Mech-Mind User’s Manual

Mech-Mind

Mar 06, 2023

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This section introduces the master-control program for FANUC robots and the procedure of setting up the communication with a robot through the program.

CHAPTER

ONE

FANUC SETUP INSTRUCTIONS

This section introduces the process of loading the robot master-control program onto a FANUC robot.

The process consists of the following steps:

- *Check Controller and Software Compatibility*
- *Setup the Network Connection*
- *Load the Program Files*
- *Test Robot Connection*

Please have a flash drive ready at hand.

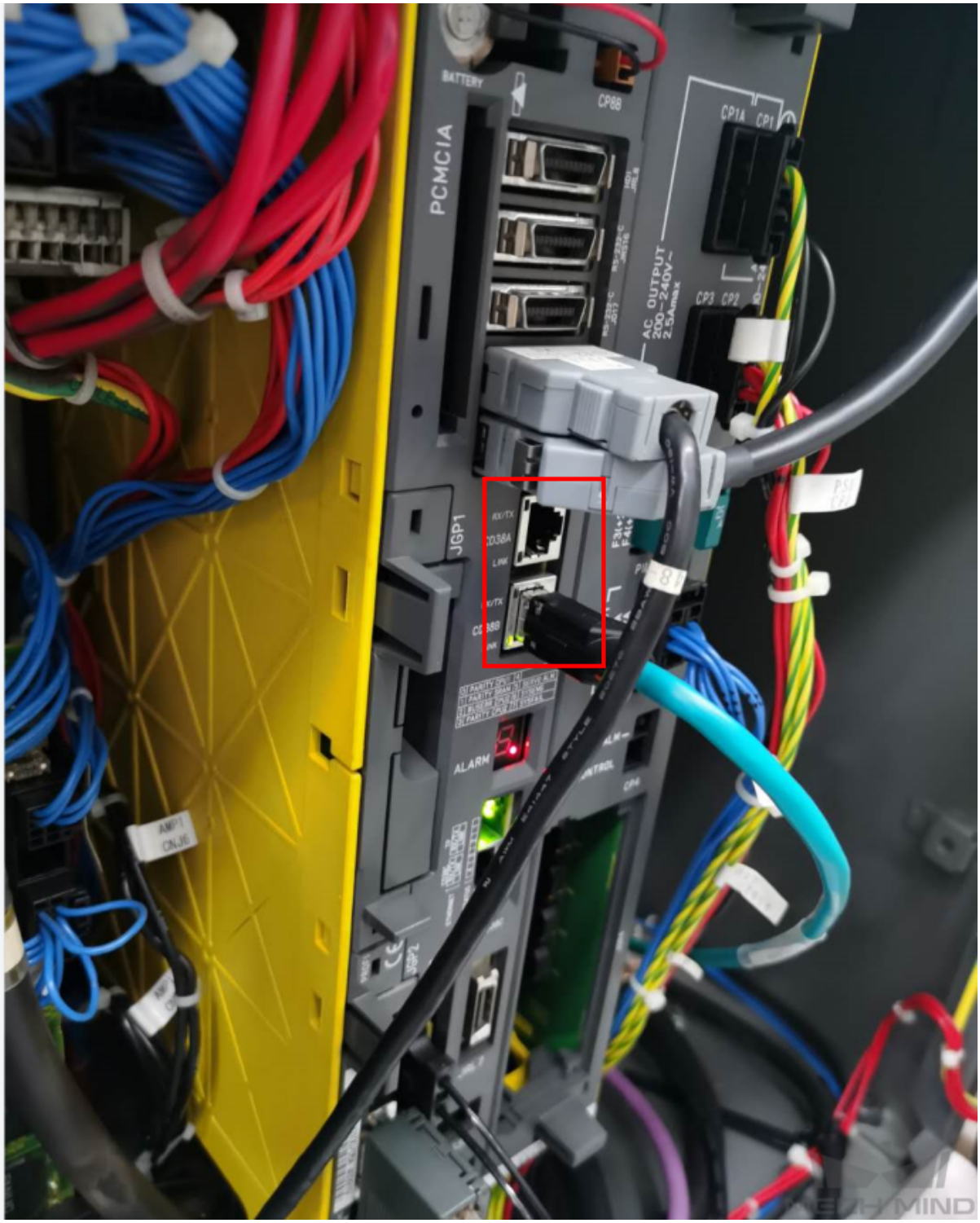
1.1 Check Controller and Software Compatibility

- Controller: no requirement
- Controller system software version: V7.5, V7.7, V8.*, and V9.*
- Additional controller software packages:
  - R651 or R632 (karel) - used to enable karel function
  - R648 (User Socket Msg)
- Mech-Mind Software Suite: latest version recommended

1.2 Setup the Network Connection

1.2.1 Hardware Connection

Plug the Ethernet cable of the IPC into the Ethernet port of robot controller as shown in the figure. You can plug the cable into either CD38A port or CD38B port. CD38A corresponds to Port#1 in the robot IP setting, while CD38B corresponds to Port#2.

