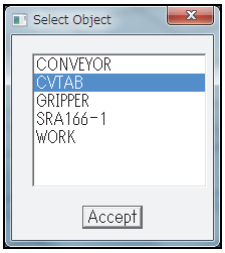
2 **Select [Tool] [Mount] menu.**



Mount the CVTAB to the CONVEYOR.

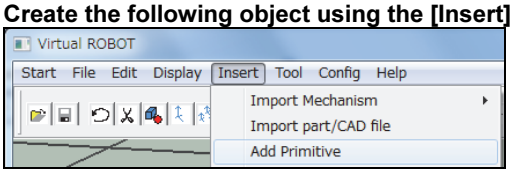


3 **Hide the CVTAB. Use the menu of [Display] [Display / Non-display].**

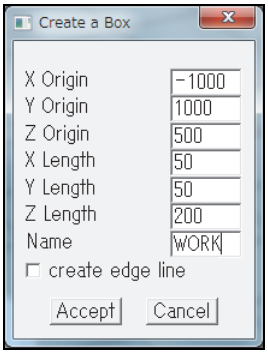


7.4.5 Creating a work-piece and a table

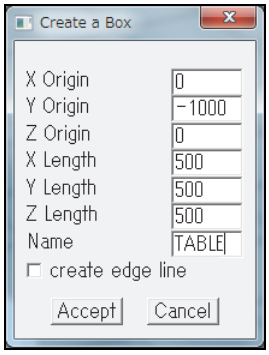
1 **Create the following object using the [Insert] [Add primitive] menu.**

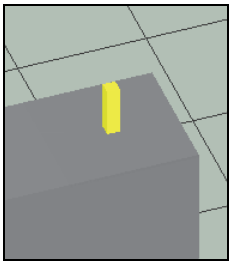


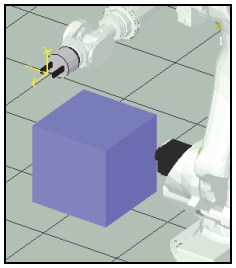
WORK



TABLE

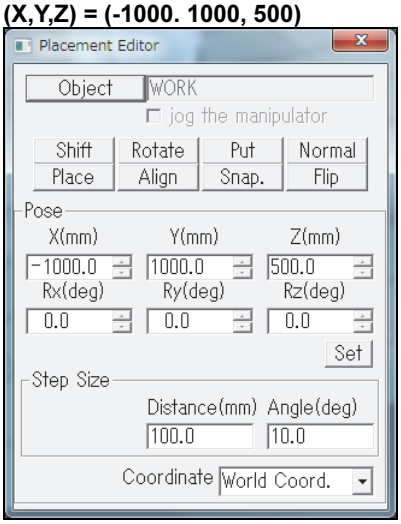






2 **Move the WORK to the following position.**

(X,Y,Z) = (-1000. 1000, 500)

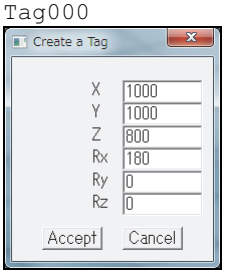


7.4.6 Creating Tags

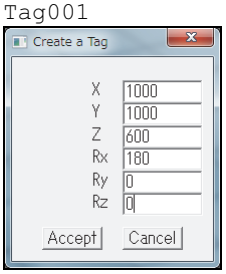
Create the following tags referring to the section “4.3.1 Creating a teaching point using a "Tag"”.

Name	For	X	Y	Z	Rx (yaw)	Ry (pitch)	Rz (roll)
HOME	Home position	1465	0	1605	180	0	0
Tag000	Pick position 1 on the conveyor	1000	1000	800	180	0	0
Tag001	Pick position 2 on the conveyor	1000	1000	600	180	0	0
Tag002	Pick position 1 on the table	0	-1000	800	180	0	-90
Tag003	Pick position 2 on the table	0	-1000	600	180	0	-90

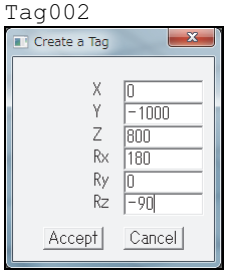
Tag000



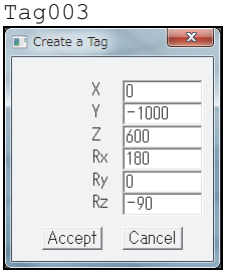
Tag001

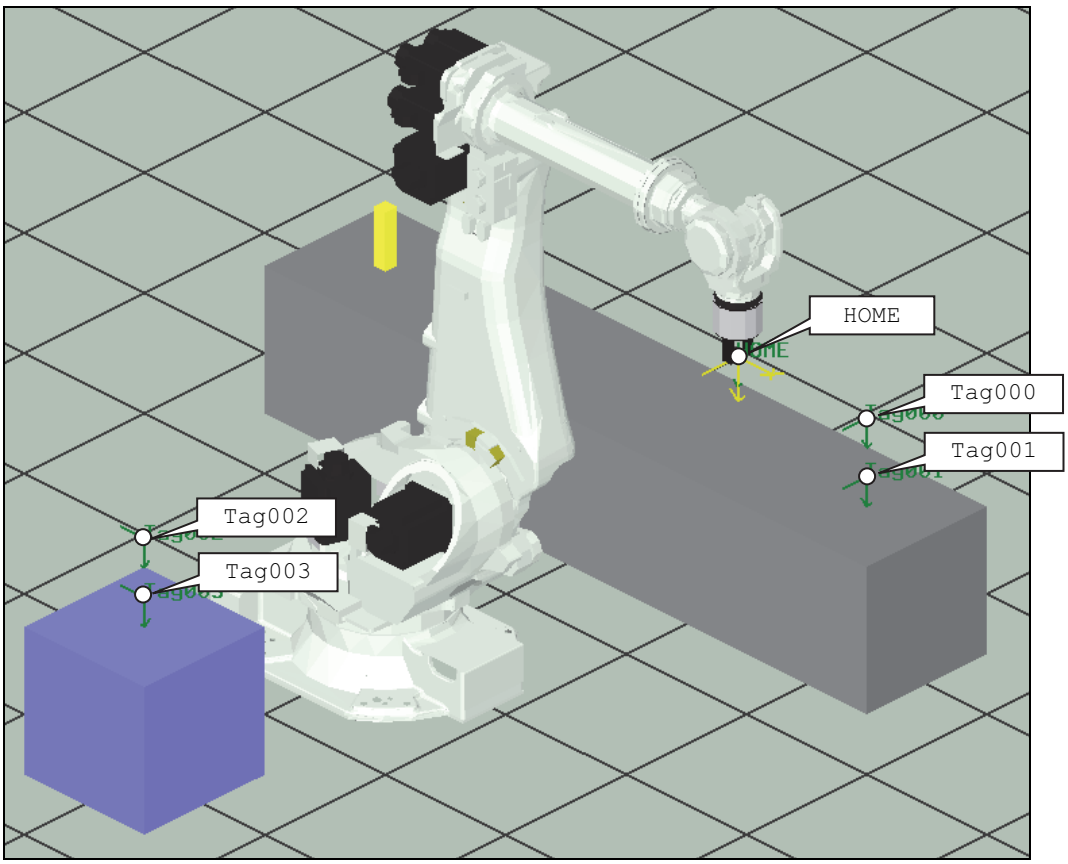


Tag002



Tag003





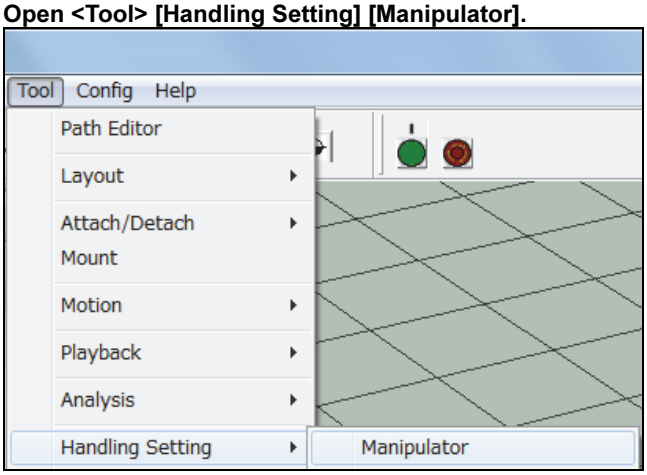
POINT

In the “Axis Data Monitor” of the robot controller, the tool angle is displayed in the order of “roll(=Rz), pitch(=Ry), yaw(=Rx)”. It is not the order of (Rx,Ry,Rz). Please be careful.

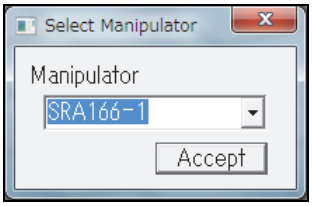
7.4.7 Setup of the handling menu

Make the settings to handle the work-piece in the Virtual ROBOT window.

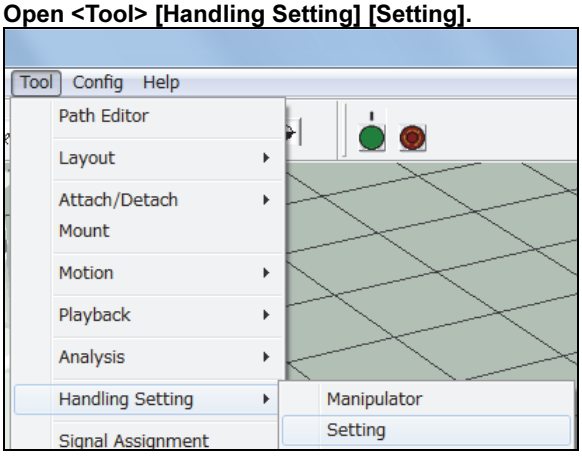
1 **Open <Tool> [Handling Setting] [Manipulator].**



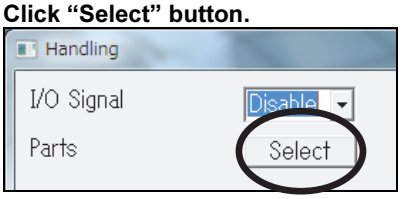
2 **Select the SRA166-01 and then click [Accept].**



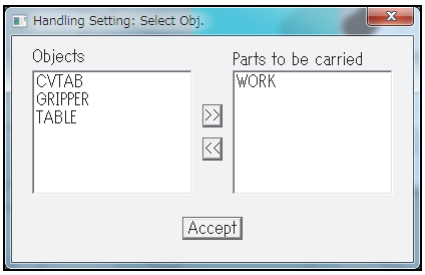
3 **Open <Tool> [Handling Setting] [Setting].**



4 **Click “Select” button.**



5 **Select "WORK" and click ">>" button.**

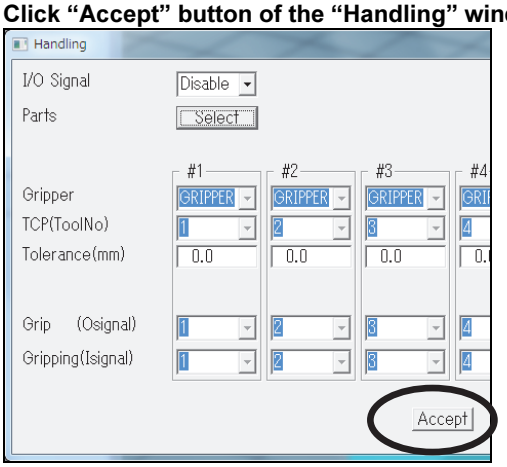


>> The "WORK" is set into the "Parts to be carried" area.

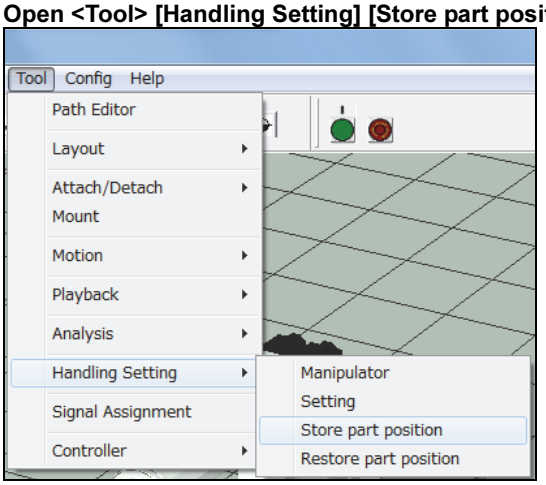
6 **Click "OK".**

>> The setting is saved.

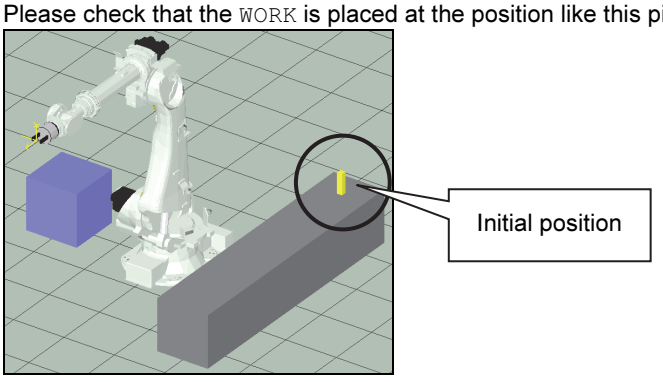
7 **Click "Accept" button of the "Handling" window.**



8 **Open <Tool> [Handling Setting] [Store part position].**



(NOTE)
Please check that the WORK is placed at the position like this picture.

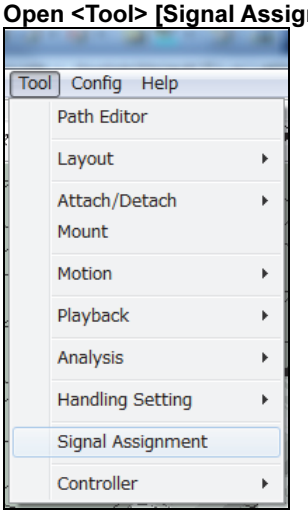


9 **The current coordinate of the WORK is stored as the initial position.**
Click “OK”.

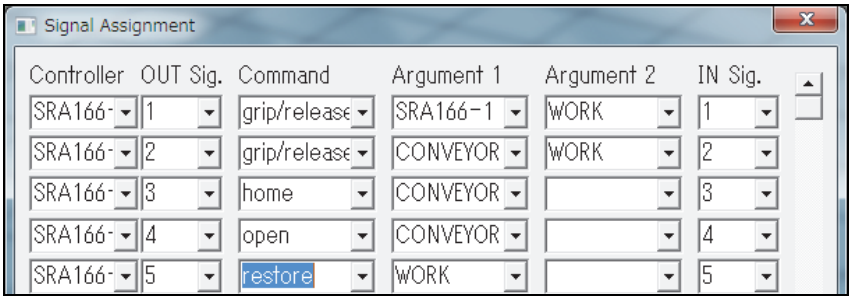
7.4.8 I/O setting

Setup the grip/release operation using the gripper and motion of the conveyor using I/O signal.

1 **Open <Tool> [Signal Assignment].**

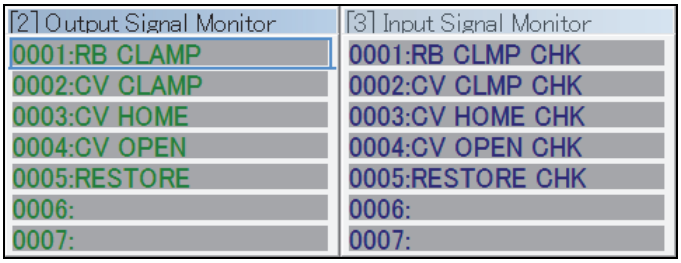


2 **Set the parameters like the following picture.**



3 **Click “OK”.**
>> The setting is saved.

4 **It is better to put names to I/O signals in Virtual FD so as to make them easy to understand.**



Concerning the name setting operation, See “7.2.3 I/O signals”.

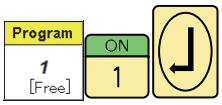
Now the basic settings of the work-cell have been completed.
Please save this work-cell as a new file.
(Example: `SAMPLE_CONVEYOR.cel`)

7.5 Creating a program

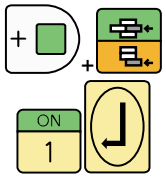
7.5.1 Creating a temporary program

Teach by using the tags created in the SAMPLE_CONVEYOR.cel.

Creating a temporary program



or



or

[Shift] + [s]
[1]
[Enter]

1 **Open the Program 1 and record a program like this picture. Because teaching point positions will be modified later, record movement commands by pressing the "c" key on the keyboard or the [Record] key on the robot operation panel regardless of the position of the robot.**

```
      5.0 %    JOINT A1  T1
  0  [START]
  1  ALLCLR                          FN0;Output signal all
  2  SET[O5](RESTORE)                FN32;Output signal set
  3  WAITI[I5](RESTORE_CHK)          FN525;Wait Input cond
  4  RESET[O5](RESTORE)              FN34;Output signal res
  5  SET[O3](CV_HOME)                FN32;Output signal set
  6  WAITI[I3](CV_HOME_CHK)          FN525;Wait Input cond
  7  RESET[O3](CV_HOME)              FN34;Output signal res
  8    100 %    JOINT A1  T1        HOME
  9  SET[O2](CV_CLAMP)               FN32;Output signal set
 10  WAITI[I2](CV_CLMP_CHK)          FN525;Wait Input cond
 11  SET[O4](CV_OPEN)                FN32;Output signal set
 12    100 %    JOINT A1  T1        Tag000
 13  WAITI[I4](CV_OPEN_CHK)          FN525;Wait Input cond
 14  RESET[O4](CV_OPEN)              FN34;Output signal res
 15  RESET[O2](CV_CLAMP)             FN34;Output signal res
 16    100 mm/s LIN   A1  T1        Tag001
 17  SET[O1](RB_CLAMP)               FN32;Output signal set
 18  WAITI[I1](RB_CLMP_CHK)          FN525;Wait Input cond
 19    100 mm/s LIN   A1  T1        Tag000
 20    100 %    JOINT A1  T1        Tag002
 21    100 mm/s LIN   A1  T1        Tag003
 22  RESET[O1](RB_CLAMP)             FN34;Output signal res
 23  WAITJ[I1](RB_CLMP_CHK)          FN526;Wait not Input c
 24    100 mm/s LIN   A1  T1        Tag002
 25    100 %    JOINT A1  T1        HOME
 26  END                             FN92;End
[EOF]
```

The respective parameters must be the same with this picture. Especially, the interpolation type of the step 20 must be “JOINT”. If the interpolation type is “LIN”, the robot will display an error message and stop.

- Concerning the teaching operations, please refer to the “BASIC OPERATIONS MANUAL”.

- It is recommended that step comments should be put to movement commands in advance. For details on how to edit step comments, refer to "BASIC OPERATIONS MANUAL".