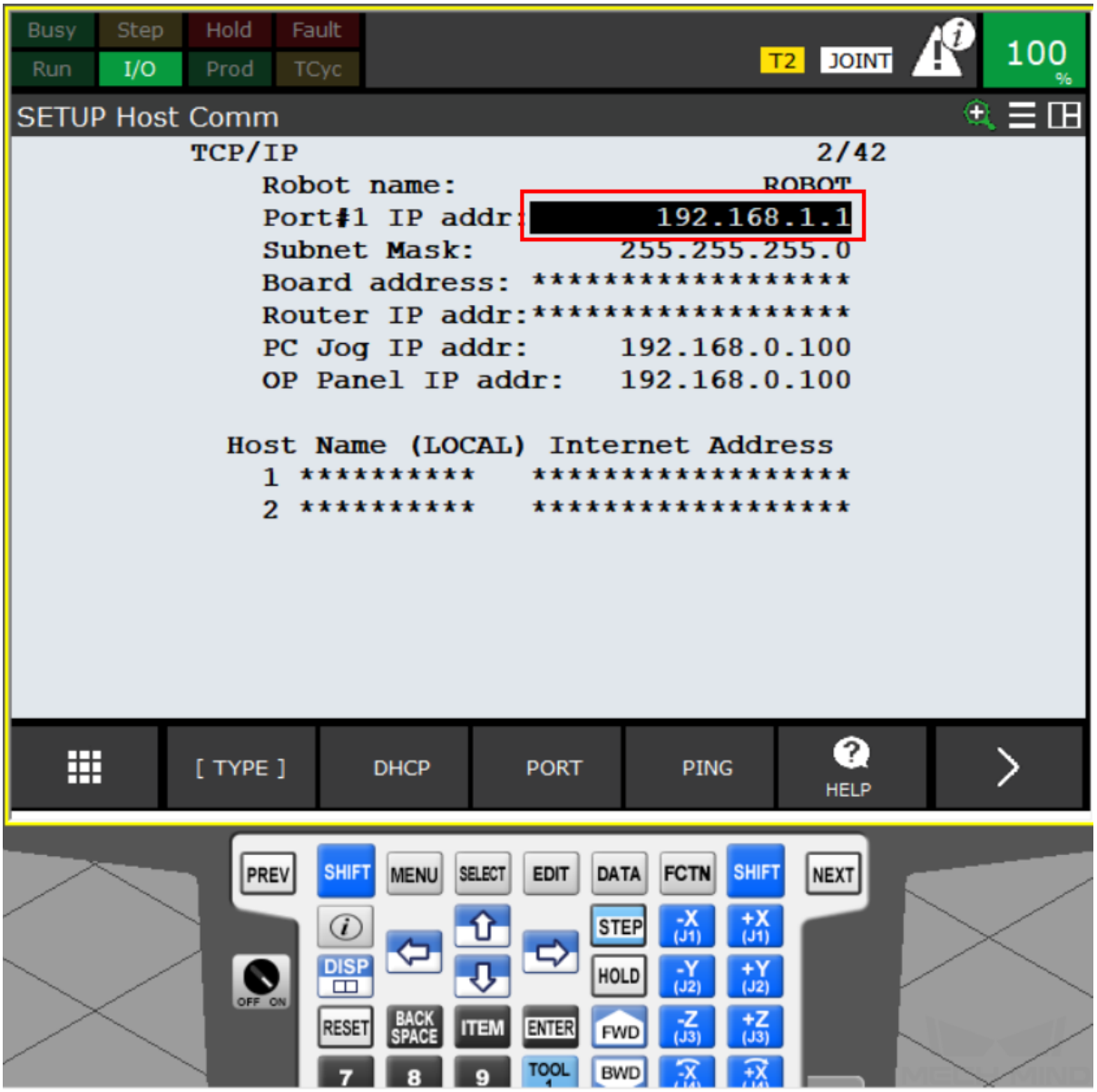

BATTERY
CP8B
PCMCIA
CP1A
CP1
AC OUTPUT
200~240V~
2.5Amax
CP3
CP2
J6P1
RX/TX
LINK
ALARM
CP4

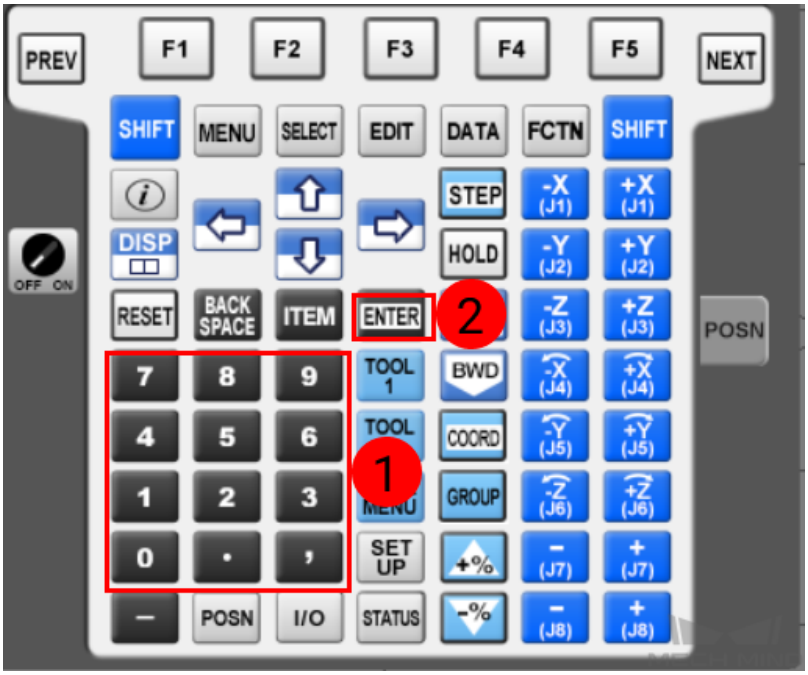
1.2.2 IP Configuration

1. Press on *MENU→ SETUP*, select **Host Comm** in the context menu, and then press `ENTER` to open the **SETUP Protocols** window.