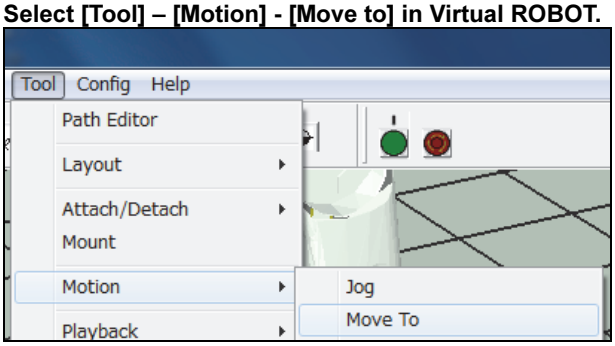
Step	Comment
8, 25	HOME
12, 19	Tag000
16	Tag001
20, 24	Tag002
21	Tag003

7.5.2 Modification of the recorded position of the robot

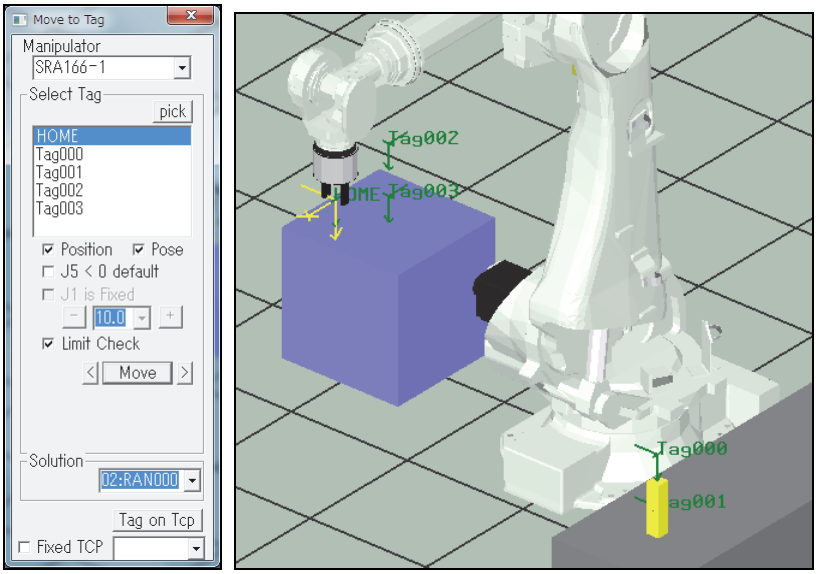
Modify the position data of the movement command using the tags (HOME, Tag000, Tag001, Tag002, Tag003).

Modification of the recorded position of the robot

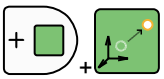
1 **Select [Tool] – [Motion] - [Move to] in Virtual ROBOT.**



2 **Double click the "HOME" to move the robot TCP.**



(NOTE) Please select "RAN000" for the "Solution".



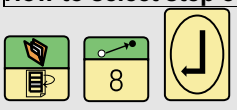
3 **Perform the position modification operation at the step 8 and step 25. ("Shift" + "M" keys on the PC keyboard can be used also)**

```
  8    100 %    JOINT A1  T1    HOME
```

```
 25    100 %    JOINT A1  T1    HOME
```

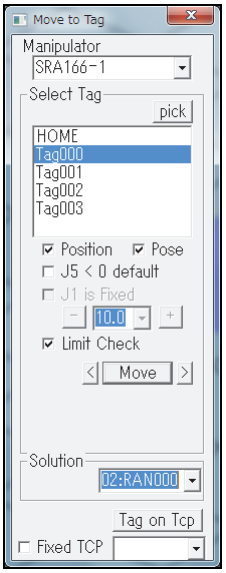
Example of the step selection operations
See the BASIC OPERATIONS MANUAL also.

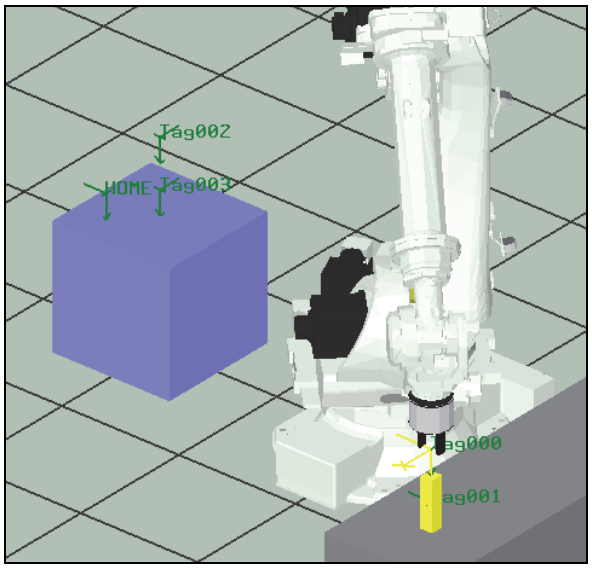
How to select step 8 using the robot operation panel

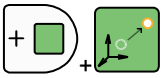


How to select step 8 using the PC keyboard
[s], [8], [Enter]

4 **Move the robot to the "Tag000" position.**





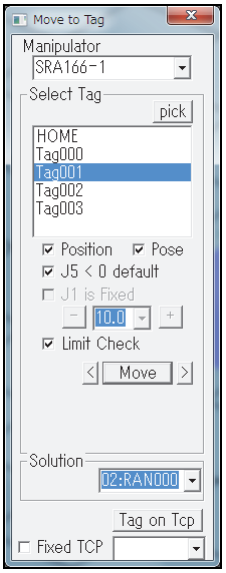


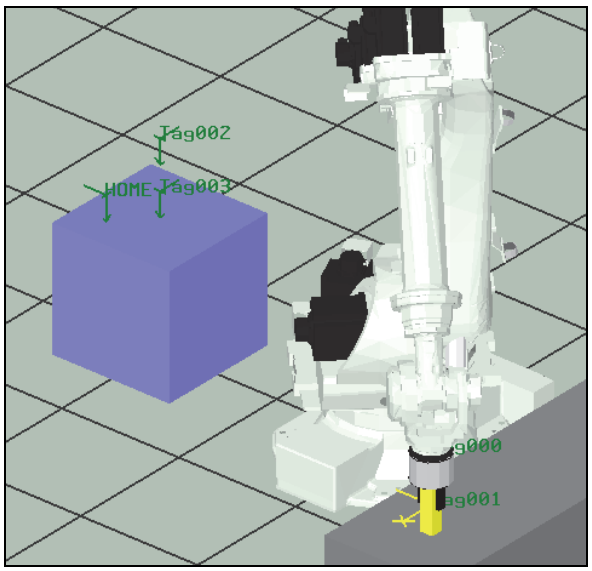
5 **Perform the position modification operation at the step 12 and step 19.**

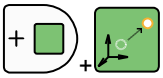
```
12    100 %     JOINT A1 T1    Tag000
```

```
19    100 mm/s LIN   A1 T1    Tag000
```

6 **Move the robot to the "Tag001" position.**



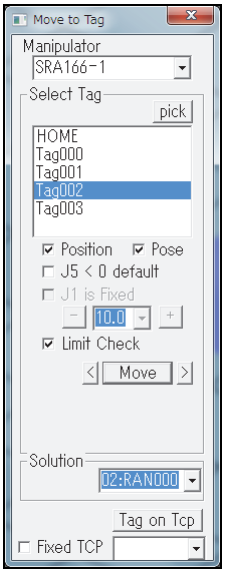


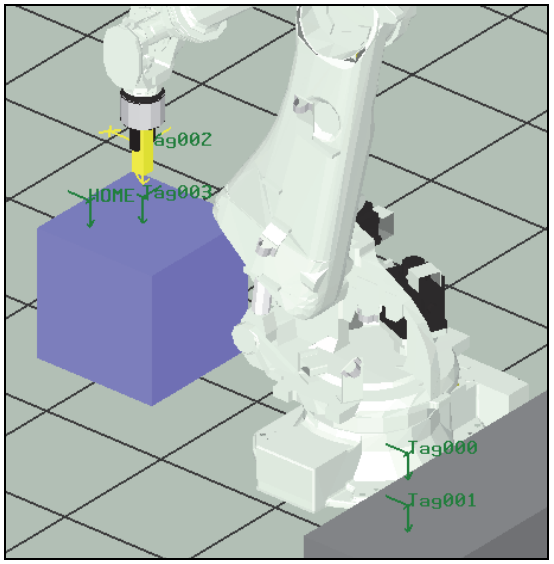


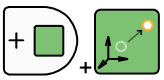
7 **Perform the position modification operation at the step 16.**

```
16    100 mm/s LIN   A1 T1    Tag001
```

8 **Move the robot to the "Tag002" position.**





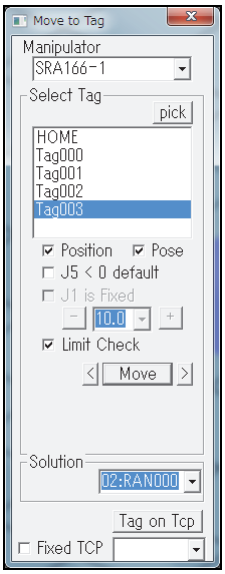


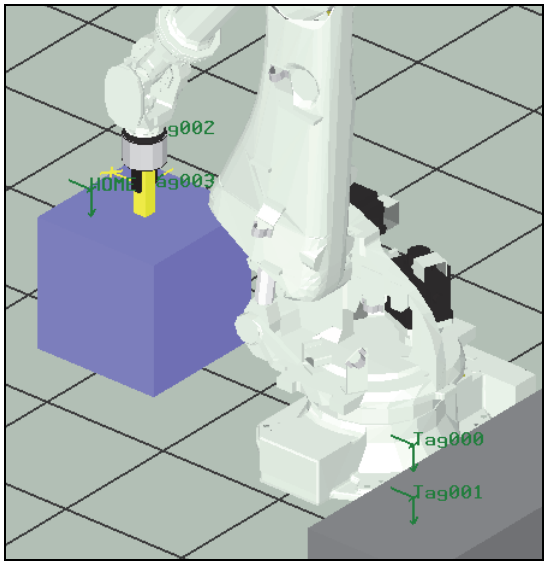
9 **Perform the position modification operation at the step 20 and step 24.**

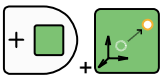
```
20    100 %     JOINT A1 T1    Tag002
```

```
24    100 mm/s  LIN   A1 T1    Tag002
```

10 **Move the robot to the "Tag003" position.**







11 **Perform the position modification operation at the step 21.**

```
21    100 mm/s  LIN   A1 T1    Tag003
```

Now the program is completed.

7.5.3 Let's run the program

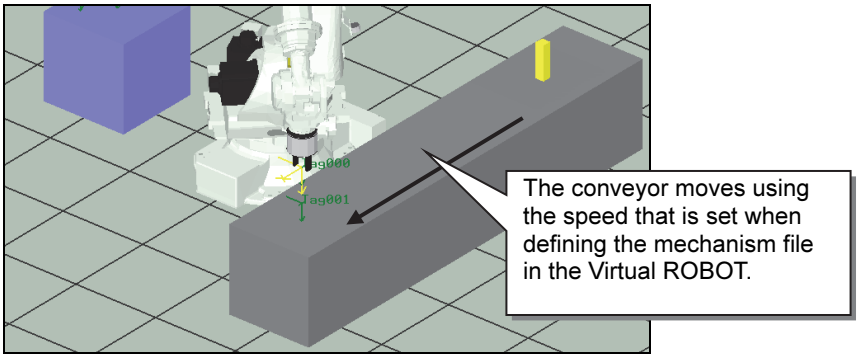
Playing back a program

1 **Select the Playback mode and start the program.**

2 **When the following 2 output signals turn ON, the work-piece (WORK) is fixed (clamped) on the conveyor and starts to move. And, please be sure that clamp check is done by using the `I2` input signal.**

`O2 : CV_CLAMP`
`O4 : CV_OPEN`

```
 9  SET[O2](CV_CLAMP)              FN32;Output signal set
10  WAITI[I2](CV_CLMP_CHK)         FN525;Wait Input cond
11  SET[O4](CV_OPEN)               FN32;Output signal set
```



3 **Just after turning ON the O4 output signal, the robot will move to the position of the `Tag000` and wait until the conveyor reaches the motion end point. To check if the conveyor reaches the end point or not, the following input signal can be used.**

`I4 : CV_OPEN_CHK`

If the motion end point check has been finished, the following signals will be turned OFF.

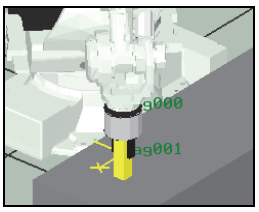
`O4 : CV_OPEN`
`O2 : CV_CLAMP`

```
12    100 %     JOINT A1  T1     Tag000
13  WAITI[I4](CV_OPEN_CHK)       FN525;Wait Input cond
14  RESET[O4](CV_OPEN)           FN34;Output signal res
15  RESET[O2](CV_CLAMP)          FN34;Output signal res
```

4 **The robot will move to the position of `Tag001` and clamp the work-piece when the `O1` output signal turns on.**
The clamp check is also done using `I1` input signal.

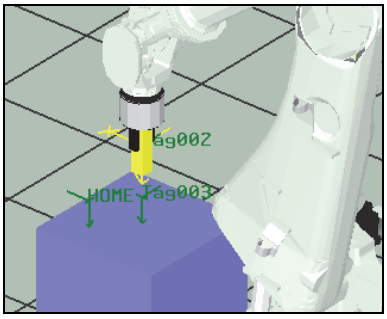
`O1 : RB_CLAMP`
`I1 : RB_CLMP_CHK`

```
16    100 mm/s LIN   A1  T1     Tag001
17  SET[O1](RB_CLAMP)            FN32;Output signal set
18  WAITI[I1](RB_CLMP_CHK)       FN525;Wait Input cond
19    100 mm/s LIN   A1  T1     Tag000
```



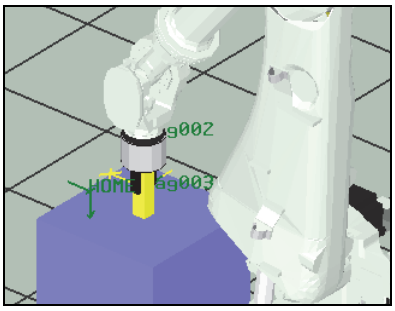
5 **The robot will pick up the work-piece and move to the position of `Tag002`.**

```
19    100 mm/s LIN    A1  T1     Tag000
20    100 %    JOINT  A1  T1     Tag002
```



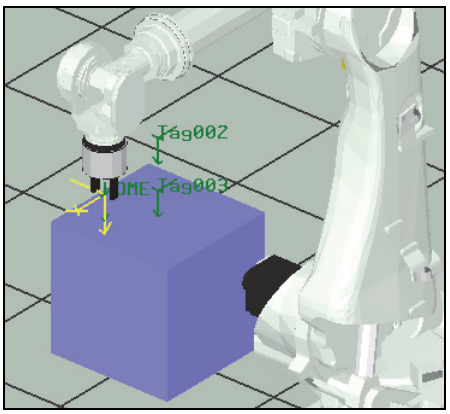
6 **The robot moves to the position of the `Tag003` and then release (unclamp) the work-piece.**

```
21    100 mm/s LIN    A1  T1     Tag003
22  RESET[O1](RB_CLAMP)          FN34;Output signal res
23  WAITJ[I1](RB_CLMP_CHK)       FN526;Wait not Input c
```



7 **After moving to the position of `Tag002`, the robot will return to the `HOME` position.**

```
24    100 mm/s LIN    A1  T1     Tag002
25    100 %    JOINT  A1  T1     HOME
26  END                          FN92;End
```



8 **Because the following initialization operations are done when starting the program, it is possible to playback this program repeatedly.**

- The position of the WORK is restored by the output signal O5.
- The CONVEYOR returns to its home position by the output signal O3.

```
  1  ALLCLR                          FN0;Output signal all
  2  SET[O5](RESTORE)                FN32;Output signal set
  3  WAITI[I5](RESTORE_CHK)          FN525;Wait Input cond
  4  RESET[O5](RESTORE)              FN34;Output signal res
  5  SET[O3](CV_HOME)                FN32;Output signal set
  6  WAITI[I3](CV_HOME_CHK)          FN525;Wait Input cond
  7  RESET[O3](CV_HOME)              FN34;Output signal res
```

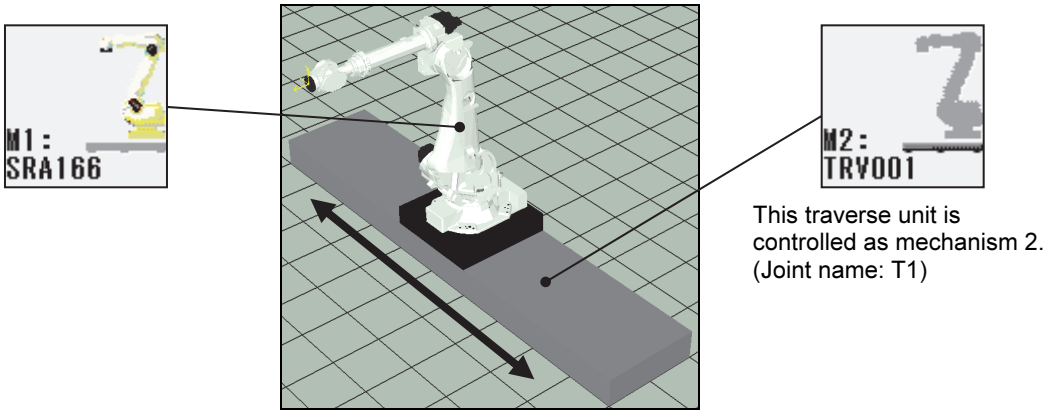
Chapter 8 Example (5) Traverse axis (Slider)

In this chapter, how to define a mechanism file (*.mec) for a traverse unit (slider) is explained.

8.1 Outline

8.1.1 The traverse axis as an additional servo joint

Normally, a traverse unit (slider) is registered to the robot controller as an “additional axis” (auxiliary axis) like a mechanism 2 or 3. And it is controlled by 1 servo motor. The following picture shows a typical configuration of a robot system that includes a traverse unit.



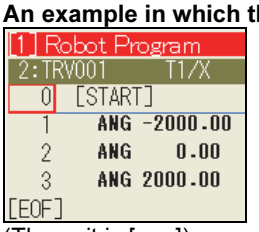
This traverse unit is controlled as mechanism 2. (Joint name: T1)

Concerning the procedures to initialize the memory with the configuration of “Robot + Slider”, please refer to the instruction manual “Memory format procedure” (TFDEN-094).

8.1.2 Servo mechanism

The procedure itself to define a traverse unit mechanism is the same with that of the previous chapter. And, if the mechanism file is assigned to a mechanism that is controlled by 1 servo motor (In this example, mechanism 2), it can be controlled by a movement command recorded in a robot program.

An example in which the traverse unit position is displayed in the program edit screen.

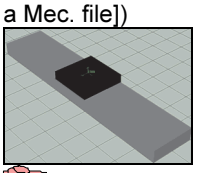
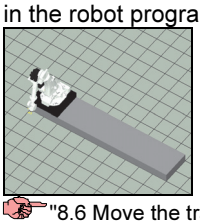


(The unit is [mm])

In the following sections, how to define a traverse unit mechanism file is described. And, because the basic operations are the same with that of the previous chapter, the detailed operations are omitted in this chapter. If necessary, refer to the previous chapter.

8.2 Outline of the settings

The overview of the setting procedures are shown as below.

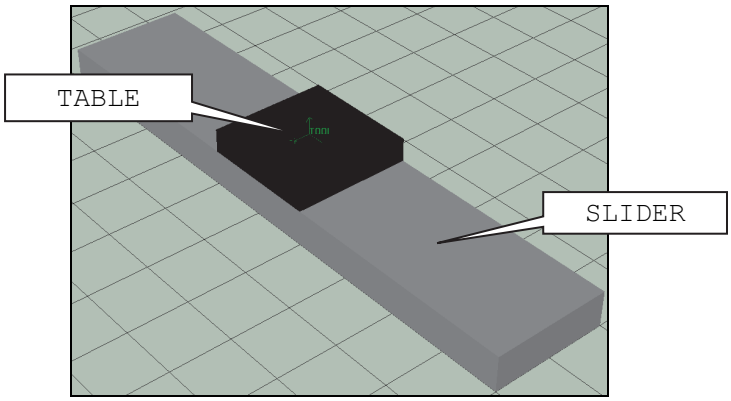
Creating a traverse unit (slider) mechanism	1	Creating the traverse unit (slider) mechanism
		Create a traverse unit as 1 axis mechanism in the mechanism creation mode of the Virtual ROBOT window. (Menu : [Start] [Create a Mec. file])  "8.3 Creating the shape and the frame" "8.4 Defining the traverse unit mechanism"
Importing the traverse unit to a work-cell as a servo control mechanism	2	Creating a workcell
		Select [Start] [Workcell] menu in the Virtual ROBOT window. Then import the respective objects. (e.g. SRA166-01.mec etc.)
	3	Importing the traverse mechanism to the work-cell
		Import the traverse unit as a servo control mechanism (“driven by servo”) to the work-cell.  "8.5 Importing the traverse unit mechanism as a servo control mechanism"
Creating a program	4	Creating a program
		The traverse unit can be controlled using the movement command in the robot programs.  "8.6 Move the traverse unit using a robot program"

Concerning the pulse constant and the installation angle, see the following section.
"8.7 Supplement"

8.3 Creating the shape and the frame

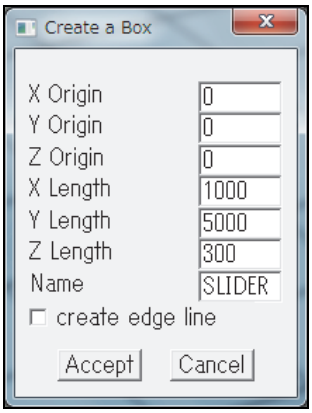
8.3.1 Creating the shapes

First, create the 3-D objects referring to the following table.

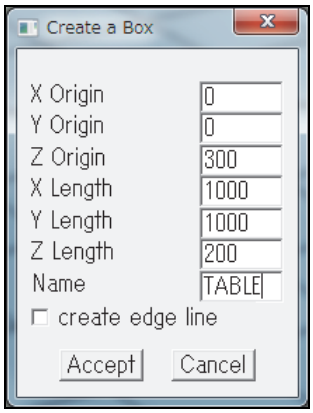


Name	For	X origin	Y origin	Z origin	X length	Y length	Z length
SLIDER	Slider Base Unit	0	0	0	1000	5000	300
TABLE	A table on which the robot is installed	0	0	300	1000	1000	200

SLIDER

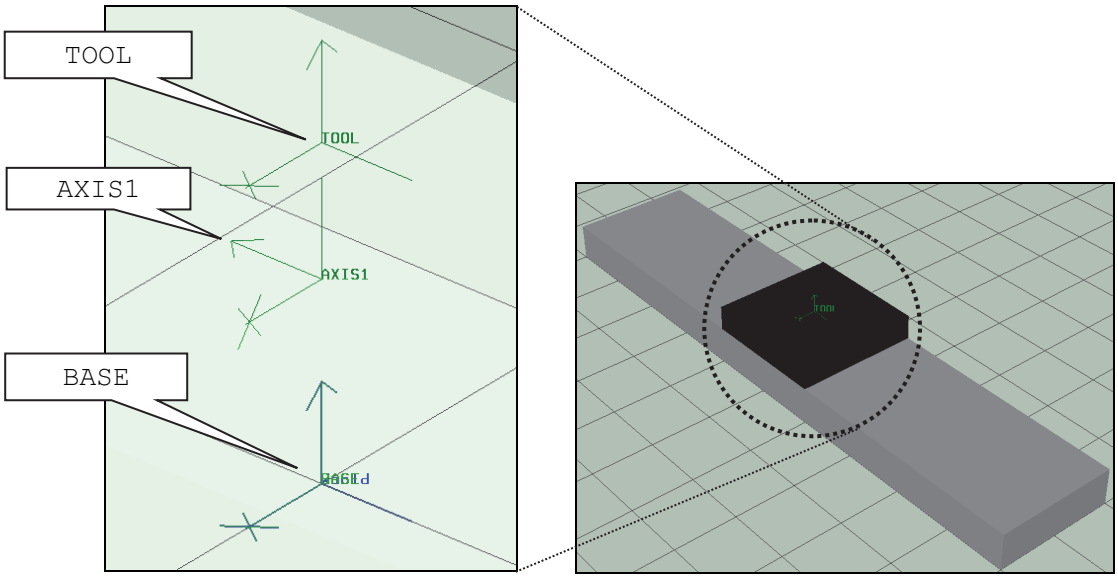


TABLE



8.3.2 Creating the frames

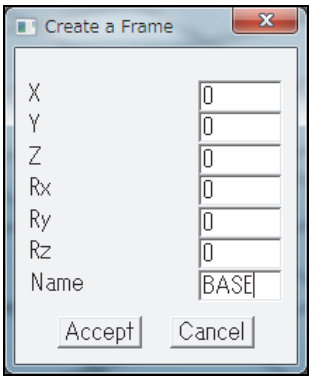
Create the following frames.



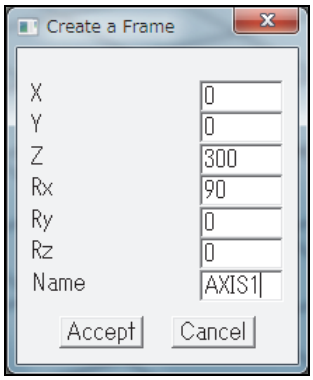
Frames to define a traverse unit

Name	For	X	Y	Z	Rx (yaw)	Ry (pitch)	Rz (roll)
BASE	BaseFrame	0	0	0	0	0	0
AXIS1	Frame to define the motion direction	0	0	300	90	0	0
TOOL	ToolFrame	0	0	500	0	0	0

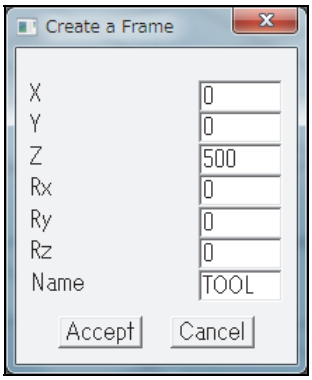
BASE



AXIS1



TOOL

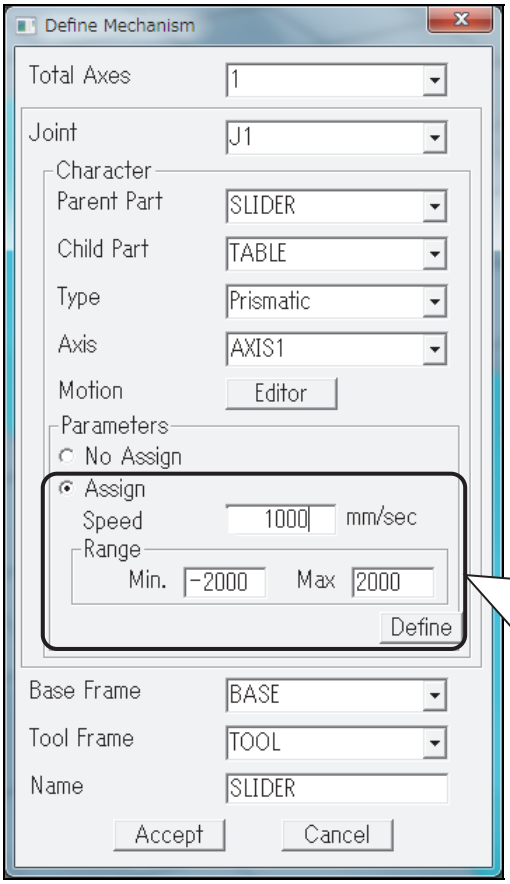


POINT

- Place the "BASE" frame on the ground.
- Make the +Z direction of the "AXIS1" and the "+" motion direction of the T1 axis (the joint of the traverse unit) match each other.
- Place the "TOOL" frame at the center point of the sliding table of the traverse unit.

8.4 Defining the traverse unit mechanism

After creating each object and the frames shown in the previous sections, define a traverse unit with a setting like the picture shown as below. The setting operation is the same with the conveyor in the previous chapter.



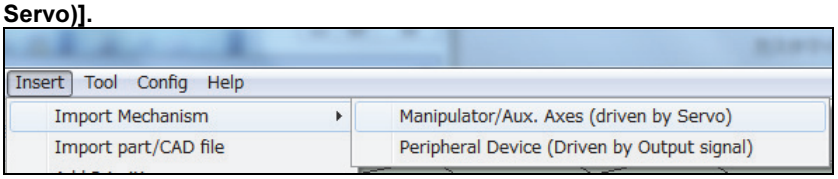
These setting parameters are used only when controlling the unit using I/O signals. When controlling the unit using servo system, these parameters are not used.

In case of servo control mechanism, the parameters in the INI file (the mechanism's constant file) like the robot main joints are used.

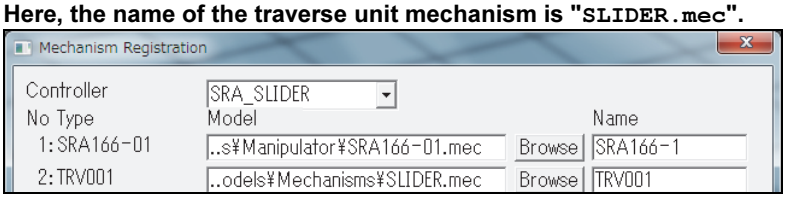
After defining the mechanism by clicking “Accept”, save the mechanism as “`SLIDER.mec`”.

8.5 Importing the traverse unit mechanism as a servo control mechanism

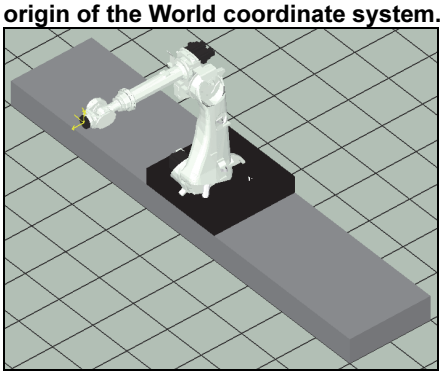
1 **Select [Insert] [Import Mechanism] [Manipulator / Aux. Axes (driven by Servo)].**



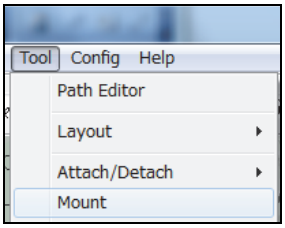
2 **Assign the robot to mechanism 1 and the traverse unit mechanism to mechanism 2.**
Here, the name of the traverse unit mechanism is "`SLIDER.mec`".



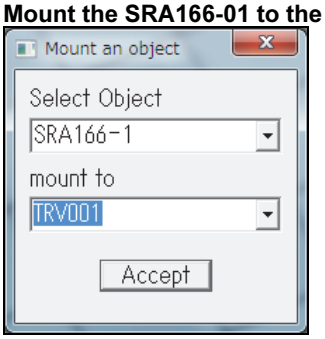
3 **At this time, both the robot and the traverse unit (slider) are placed at the origin of the World coordinate system.**



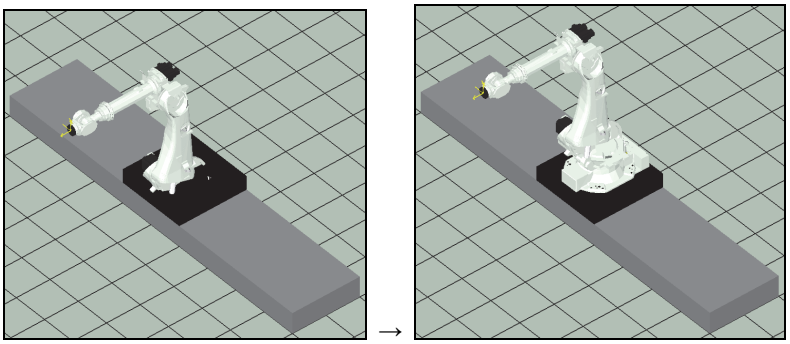
4 **Mount the robot to the traverse unit. Select [Tool] [Mount] menu.**

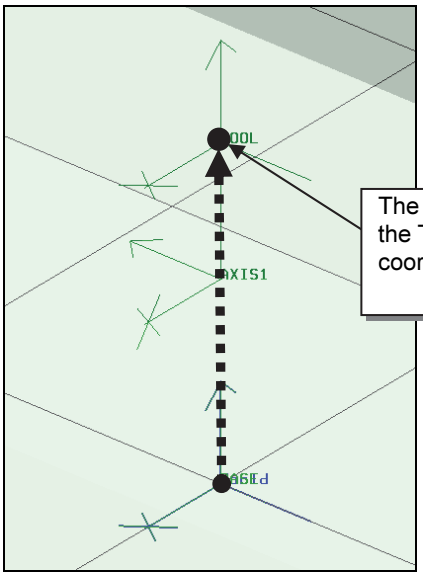


5 **Mount the SRA166-01 to the traverse unit (TRV001).**



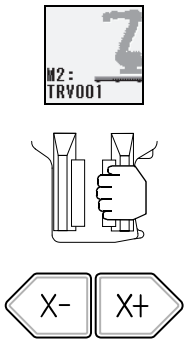
6 **When clicking the “Accept” button, the robot is attached to the origin of the TOOL frame of the traverse unit.**

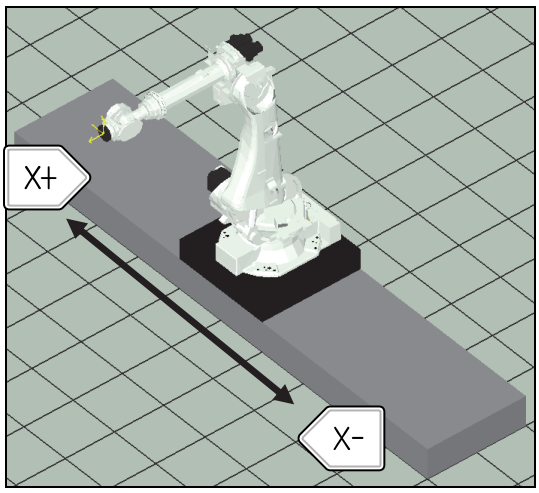




And, the direction of the machine coordinate system of the robot matches the direction of the TOOL frame at this time.

7 **After selecting mechanism 2, turning ON the Motors, and operating the traverse unit using the X+/X- keys, the robot is moved by the traverse unit.**





Now, it becomes possible to operate the traverse unit on FD on Desk II.

8.6 Move the traverse unit using a robot program

By setting position values in [mm] for the traverse unit in the movement command of a program, it is possible to move the traverse unit.

8.6.1 Example 1: An unit in which both the robot and the slider are included

UNIT1

1	☑	SRA166-01	8.00.00
2	☑	TRV001	2.00.00

In case of a configuration like this, it is possible to move the robot (=mechanism 1) and the traverse unit (=mechanism 2) together using only 1 program.

Mechanism 1 (SRA166-01) position data

[1] Robot Program UNIT1

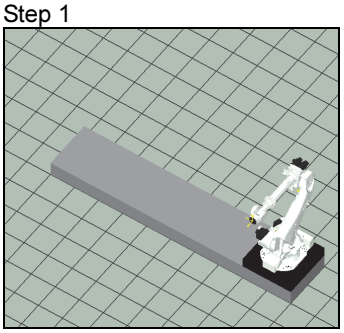
1:SRA166-01	J1/X	J2/Y	J3/Z	J4/A	J5/B	J6/C
0 [START]						
1 V ANG	0.00	130.00	-40.00	0.00	0.00	0.00
2 V ANG	0.00	90.00	0.00	0.00	0.00	0.00
3 V ANG	0.00	70.00	-60.00	0.00	0.00	0.00

Mechanism 2 (TRV001) position data

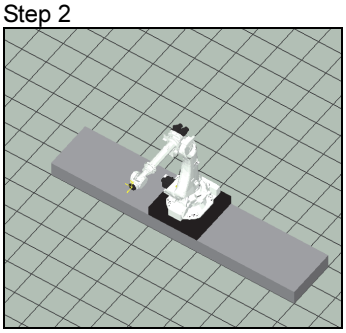
[1] Robot Program UNIT1

2:TRV001	T1/X	/Y	/Z	/A	/B	/C
0 [START]						
1 ANG -2000.00						
2 ANG 0.00						
3 ANG 2000.00						

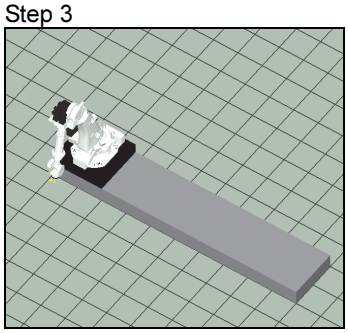
Step 1



Step 2

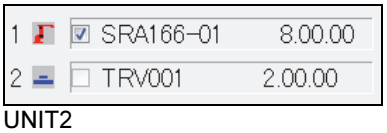


Step 3

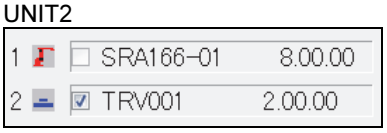


8.6.2 Example 2: The robot is UNIT1 and the traverse unit is UNIT2

UNIT1



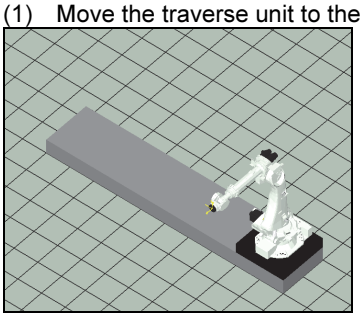
UNIT2



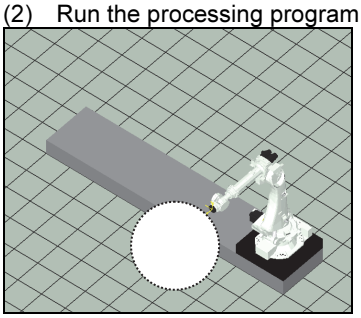
For a configuration like this, it is possible to move only the traverse unit using the program for UNIT 2. **The program for UNIT 1 is independent of UNIT 2**. Therefore, it is possible to perform the same work **regardless of the position of the traverse unit**.

(Example)

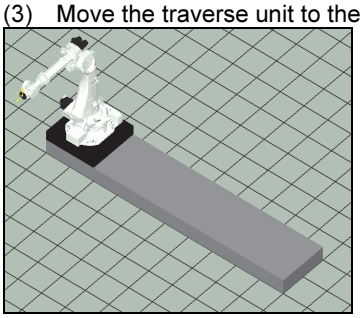
(1) Move the traverse unit to the position of -2000[mm] by the UNIT2 program.



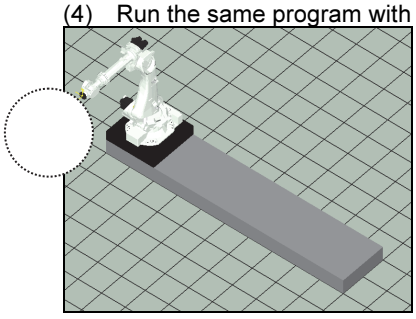
(2) Run the processing program in the UNIT1 (robot).



(3) Move the traverse unit to the position of 2000[mm] by the UNIT2 program.



(4) Run the same program with (2) in the UNIT1.



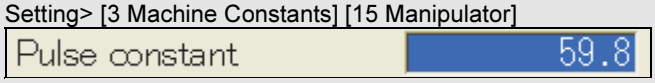
8.7 Supplement

8.7.1 Pulse constant

WARNING

If a work-program is created on FD on Desk II with the **"Pulse constant"** for the traverse unit different from the one for the real robot controller, and downloaded to the real robot controller, the robot may move to an unexpected position. This is dangerous. Therefore, if it is necessary to teach (create a program) on FD on Desk II, please carefully check the value set on FD on Desk II and the value set in the real robot controller. Concerning the setting value for the pulse constant, please ask the mechanical designer of the traverse unit.

(Reference)
Setting example of the pulse constant for the traverse unit in the menu of <Constant Setting> [3 Machine Constants] [15 Manipulator]

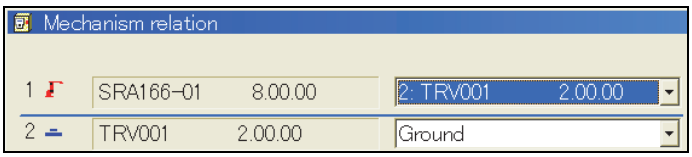


To avoid trouble like this, it is recommended that the teaching operation should be performed after restoring into FD on Desk II the backup data for a real robot system who has been set up completely and whose operability has been confirmed.

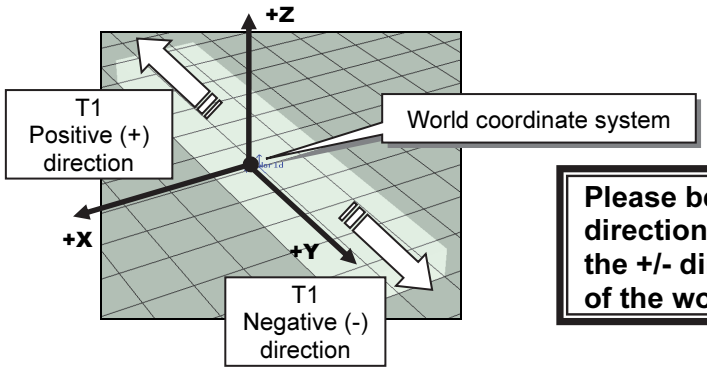
The “Pulse constant” is a parameter to decide the relationship between the number of the encoder pulses and the motion amount of the mechanism. This parameter depends on the mechanical design of the traverse unit.

8.7.2 Relationship between the motion direction of the traverse unit and the World coordinate system

If the robot is installed on the traverse unit logically



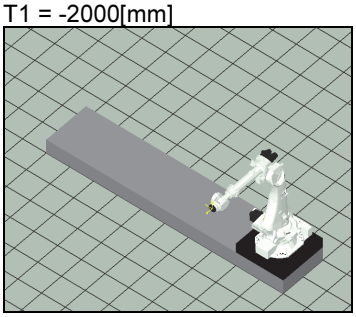
In the initial setting, a traverse unit is placed in the world coordinate system like the following picture. For example, if the unit (Joint of "T1") moves to +1000[mm] position, the robot on the unit will be regarded that it moved 1000[mm] towards the minus direction of the Y axis of the world coordinate system. In another word, because the child mechanism (=robot) is mounted on the parent mechanism (=traverse unit), its coordinates in the world coordinate system are affected by the motion of the parent mechanism.



Please be sure that the +/- direction of the T1 joint and the +/- direction of the Y axis of the world coordinate.

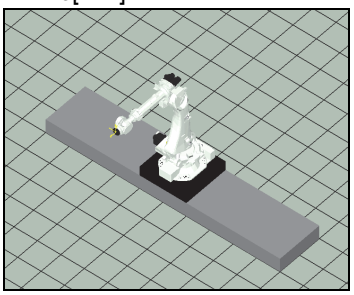
Under this setting, the TCP position (X, Y, Z) on the World coordinate system is displayed like the following pictures.

T1 = -2000[mm]



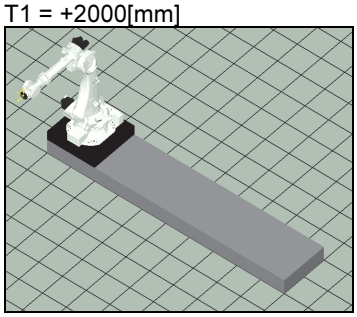
X=	1690.0
Y=	2000.0
Z=	2030.0
r=	0.0
p=	-90.0
y=	-180.0

T1 = 0[mm]



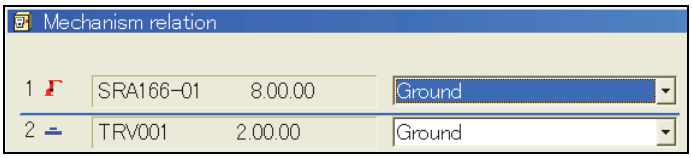
X=	1690.0
Y=	-0.0
Z=	2030.0
r=	0.0
p=	-90.0
y=	-180.0

T1 = +2000[mm]



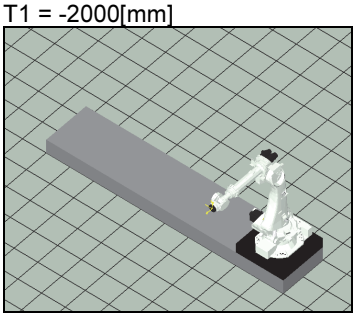
X=	1690.0
Y=	-2000.0
Z=	2030.0
r=	0.0
p=	-90.0
y=	-180.0

If the robot is not installed on the traverse unit logically



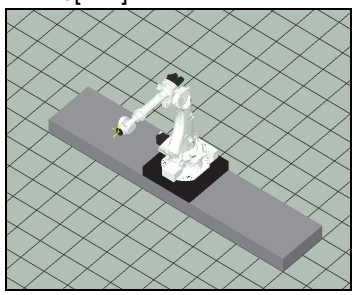
Under this setting, the movement of the traverse unit does not affect the coordinates of the robot in the world coordinate system. When the traverse unit moves, the real robot also moves physically because it is fixed on the sliding table on the traverse unit mechanically. However, from the viewpoint of the software, the robot is still fixed on the world coordinate system.

T1 = -2000[mm]



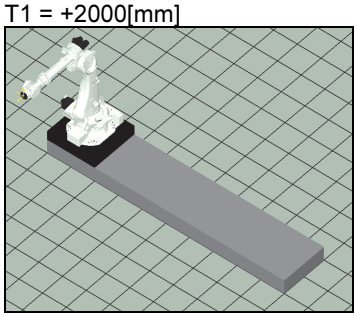
X=	1690.0
Y=	-0.0
Z=	2030.0
r=	0.0
p=	-90.0
y=	-180.0

T1 = 0[mm]



X=	1690.0
Y=	-0.0
Z=	2030.0
r=	0.0
p=	-90.0
y=	-180.0

T1 = +2000[mm]



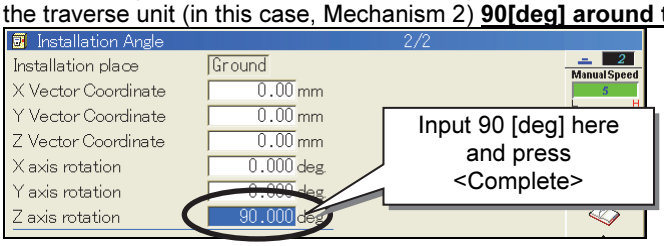
X=	1690.0
Y=	-0.0
Z=	2030.0
r=	0.0
p=	-90.0
y=	-180.0

8.7.3 How to change the motion direction of the traverse unit to X axis direction

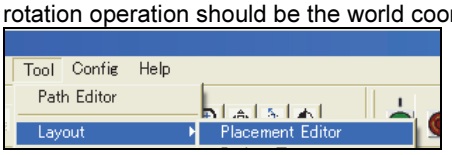
As described in the previous section, in the initial setting, the motion direction of the traverse unit is **parallel to the Y axis** of the world coordinate system. In this section, how to make it **parallel to the X axis** is described. **Normally, Teaching and Playback are possible without a setting like this.** But, when using the RMU (Robot Monitoring Unit), or the "Synchro-motion function (cooperative motion)" etc., it may be necessary to change the settings to calculate the TCP (Tool Center Point) coordinates of the robot hand in the world coordinate system depending on the layout out the peripheral equipment etc.

Setting procedure

After opening the menu of <Constant Setting> - [12 Format and Configuration] [5 Installation Angle], rotate the traverse unit (in this case, Mechanism 2) **90[deg] around the Z axis**.

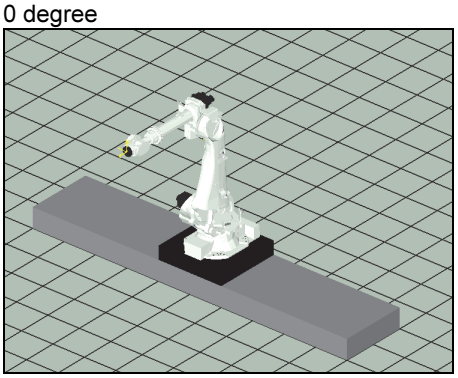


At the same time, also in Virtual ROBOT, using the same rotation angle data, rotate the traverse unit in the z axis direction by selecting the menu items as follows. And, please be sure that the coordinate system for the rotation operation should be the world coordinate system.

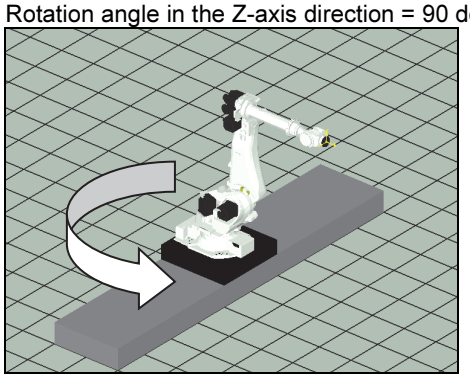


(Example)

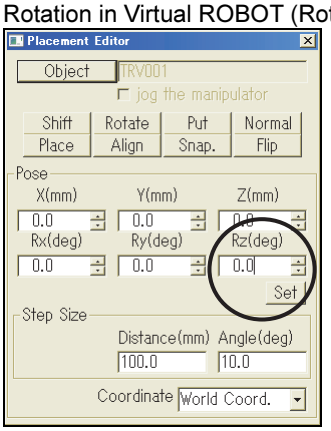
0 degree

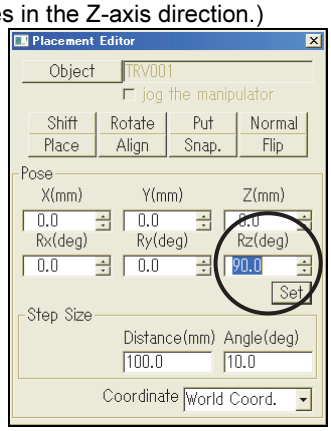


Rotation angle in the Z-axis direction = 90 degrees



Rotation in Virtual ROBOT (Rotate TRV001 90 degrees in the Z-axis direction.)

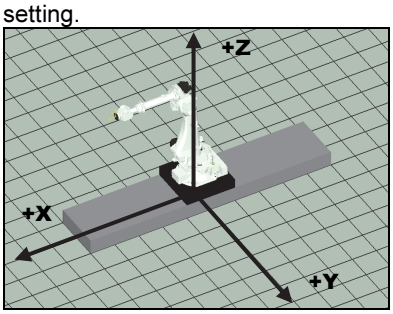




In this case, the robot is placed as a child mechanism of the traverse unit. Therefore, when the traverse unit is rotated, the robot will be rotated also. To rotate only the installation angle of the robot on the traverse unit, see the next section.

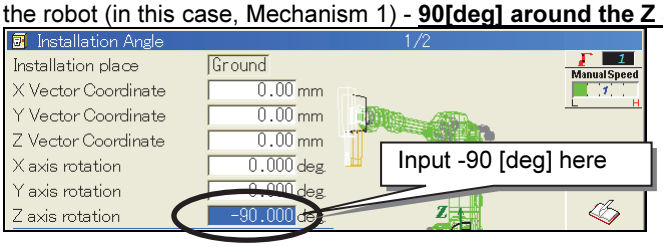
8.7.4 How to change the robot direction on the traverse unit

As described in the previous section, when the traverse unit is rotated, the robot will be rotated also. Therefore, to install the robot on the traverse unit like the following picture, it is necessary to change the setting.

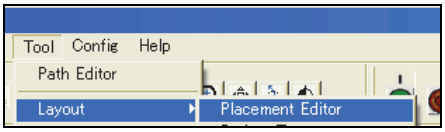


Setting procedure

After opening the menu of <Constant Setting> - [12 Format and Configuration] [5 Installation Angle], rotate the robot (in this case, Mechanism 1) - **90[deg] around the Z axis**.

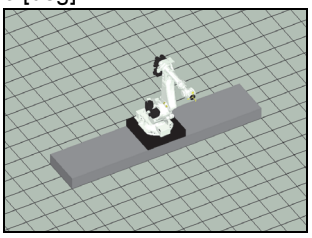


Then, apply the same rotation to the robot in the Virtual ROBOT window also. Please use the menu shown in the following picture. And, please be sure that the coordinate system for the rotation operation should be “TRV001”.

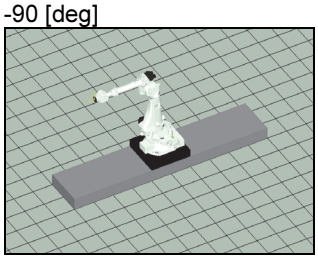


(Example)

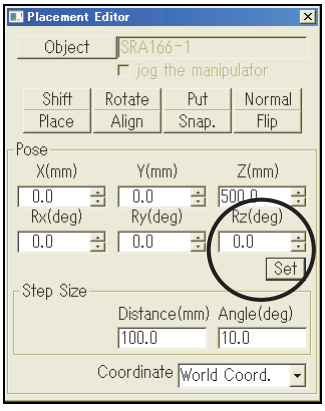
0 [deg]

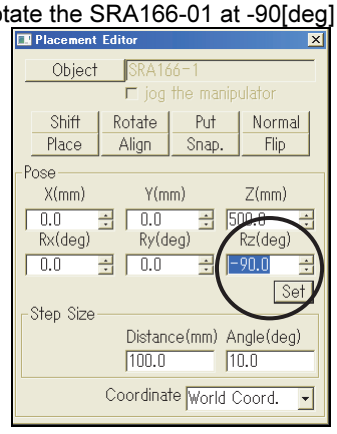


-90 [deg]



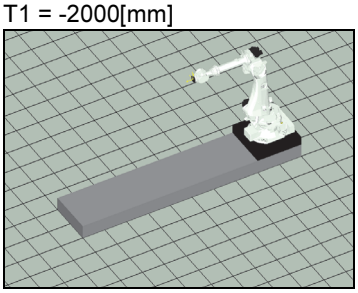
Rotation in the Virtual ROBOT (Rotate the SRA166-01 at -90[deg] around the Z axis).





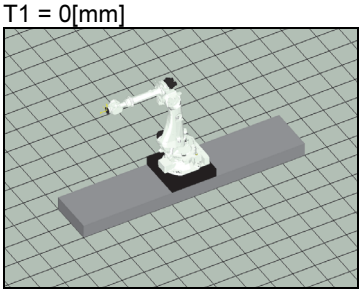
Example of the motion

T1 = -2000[mm]



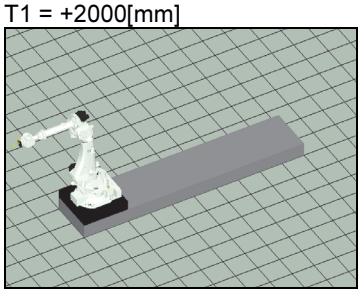
X=	-310.0
Y=	-0.0
Z=	2030.0
r=	0.0
p=	-90.0
y=	-180.0

T1 = 0[mm]



X=	1690.0
Y=	-0.0
Z=	2030.0
r=	0.0
p=	-90.0
y=	-180.0

T1 = +2000[mm]



X=	3690.0
Y=	-0.0
Z=	2030.0
r=	0.0
p=	-90.0
y=	-180.0

NOTE

Chapter 9 For beginners

Thank you for purchasing FD on Desk II.
In this chapter, how to set up this software and how to use the basic functions are described.
By operating the FD on Desk by following this chapter, it becomes possible to operate the FD on Desk on your PC.
For details on more complicated robot program design and development, refer to sections in and after 1.4.6 "Editing a program" in Chapter 1.

9.1 Outline

9.1.1 Installation

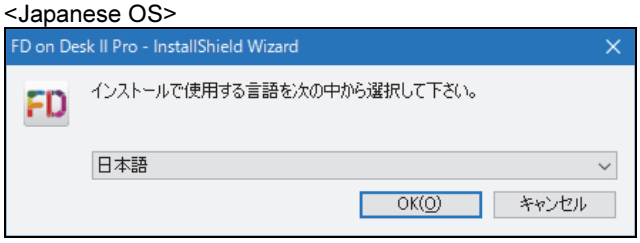
The following describes how to install FD on Desk II.
If FD on Desk II (or FD on Desk) is already installed, the old FD on Desk II (or FD on Desk) will be uninstalled and then FD on Desk II will be newly installed.

IMPORTANT

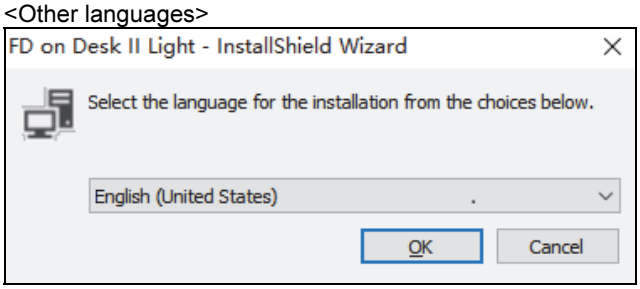
The Administrator account of the PC is required for this installation procedure.

1 **Execute the "`setup.exe`".**
(The file name might be "`setup_FDonDeskII_***.exe`" in some cases.)
In case of installation CD, this will be executed automatically.
≫ The installer will start.
Please select the language.
Japanese and English are available.
If the language setting of the PC is Japanese, the following screens are displayed in Japanese.
In case of other languages, the screens are displayed in English.

<Japanese OS>

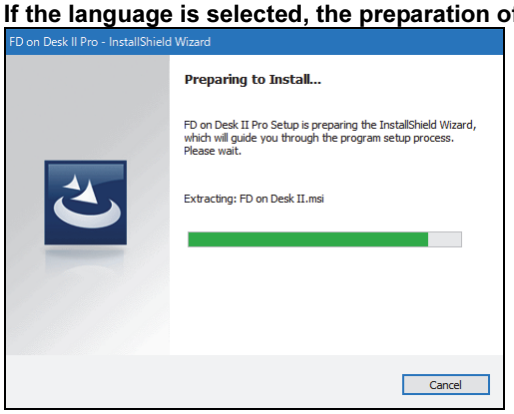


<Other languages>

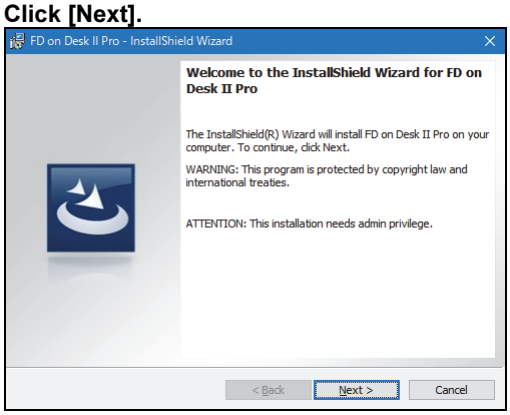


The language selected in this dialog window will be used in this installation procedures, the startup screen of the FDonDesk, and the FDonDeskLight, VirtualIO, Virtual TP, and RobView.
The display language in the FDonDeskII is automatically selected referring to the language setting of the PC. In case of language other than Japanese, SImplifiedChinese and Korean, English is selected.

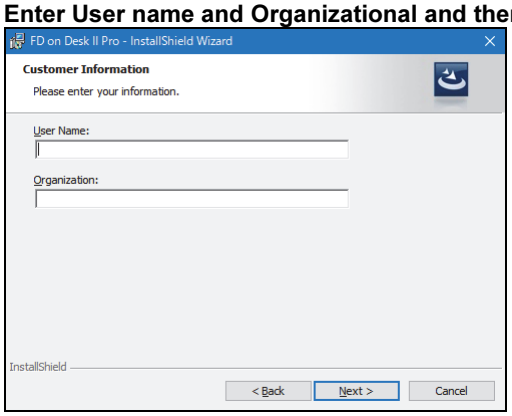
2 **If the language is selected, the preparation of the installation will start.**



3 **Click [Next].**



4 **Enter User name and Organizational and then click [Next].**

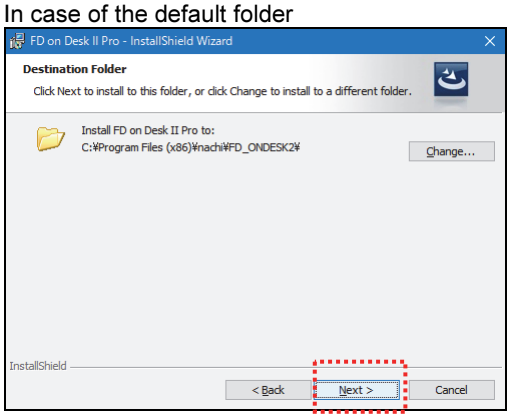


5 **Set the Destination Folder and click [Next].**

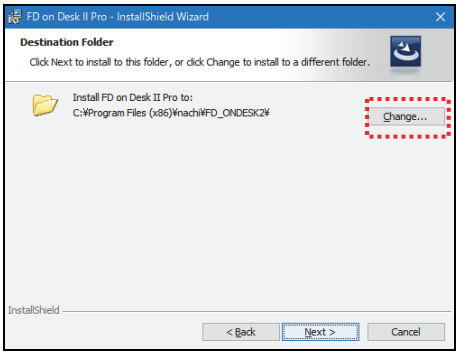
The default value of the installation folder is C: \ Program Files \ nachi \ FD_ONDESK2.

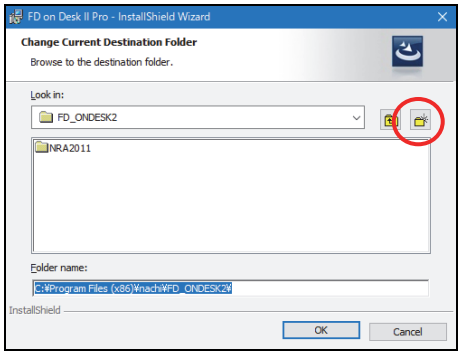
If the installation folder is not changed, click [Next>] in the following screen.

In case of the default folder

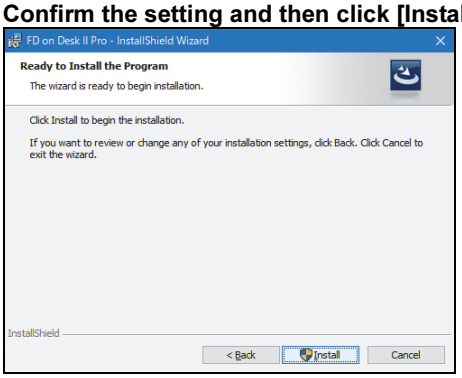


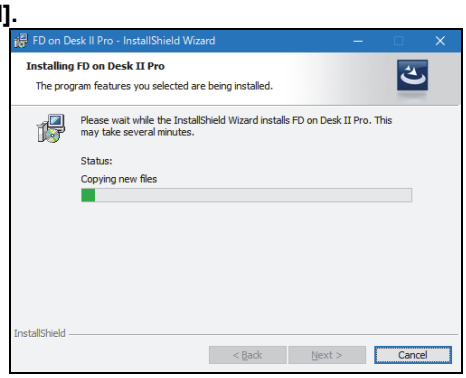
If the installation folder is to be changed, click [Change].
Please select the destination folder.





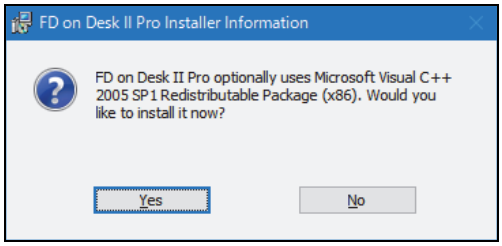
6 **Confirm the setting and then click [Install].**



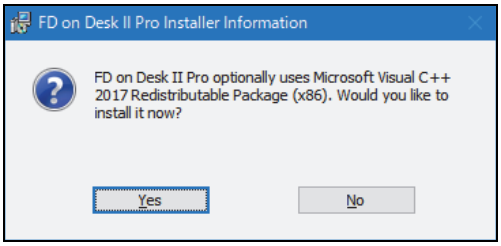


7 **Before finishing the installation, the runtime installation will be performed.**
To install the runtime, click [Yes(Y)].
If the runtime has been installed already, click [No(N)] to skip.

<VC runtime 2005>

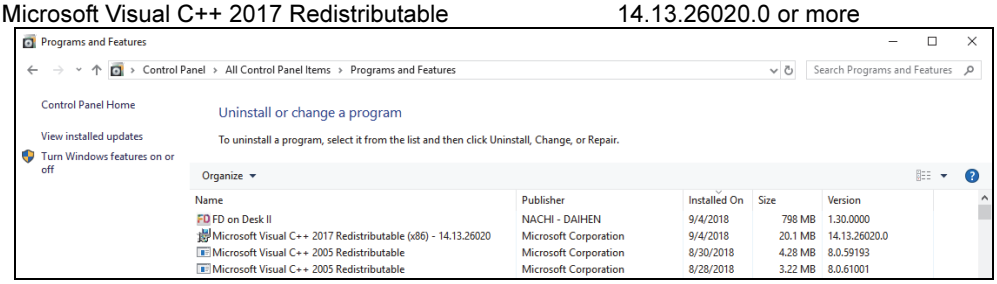


<VC runtime 2017>

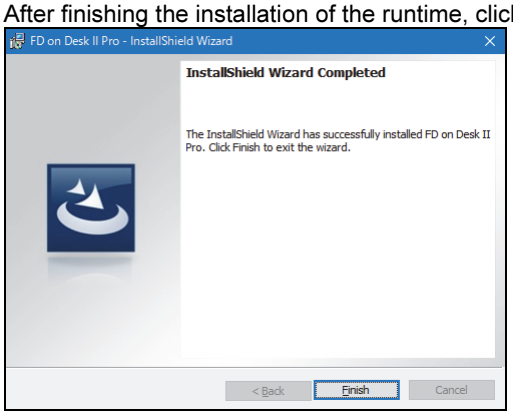


Checking method of runtime version
At “Programs and Features” of the “Control Panel”, please check whether there is the below Microsoft VC++ runtime or not and its version.

	Version
Microsoft Visual C++ 2005 Redistributable	8.0.59193 or more
Microsoft Visual C++ 2017 Redistributable	14.13.26020.0 or more

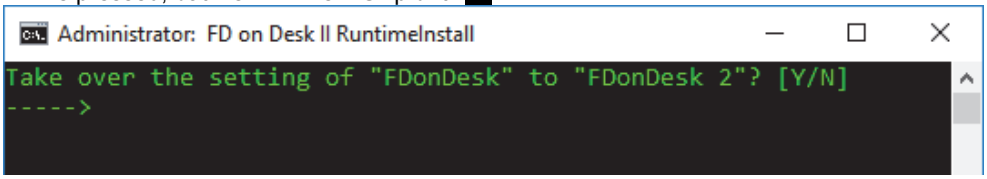


After finishing the installation of the runtime, click [Finish(F)]

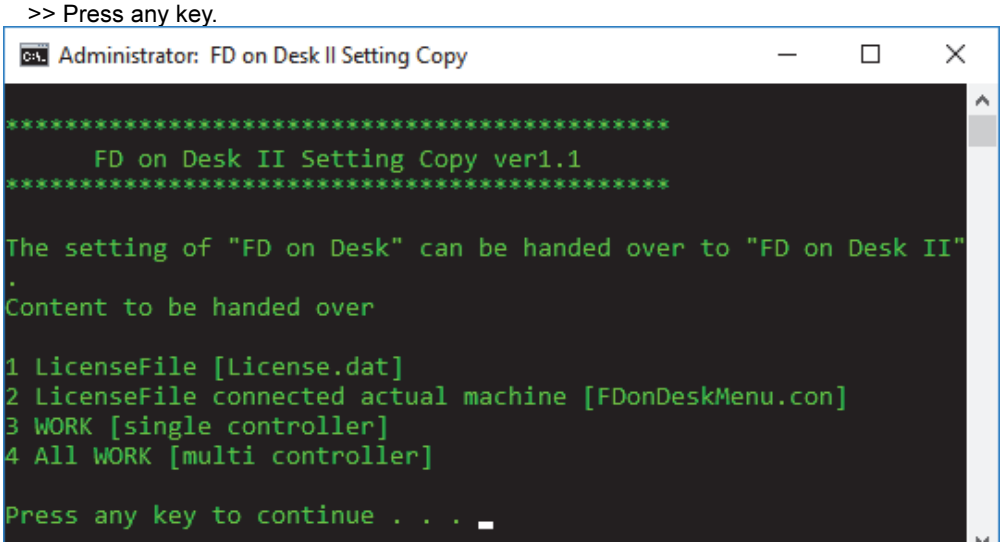


8 **Click [Finish] to launch the bat file which makes necessary settings for FD on Desk II.**
When completed, the following screen will be displayed.
Select the language.
≫Please enter the corresponding number.

9 **Take over the setting to FD on Desk II.**
>> Input Y: YES or N: NO.
If “N” is pressed, bat file will finish. Skip until 22.

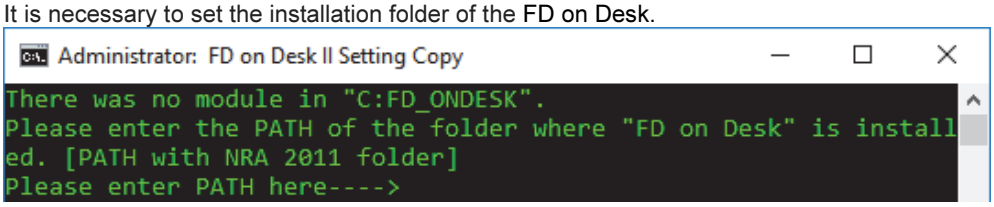


10 **The list of the takeover contents will indicate.**
>> Press any key.

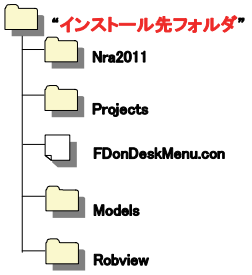


11 **This procedure is not necessary when setting the install folder of FD on Desk as the default value.**

When installing with a value other than the default value, the following screen is displayed.
It is necessary to set the installation folder of the FD on Desk.

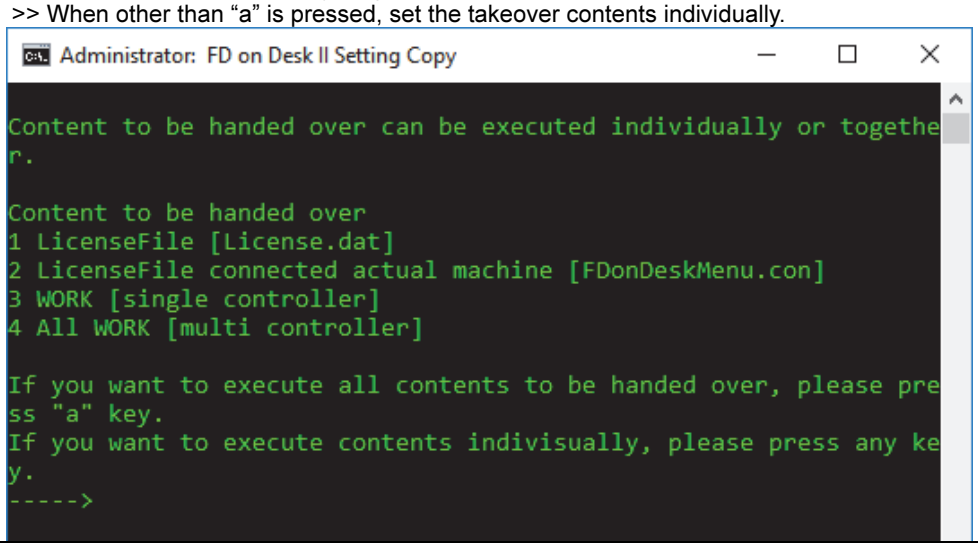


>> Please enter the PATH of the installation folder of FD on Desk.



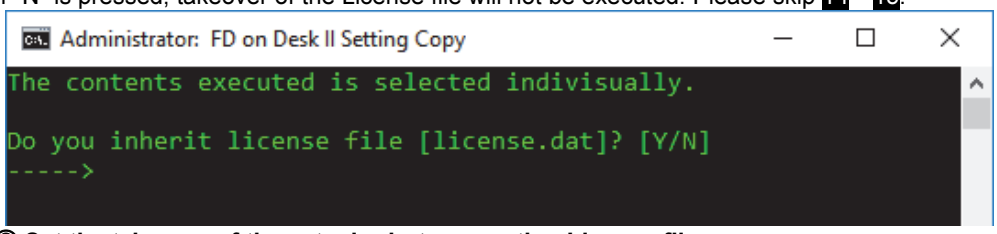
Search the NRA2011 folder from the entered PATH.
If not found, it will be re-entered.

12 **Specify the takeover contents to be individually or together.**
>> When “a” is pressed, everything will be executed. Skip until **14**.
>> When other than “a” is pressed, set the takeover contents individually.



13 **Specify the takeover contents individually.**

① Set the takeover of the License file.
>> Press Y: YES or N: NO.
If “N” is pressed, takeover of the License file will not be executed. Please skip 14～15.

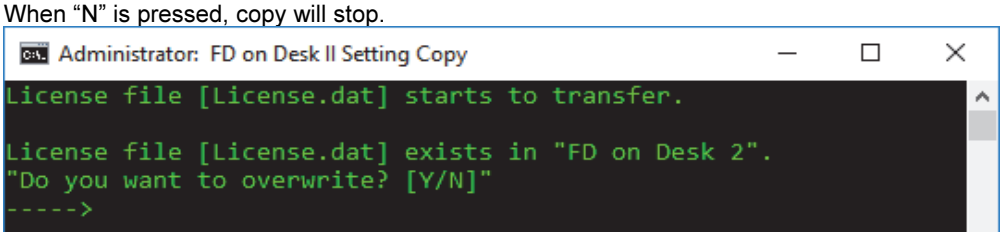


② Set the takeover of the actual robot connection License file.
>> Press Y: YES or N: NO.
When “N” is pressed, the takeover of the license file of actual robot connection will not be executed. Skip 18.

③ Set the takeover of the WORK folder.
>> Press Y: YES or N: NO.
When “N” is pressed, the takeover of the WORK folder will not be executed. Please skip 19.

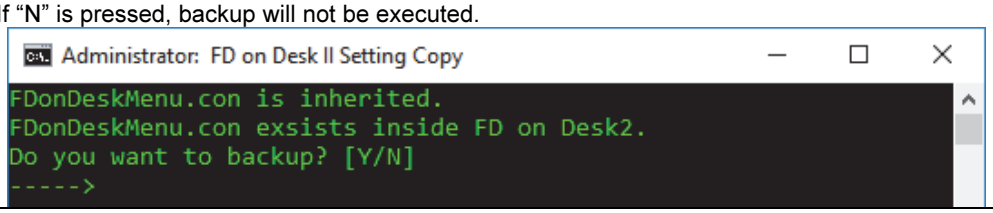
④ Set the takeover of the WORK folder of multi-controller.
>> Press Y: YES or N: NO.
When “N” is pressed, the takeover of the WORK folder of multi-controller will be executed. Please skip 20.

14 **Start the takeover of the License.**
If “N” is pressed at 13-①, please skip 14～15.
If there is no License file (license.dat) in FD on Desk,
Skip license migration work.
Also, if License.dat already exists in FD on Desk II, we will confirm overwriting.
When “N” is pressed, copy will stop.



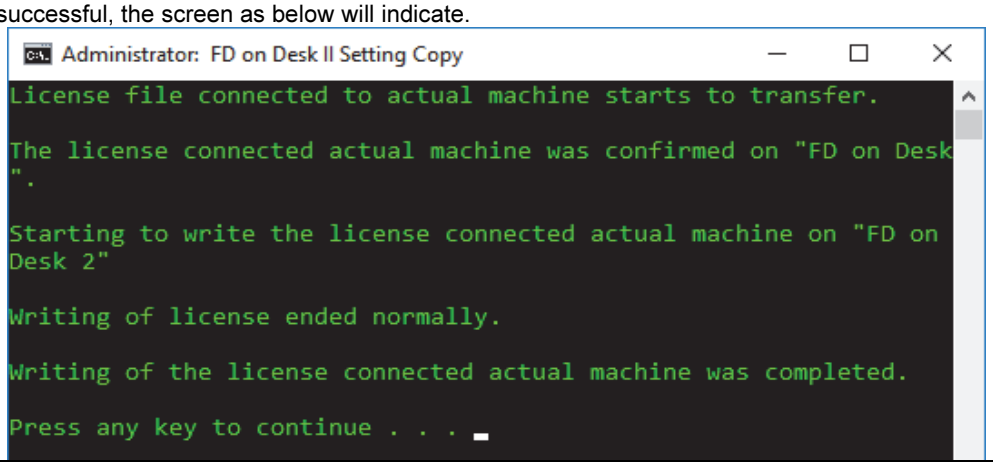
15 If succeeded in taking over the license, the following screen will be displayed.

16 If there is FDonDeskMenu.con at FD on Desk II,
execute backup of FDonDeskMenu.con.
If “N” is pressed, backup will not be executed.



17 If the backup of FDonDeskMenu.con is successful then, the screen as below will indicate.
Backup file will be “FDonDekMenu.con_(Executed date)”.

18 **Start the takeover of license file (FDonDeskMenu.con) of the actual robot connection.**
If “N” is pressed at 13-②, please skip this item.
When the takeover of the license file (FDonDeskMenu.con) of actual robot connection is successful, the screen as below will indicate.



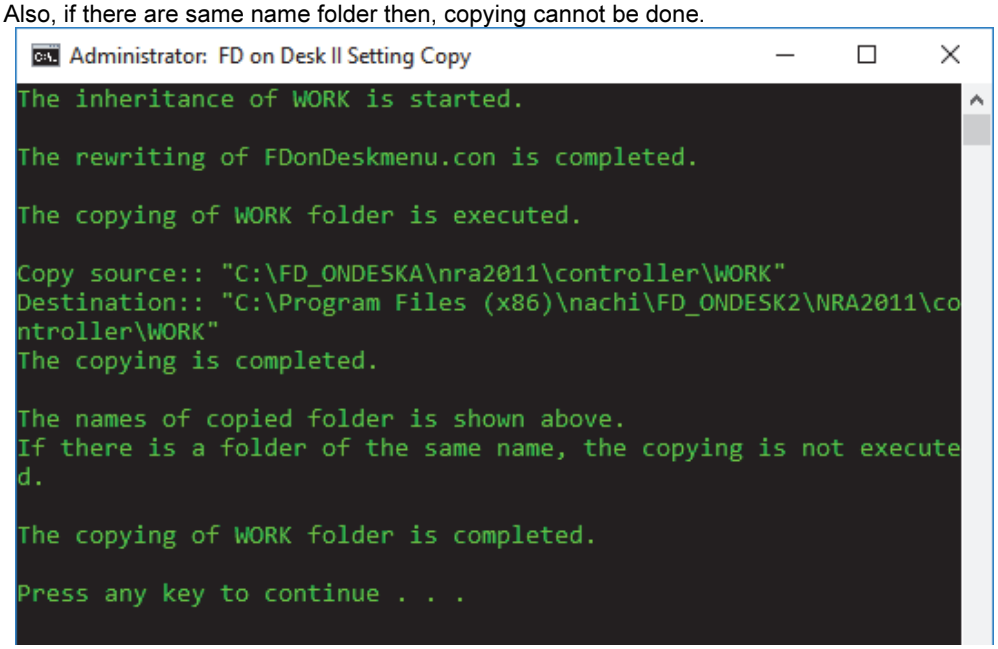
19 **Start the takeover of the WORK folder.**

If “N” is pressed at 13-③, please skip this item.

When the takeover of the WORK folder is successful, the screen as below will indicate.

Copied folder list will indicate.

Also, if there are same name folder then, copying cannot be done.



CAUTION

The following character group cannot be used for the folder name where the WORK folder to takeover exists.

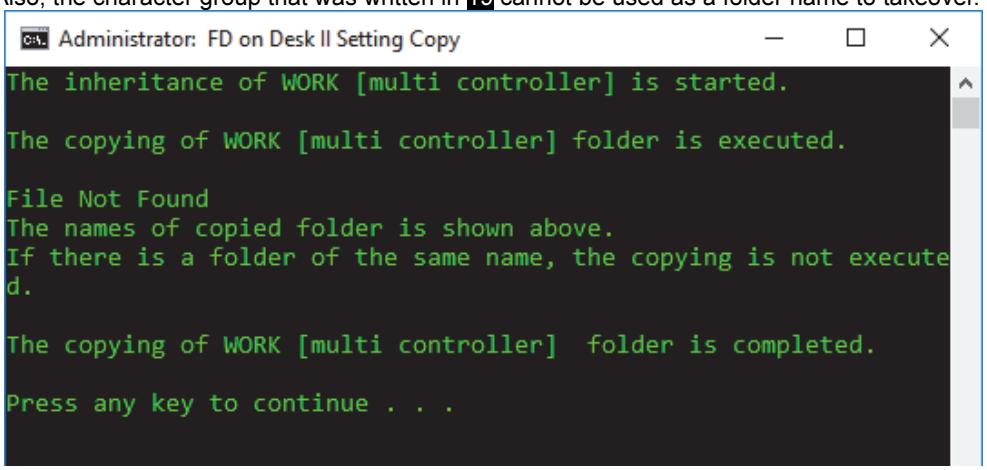
Character group that cannot be used. ¥ / : ? " < > | !

20 **Start the takeover of the WORK folder of the multi-controller.**

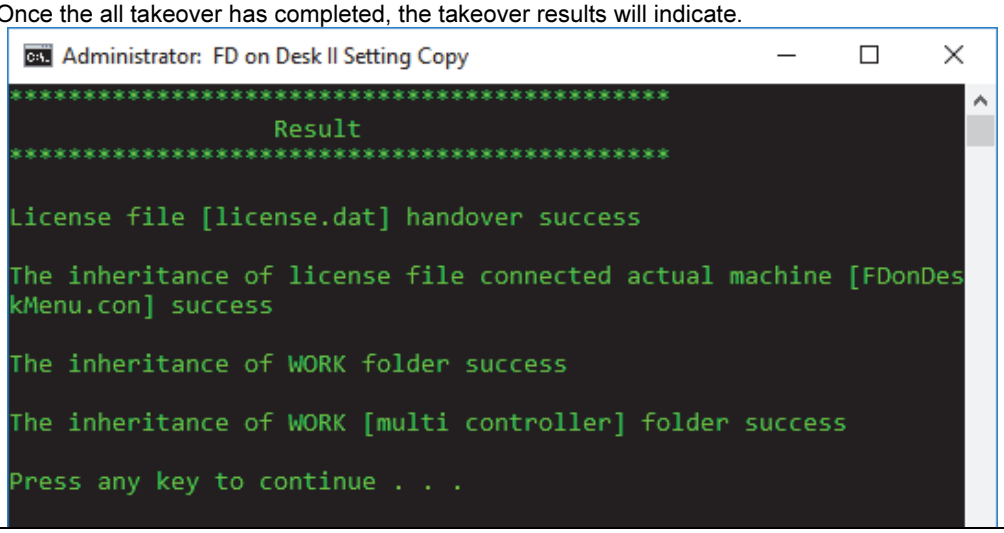
If “N” is pressed at 13-④, please skip this item.

The following screen will indicate when the takeover of the WORK folder of multi-controller has become successful.

Also, the character group that was written in 19 cannot be used as a folder name to takeover.

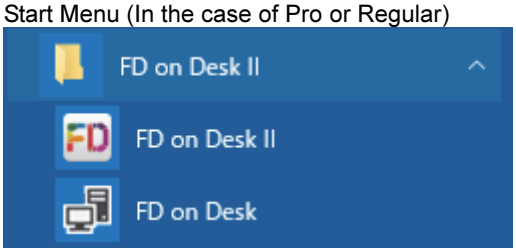


21 Once the all takeover has completed, the takeover results will indicate.

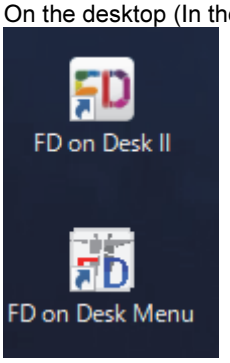


22 **A shortcut is created after installation is completed.**

Start Menu (In the case of Pro or Regular)



On the desktop (In the case of Pro or Regular)



CAUTION

If the runtime has been installed, please restart the PC.

9.1.2 Uninstallation

Uninstallation of FD on Desk can be executed from the “Add or Remove Programs” of Control Panel.

IMPORTANT

Even if uninstallation is executed, the files/folders (e.g. license file, work folder, etc.) that were created or copied after installing the FD on Desk will not be deleted.
To delete those files/folders after the uninstallation, delete them manually.

IMPORTANT

The components of "Microsoft Visual C++ 2005 Redistributable" will not be uninstalled even if FD on Desk II is uninstalled. If necessary, uninstall them via “Add or Remove Programs” of Control Panel.

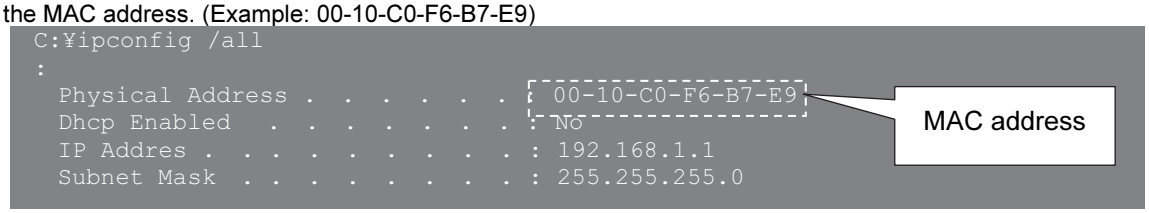
9.1.3 Setting for the license

Before starting FD on Desk II, please set up a license.
For the “Pro” and “Regular” grades, two authentication methods are provided: Authentication using a "license file" and authentication using a "USB dongle". (These 2 types are described hereinafter.)
In case of “Light” grade license, it is necessary to connect the PC and the robot controller in advance. (Refer to chapter 1)

In case of “Standard specification (License file)”

To use the license authentication using a license file, please copy the “license.dat” to the folder of “[Install folder]\nra2011\license\” in advance.
To issue a license file, contact our sales representative. Then, inform the sales representative about the MAC address of the PC you are using. The following shows how to check the MAC address.

How to check the MAC address of the PC
To get the MAC address of your PC, open [Program] [Accessories] [Command prompt] menu of the Windows OS and then enter a command of “ipconfig /all”. In the displayed message, the item of “Physical Address” is the MAC address. (Example: 00-10-C0-F6-B7-E9)



POINT

When sending the license file to the customer, We uses a name like “license_**********.dat” (“**********” is the MAC address).
When using the file on your PC, please rename the file to “license. dat” in advance.

In case of “USB dongle specification”

To use the license authentication using an USB dongle, please insert the USB dongle to the USB port of the robot controller.
Please use the designated dongle by inserting it to the USB port. If inserting the dongle, any computer that had installed FD on Desk II can be used. However, the dongle cannot be removed during use.

To get the USB dongle, please contact our NACHI-FUJIKOSHI sales agent.
Product of (Aladdin Japan) is used as the dongle for FD on Desk Regular/Pro.

To get the USB dongle, please contact our NACHI-FUJIKOSHI sales agent.
Product of SafeNet Japan Inc., (Previous name: Aladdin Japan) is used as the dongle for FD on Desk Regular/Pro. Execute HASPUserSetup.exe from the DongleDriver of installation CD.

If there is no installation CD, please visit the web-site below.
https://sentinelcustomer.gemalto.com/
At that web-site, search the Sentinel HASP/LDK - Windows GUI Run-time Installer and download them.

For the people who has been using the FD on Desk up until now, and it is necessary to update the driver, please visit the above web-site and download for the installation.

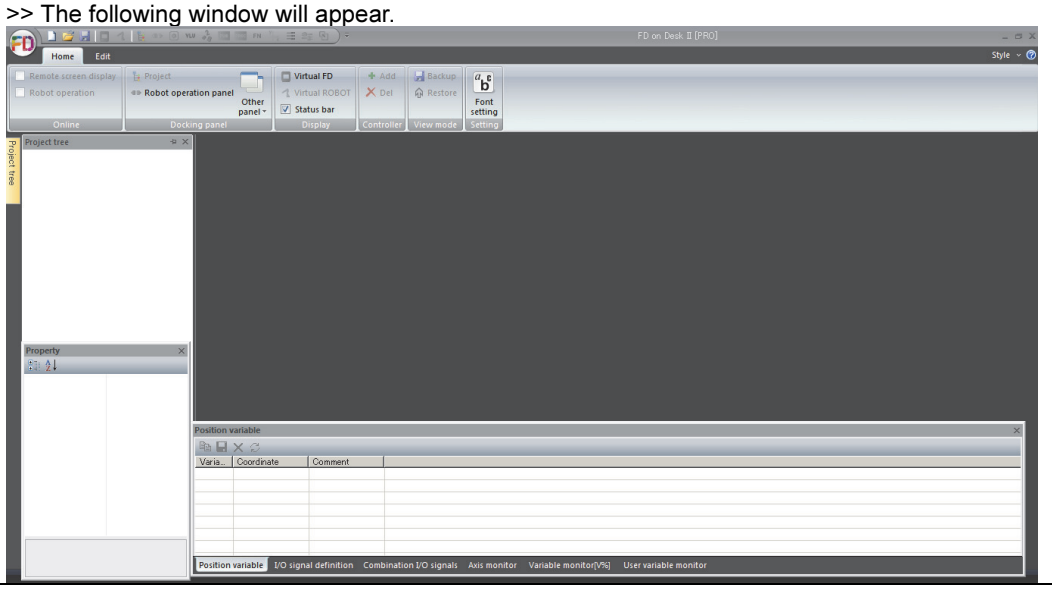
9.1.4 Starting and terminating FD on Desk II

This section explains how to start and terminate FD on Desk II.

How to start the FD on Desk

1 **Execute the FD on Desk II shortcut on Desktop.**

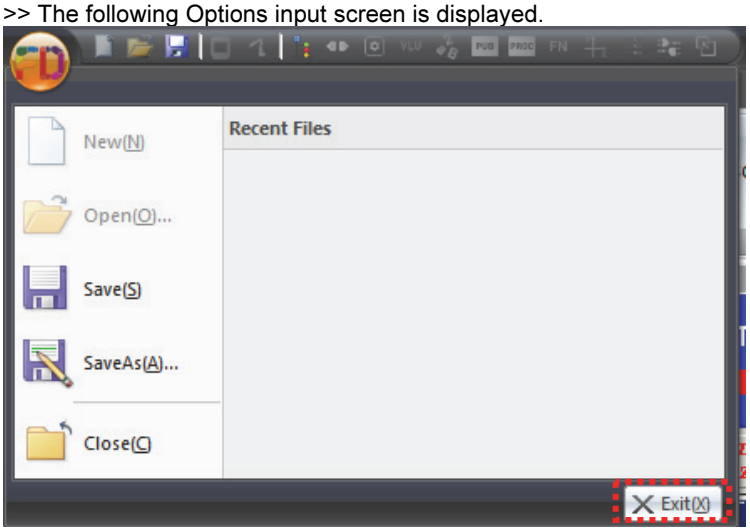
>> The following window will appear.



How to terminate the FD on Desk

1 **Click the button in the upper left of the application.**

>> The following Options input screen is displayed.



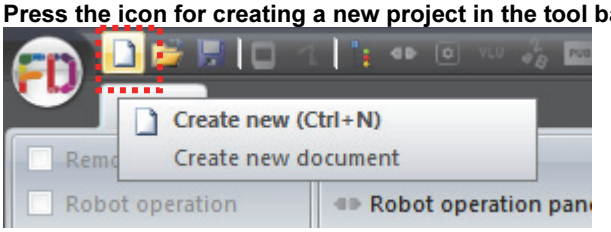
2 **Click [Exit].**

9.1.5 Creating a new project or opening an existing project

This part explains how to create a new project or how to open an existing project.

Creating a new project

1 **Press the icon for creating a new project in the tool bar.**



2 **Specify a project name.**
>> Use either of the following procedures.

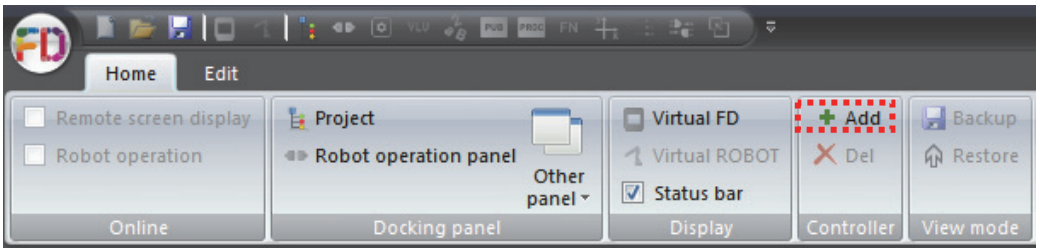
Select Docking panel, then Project tree, and click "New project",

or

select Docking panel, then Property, and click "Project", then "name".

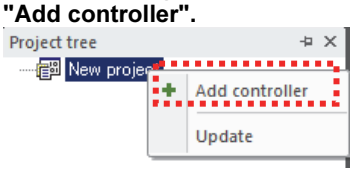
3 **Add a controller.**
>> Use either of the following procedures.

Select Ribbon, Project, then Controller, and click "Add",



or

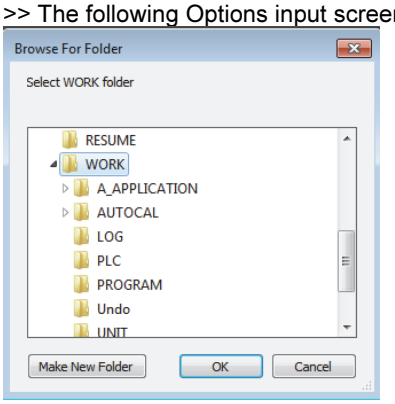
select Docking panel, then Project tree, right-click the mouse on "New project", and click "Add controller".



POINT

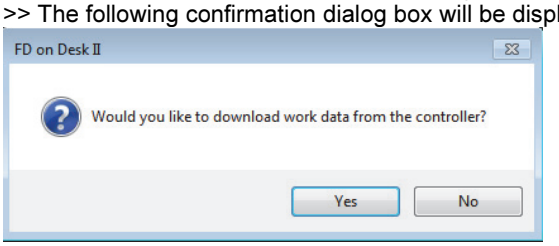
You can also add a controller by copying the WORK folder in Explorer through drag and drop operation.

3 **Select a WORK folder.**
>> The following Options input screen is displayed.

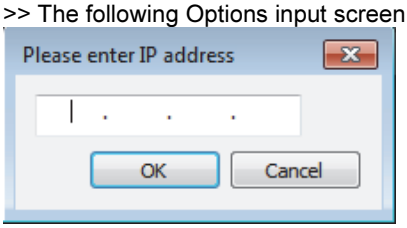


When an existing work is selected, move to 4.

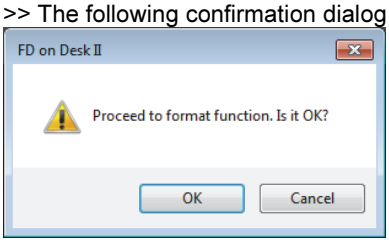
When a new folder is created or an empty folder is selected,
>> The following confirmation dialog box will be displayed.



When Yes is selected, download the work from the FD/CFD robot controller.
>> The following Options input screen is displayed. Enter the IP address of the robot controller.

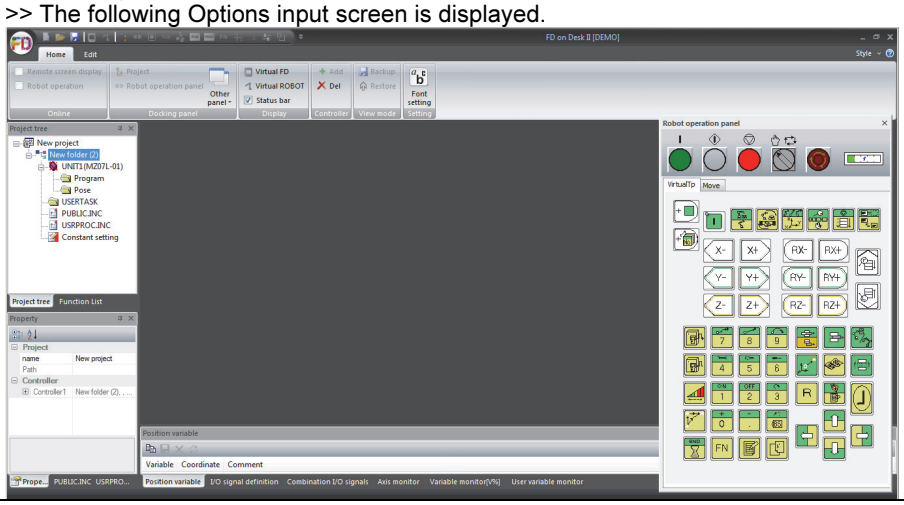


When No is selected, memory format operation is performed using Virtual FD.
>> The following confirmation dialog box will be displayed.

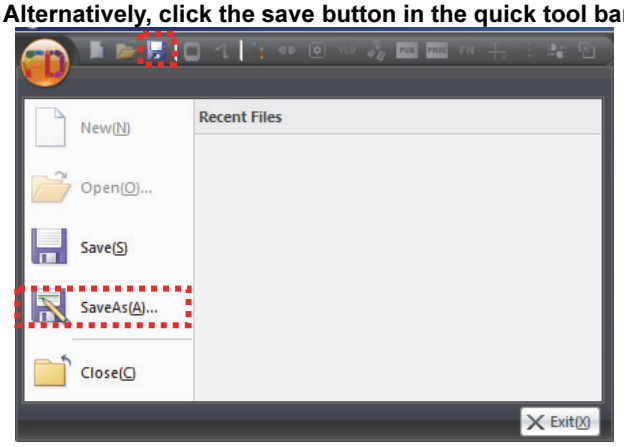


Refer to **9.1.6 Memory format**.

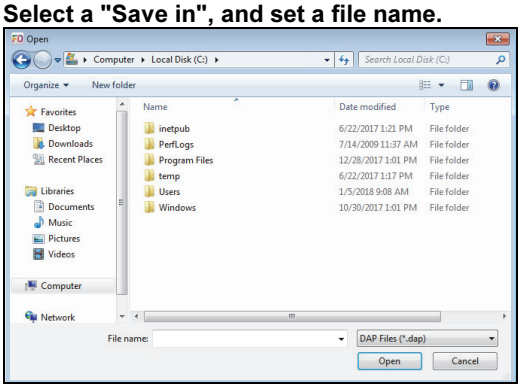
4 **A new project will be created.**
>> The following Options input screen is displayed.



5 **Click the icon as shown in the figure, and click "Save As ...".**
Alternatively, click the save button in the quick tool bar.



6 **Select a "Save in", and set a file name.**

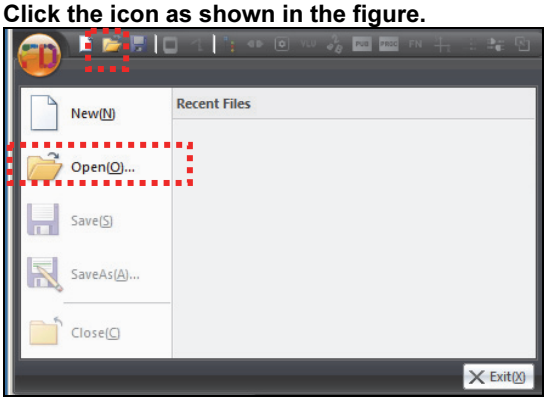


POINT

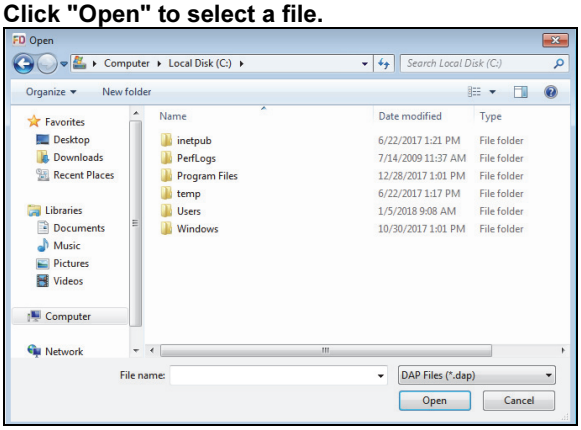
When a project is saved, you can operate easily next time by using "Open an existing project".

Opening an existing project

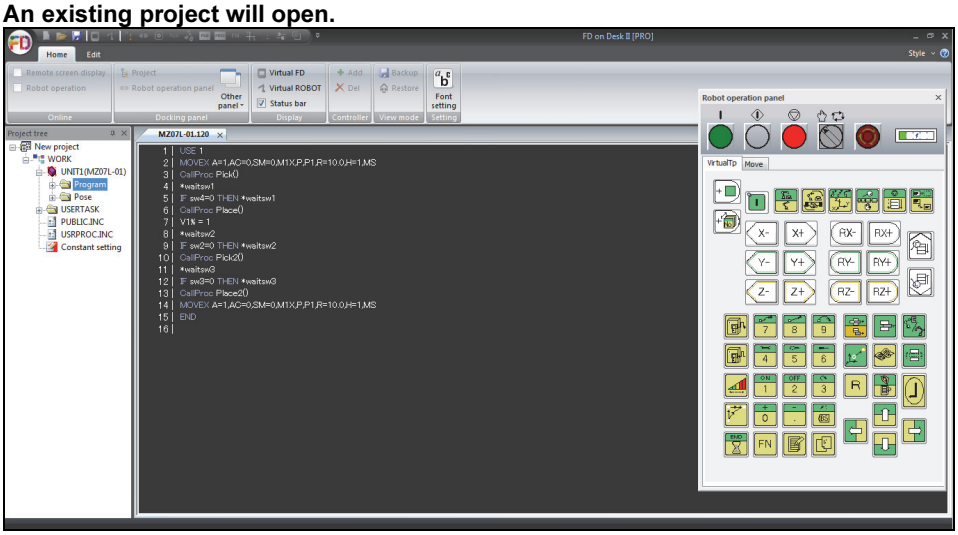
1 **Click the icon as shown in the figure.**



2 **Click "Open" to select a file.**



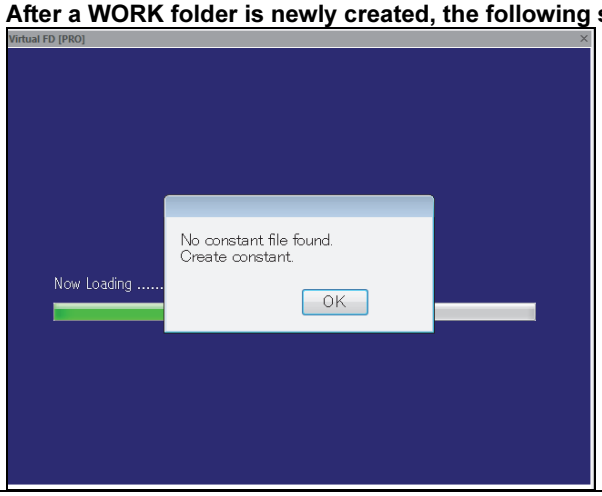
4 **An existing project will open.**



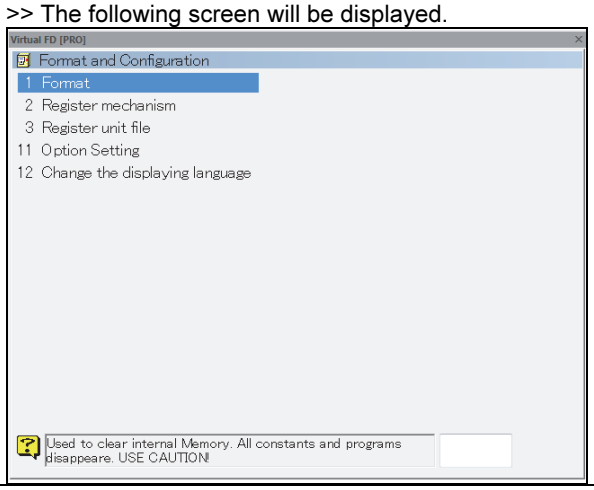
9.1.6 Memory format

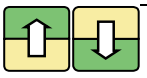
If not using an existing WORK folder or downloading data from the controller, perform memory format operation with Virtual FD.
An example of memory format operation is described hereinafter using a configuration of “Robot + Servo gun”.
For details, refer to the instruction manual “Memory format procedure”.

1 **After a WORK folder is newly created, the following screen will be displayed.**

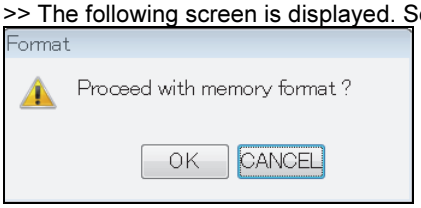


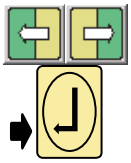
2 **Select "OK".**
>> The following screen will be displayed.





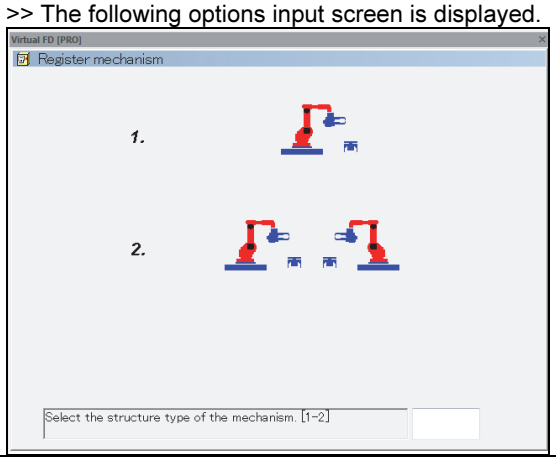
3 Select “1 Format”.
>> The following screen is displayed. Select [OK] and press [Enter].

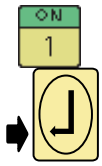




4 **Select [OK] and press [Enter].**

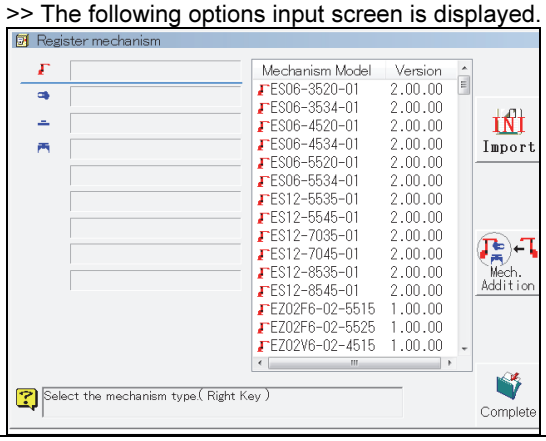
>> The following options input screen is displayed.



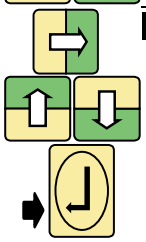


5 **Input “1” and press [Enter].**

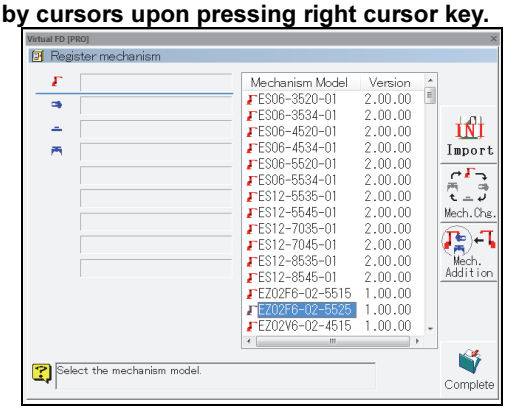
>> The following options input screen is displayed.



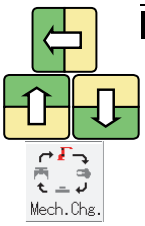
6 **Select the mechanism number to apply the registration using the cursor keys.**



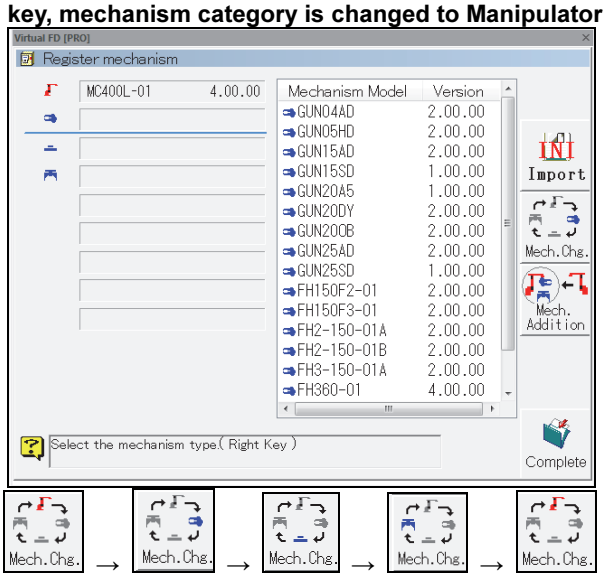
7 **Press [Enter] after selecting mechanism models to assign to the mechanism number by cursors upon pressing right cursor key.**



The selected mechanism model is assigned to the mechanism number.
To change the mechanism model, select the other model and press [Enter] again.

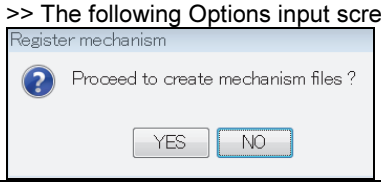


8 **Press f9 key <Mech.Chg.>, for a mechanism category change. Every time pressing the key, mechanism category is changed to Manipulator → Gun → Slider → Positioner.**

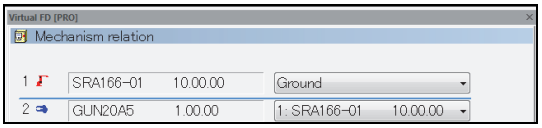


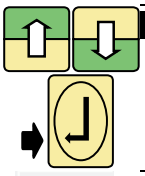
9 **Press f10 key <Mech. Addition> in case of mechanism addition.**
A mechanism with a new number is added.

10 **Press f12 key <Complete> after registering all mechanisms for use.**
>> The following Options input screen is displayed. Press [Enter] upon selecting [Yes].

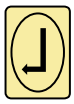


11 **The following screen is displayed.**

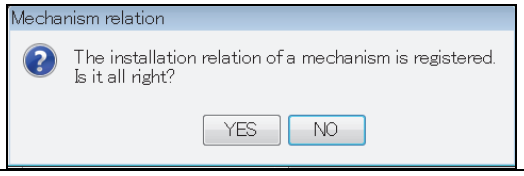


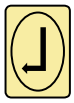


12 **The default value for the installation location of each mechanism is preregistered. To change a value, move the cursor over the target value and press [Enter].**



13 **After setting the installation place of the all mechanisms, press <Complete>**
>> The following Options input screen is displayed.

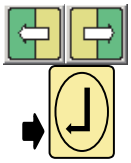




14 **Select [YES] and press [Enter].**

>> The following Options input screen is displayed.

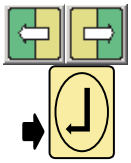
(This message may be displayed for the respective mechanisms one by one.)



15 **Select [OK] and press [Enter].**

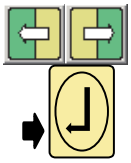
>> The following Options input screen is displayed.

(This message may be displayed for the respective mechanisms one by one.)



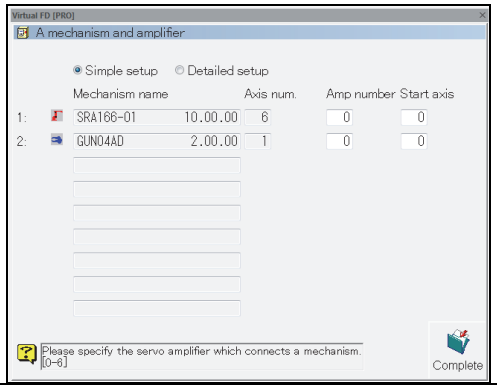
16 **Select [YES] and press [Enter].**

>> The following Options input screen is displayed.



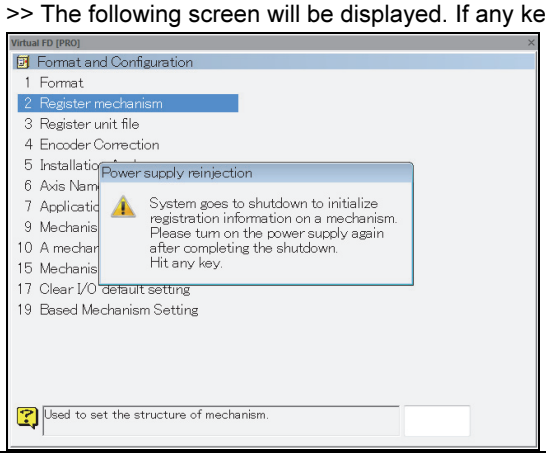
17 **Select [YES] and press [Enter].**

>> The following Options input screen is displayed.

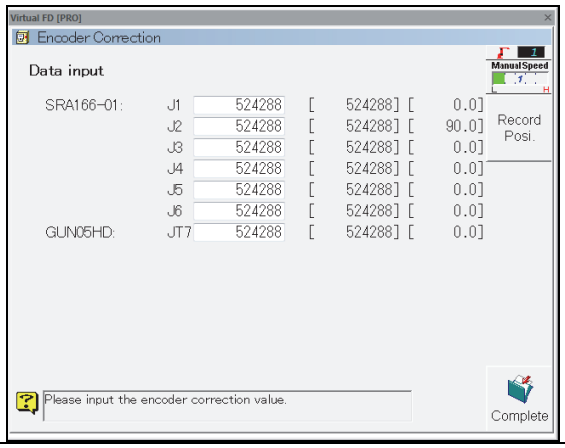


18 **Because this is simulation software, just press <Complete> without setting anything.**
(In case of a real machine, the parameters must be set considering the configuration of the system. This setting can be done in the menu of <Constant Setting> - [12 Format and Configuration] - [10 A mechanism and amplifier])

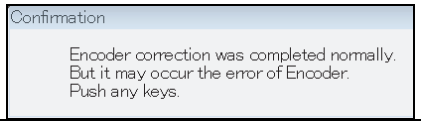
>> The following screen will be displayed. If any key is pressed, the controller will stop.



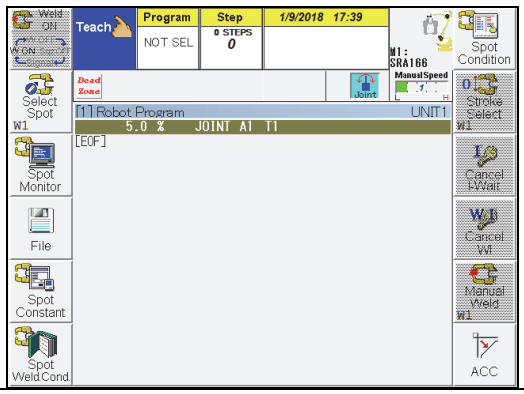
19 **Press ”Power OFF” and then press “Power ON” to restart the robot controller.**
The following screen for entering the value of [Encoder correction] is displayed

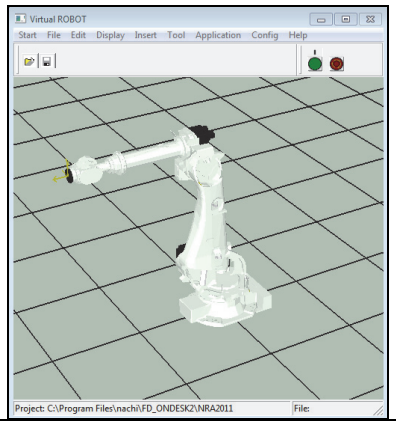


20 **Because this is simulation software, just press <Complete> without setting anything.**
(In case of a real machine, please perform the encoder correction setting (Encoder offset value setting). This setting can be done in the menu of <Constant Setting> - [12 Format and Configuration] - [4 Encoder correction])
>> The following Options input screen is displayed.



21 **Press any keys.**
>> The basic screen of the robot controller is displayed on the Virtual FD.
>> The robot model is displayed on the Virtual ROBOT.





9.2 Operation example

In this section, the following operations are described using FD on Desk II.

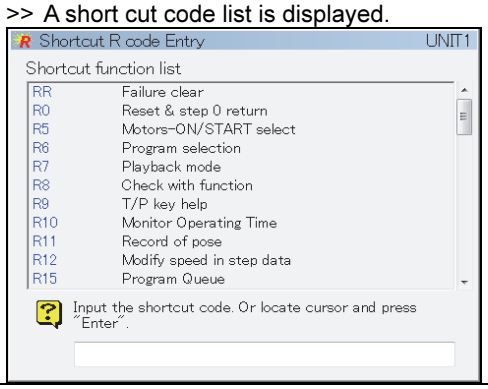
- How to operate the robot manually
- How to teach a program (Programming operation)
- Check go operation
- How to playback a program

For details, refer to the instruction manual “BASIC OPERATIONS MANUAL”.

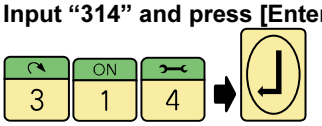
9.2.1 Changing the operator class to *EXPERT*

In Virtual FD, an operator class can be set.
By setting an operator class, it is possible to hide or show a specific function or menu according to the skill level of the operator using the robot.
Normally, the operator class is set to ***USER*** when turning ON the controller power. So some functions are limited. Some operations introduced in this section require an operator class ***EXPERT*** or higher. In such a case, please change the operator class accordingly in advance.

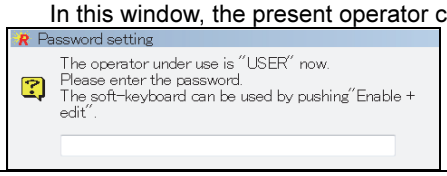
1 **Press [R] key.**
>> A short cut code list is displayed.



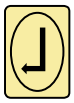
2 **Input “314” and press [Enter].**

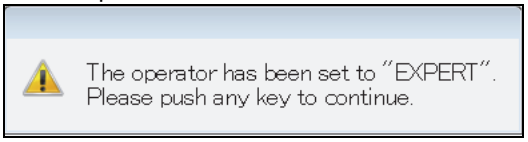


>> The password input window will be displayed.
In this window, the present operator class is displayed.



3 After confirming that the present operator class is ***USER***, press [Enter] again.
>> The operator class will be switched to ***EXPERT***.

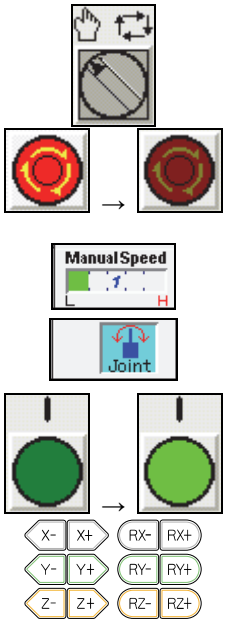




Press any keys to return to the previous screen.

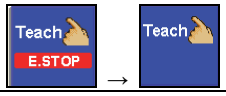
POINT	If the present operator class is ***EXPERT*** or higher already, press R key to return to the previous screen.

9.2.2 How to operate the robot manually



1 **Select the Teach mode.**

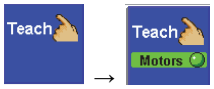
2 **Release the E.STOP button.**



3 **Select the manual operation speed.**

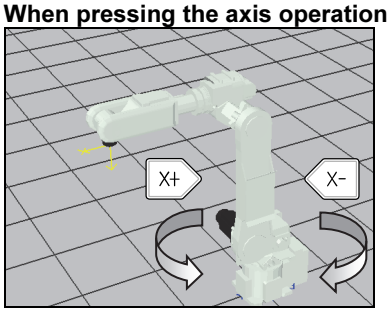
4 **Select the manual operation coordinate system.**
If this is the first time, joint coordinate system is recommended.

5 **Press the Motors ON button to turn the motors ON.**



The motors are turned ON.

6 **When pressing the axis operation keys, the robot will move.**

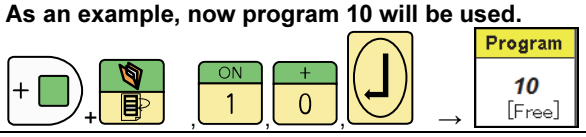


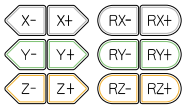
7 **When releasing the axis operation keys, the robot will stop.**

9.2.3 How to teach a program (Programming operation)

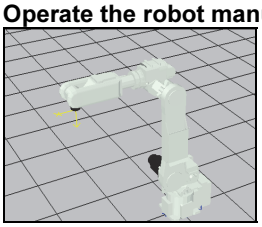
1 **Select the Teach mode.**

2 **Open an empty program number.**
As an example, now program 10 will be used.

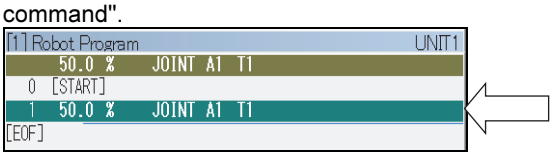




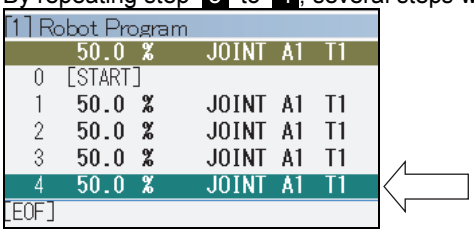
3 **Operate the robot manually.**



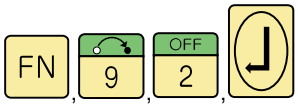
4 **Press [O.W / REC] key. ([O.W / REC] = "Overwrite / Record")**
>>The present position of the robot will be recorded in the program as a "MOVE command".

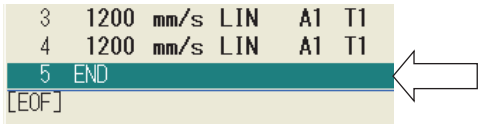


5 By repeating step **3** to **4**, several steps will be made.



6 **Record "FN92 END" at the end of the program.**



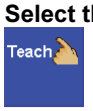


Every program must have END function at the last step.

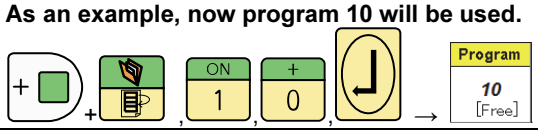
9.2.4 Check go operation

The recorded program can be checked by the following procedures step by step.
This operetion is called as "***CHECK GO operation***".

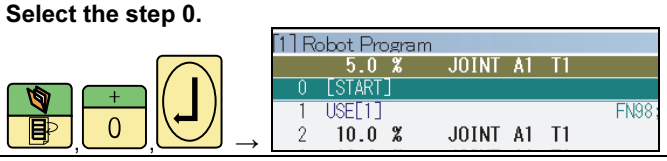
1 **Select the Teach mode.**



2 **Open the program.**
As an example, now program 10 will be used.

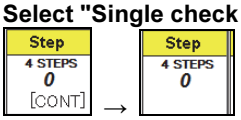


3 **Select the step 0.**

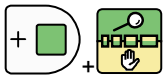


4 **By referring to " 9.2.2 How to operate the robot manually", prepare the manual operation.**

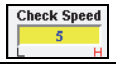
5 **Select "Single check go" by the [Stop / CONT] key.**



The characters "CONT" disappear.



6 **Select the check go / back operation speed.**



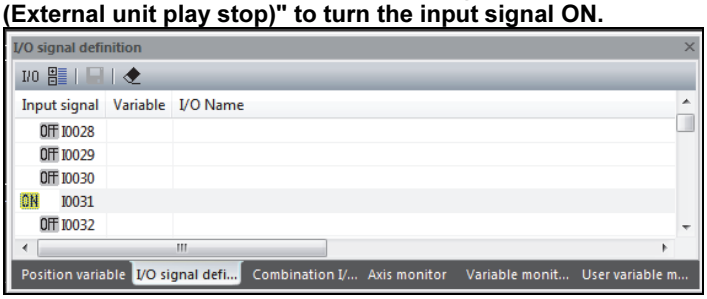
Normally, "5" is used.

7 **Open <Teach/Play Condition> setting screen and set "9 Check with function" to "Enabled".**

If you do not want to execute the function commands, select "Disabled".

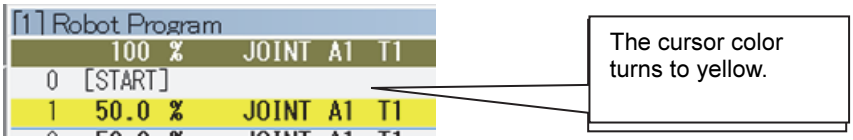
8 **Press <Complete> to save the setting.**

9 **In the FD on Desk II screen, open "I/O Signal" and double-click "I0031 (External unit play stop)" to turn the input signal ON.**



Because this signal is Normal Close, the check go operation and playback operation of the robot is prohibited while this signal is OFF.

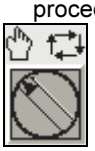
10 **Keep pressing [CHECK GO] key.**
>> The robot will move toward the step 1 record point and when the robot reaches the point, the cursor color turns to yellow and then the robot will stop.



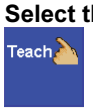
11 **Release the [CHECK GO] key and then push the key again and keep pressing it.**
>> The robot will move toward the position of the step 2.
(Supplement) If it is necessary to move the robot continuously, please turn ON "CONT" by referring to the procedure 5. If "CONT" is ON, the robot will move continuously and make the shortcut motion based on the Accuracy setting of each step.

9.2.5 Internal playback

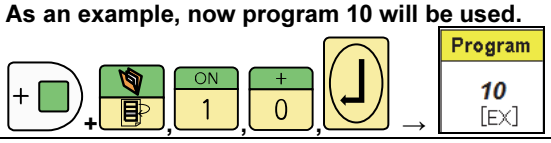
To perform playback operation (internal playback) using the robot operation panel, please follow the procedure shown below.



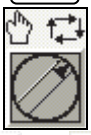
1 **Select the Teach mode.**



2 **Open the program.**
As an example, now program 10 will be used.

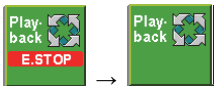


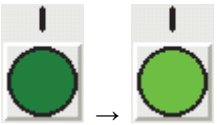
3 **Move the robot to the first MOVE command step using the CHECK GO operation with "CONT" = OFF setting. For details, see "9.2.4 Check go operation".**



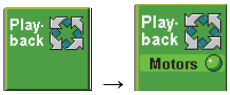
4 **Select “Playback” mode using the Virtual IO window.**

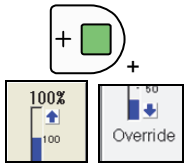
5 **Release the E.STOP button.**



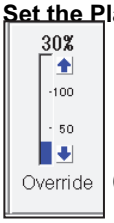


8 **Press the Motors ON button to turn the motors ON.**

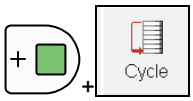




9 **Set the Playback speed override. At this time, select 30%.**

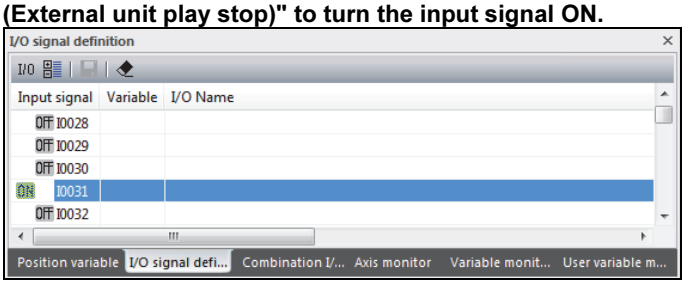


(NOTE) When using a real robot, 10% is recommended for safer operation.

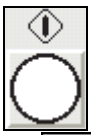


10 **Select the playback mode. In this case, select “Cycle”.**

11 **In the FD on Desk II screen, open "I/O Signal" and double-click "I0031 (External unit play stop)" to turn the input signal ON.**



Because this signal is Normal Close, the check go operation and playback operation of the robot is prohibited while this signal is OFF.



12 **Press Start button.**
>> The program will start and the robot stops after executing the last step.

13 **In case of functions like "FN5252 WAITI" etc., the robot will make signal waiting condition. This waiting condition can be canceled by the operation of [Enable] + [Cancel I-Wait].**

9.2.6 External playback (for experienced operators)

It is also possible to simulate an external playback operation using "I/O signal" in the FD on Desk II screen. This section helps you to understand the procedures for executing an external playback with external PLC etc.

For details, refer to the following instruction manuals also.
"FD CONTROLLER INSTRUCTION MANUAL: SETUP"
"FD CONTROLLER INSTRUCTION MANUAL: BASIC OPERATIONS"

POINT

- To execute the Motors ON operation, the input signal "Motors ON external" will be used (not the Motors ON button on the robot operation panel). ***Because this signal is not assigned as the default setting,*** it is necessary to assign the signal in advance.
- In the same way, please use the input signal "External playback start" to start a program, instead of the Start button on the robot operation panel ("I0030" is assigned by default).
- For the program number selection, the teach pendant key operation is not used. Instead of that, the input signals of "Program selection bits" are used. 8 points from I0017 to I0024 (binary signals) are assigned by default.
- The operation of the Motors OFF and the Stop are common between the internal mode and the external mode. And the Emergency stop can be used in both modes.

POINT

(Reference) The program number conversion from decimal value to the binary value
$10 = 8 + 2 = \underline{1} \times 2^3 + \underline{0} \times 2^2 + \underline{1} \times 2^1 + \underline{0} \times 2^0 = 00001010$

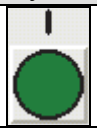
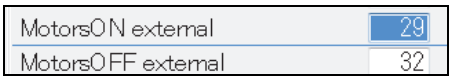
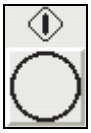
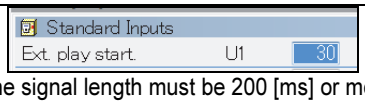
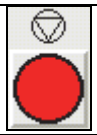
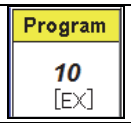
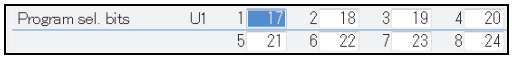
Therefore, each signal must be like the following;

I 1 7	I 1 8	I 1 9	I 2 0	I 2 1	I 2 2	I 2 3	I 2 4
OFF	**ON**	OFF	**ON**	OFF	OFF	OFF	OFF

CAUTION

Because the "Program selection bits" are plural combination signals, it is possible to use a "Program strobe" signal that determines the timing of reading the signals. However, in this example, the "Program strobe" signal is not used. In this example, the program number is immediately determined when the "External playback start" signal is turned ON. In the simulation of the FD on Desk II, the timing dispersion of the input signals does not matter. But in the case of the real robot and the controller, if the "Program selection bits" signals are not stable, an unexpected program number may be selected when the "External playback start" signal or the "Program strobe" signal is turned ON. Please use caution. (As an example, it is recommended to leave 100 ms or more after inputting the "Program selection bits" signals.)

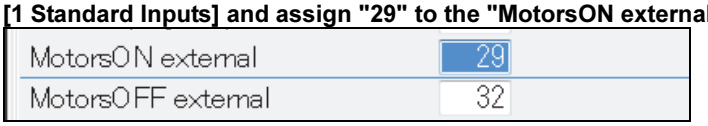
(Reference) Internal playback and external playback

	Internal playback 	External playback 
Motors ON		
Motors OFF		
Start		 - The signal length must be 200 [ms] or more. - This signal must be turned ON after the "Program selection bits" signal is stabilized.
Stop	 or 	
Program Selection	 or 	I17～I24 

Preparation for the external playback start

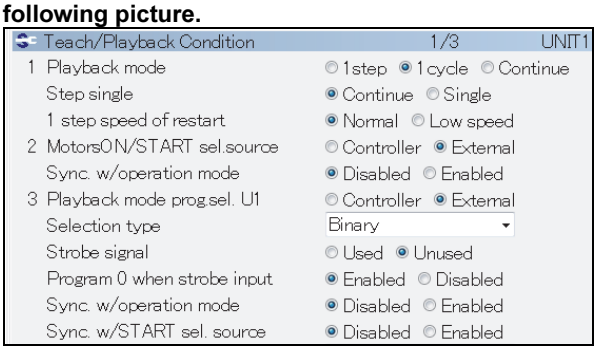
1 **Select the Teach mode.**

2 **Open <Constant Setting> - [6 Signals] [2 Input Signal Assignment] [1 Standard Inputs] and assign "29" to the "MotorsON external" signal.**



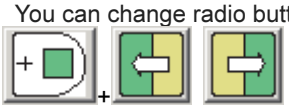
3 **Press <Complete> to save the setting.**

4 **Open <Teach/Play Condition> setting screen and set the settings like the following picture.**



Set the "Strobe signal" to "Unused".

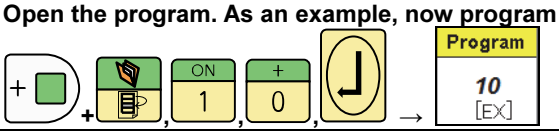
You can change radio buttons with [Enable] + Left / Right cursor keys.



5 **Shutdown and restart Virtual FD. (Exit -> Reload the project)**

6 **Select the Teach mode.**

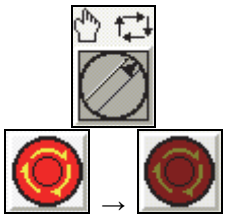
7 **Open the program. As an example, now program 10 will be used.**



8 **Move the robot to the first MOVE command step using the CHECK GO operation with "CONT" = OFF setting. For details, see "9.2.4 Check go operation".**

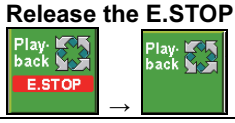
If the "Motors ON external" input signal has been assigned already, please use the signal number as it is.

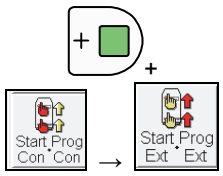
Playback operation (External playback)



1 **Select “Playback” mode using the Virtual IO window.**

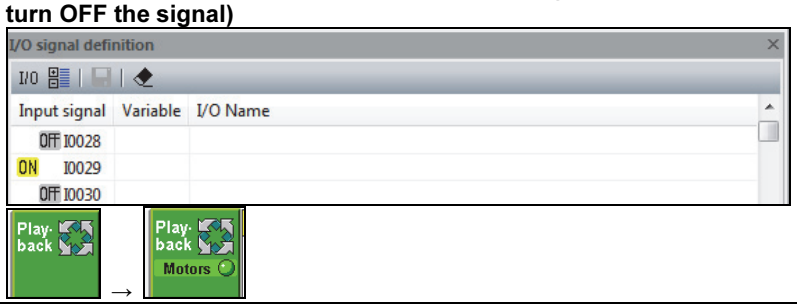
2 **Release the E.STOP button.**



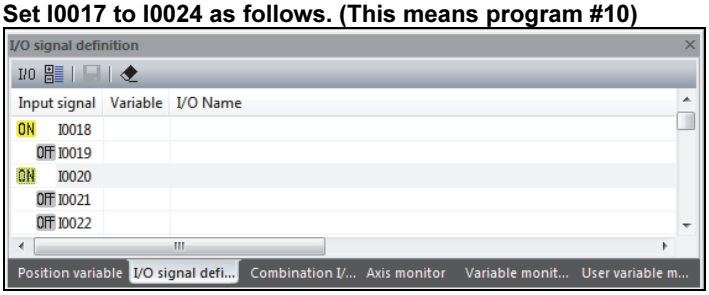


3 **Select the "External program selection" and the "External playback start".**

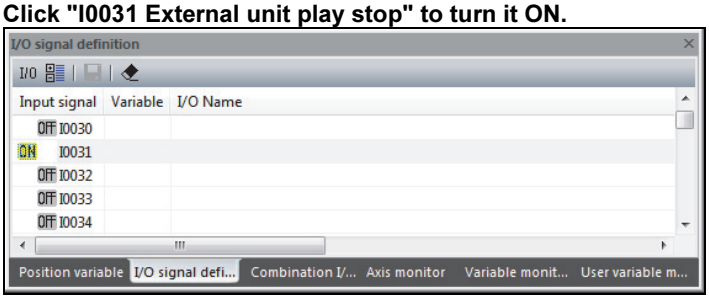
4 **Click the "I0029 Motors ON external" button in "IO signals" in the FD on Desk II screen to turn the Motors ON. (After confirming that the Motors are ON, turn OFF the signal)**



5 **Set I0017 to I0024 as follows. (This means program #10)**

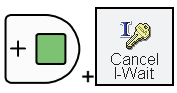


6 **Click "I0031 External unit play stop" to turn it ON.**



Because this signal is Normal Close, the check go operation and playback operation of the robot is prohibited while this signal is OFF.

7 **Click "I0030 External playback start" to turn it ON.**
>> The program will start and the robot stops after executing the last step.



8 **In case of functions like "FN5252 WAITI" etc., the robot will make signal waiting condition. This waiting condition can be canceled by the operation of [Enable] + [Cancel I-Wait].**

When using FD on Desk II with restored backup data of the actual equipment, assigned signal numbers may be different from those shown in this example.

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- Concerning the Contact list, please refer to ***"Contact list (TFDJP-254)"***.
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- In case that an end user uses this product for military purpose or production of weapon, this product may be liable for the subject of export restriction stipulated in the Foreign Exchange and Foreign Trade Control Law. Please go through careful investigation and necessary formalities for export.
- This is an original instruction.