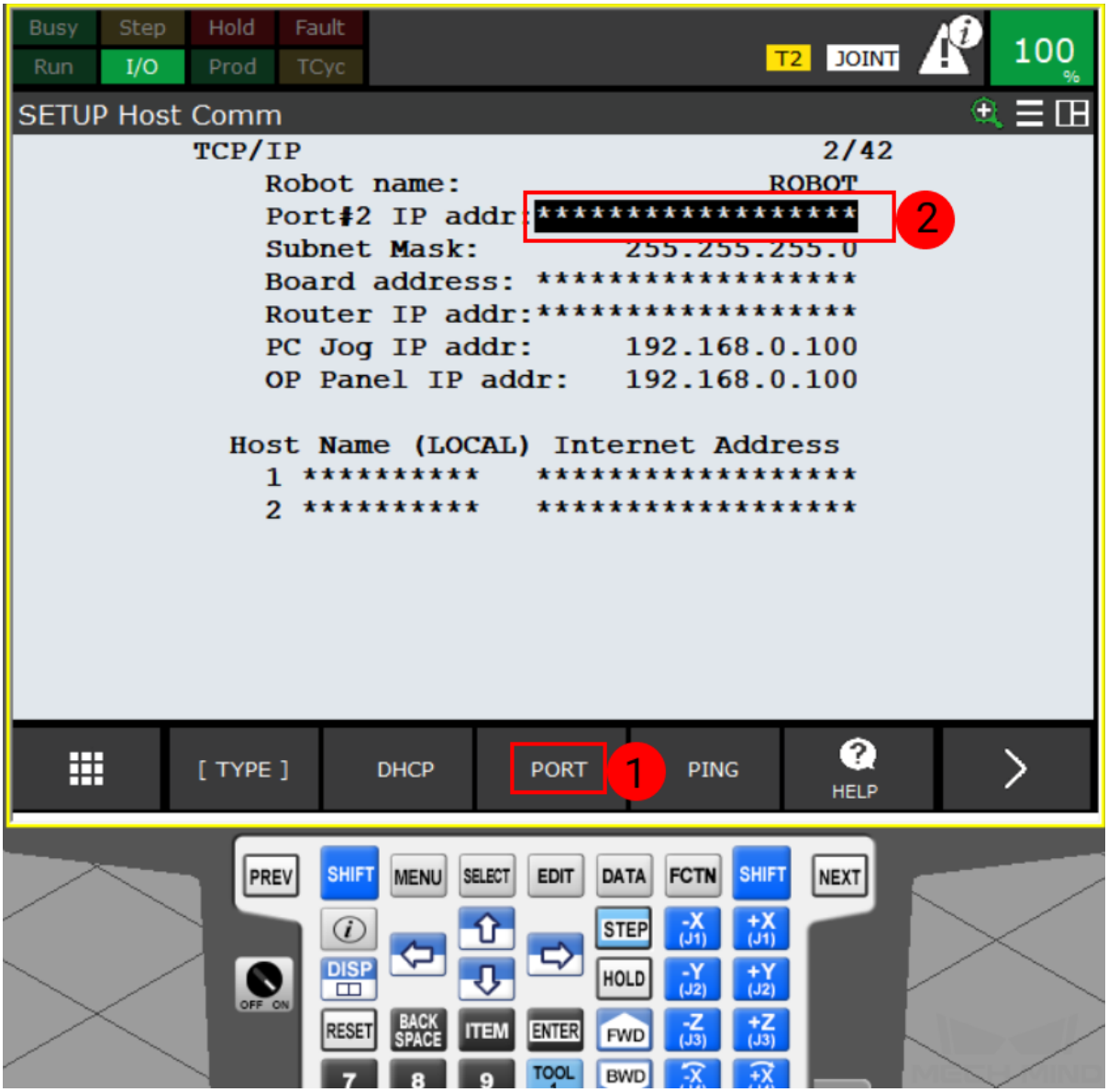
2. Select **TCP/IP** and press on *DETAIL* to open the **SETUP Host Comm** window.

3. Enter the robot IP in the **IP address** line with the keyboard of the teach pendant. The robot IP should be in the same subnet as the IPC.


Busy
Step
Hold
Fault
Run
I/O
Prod
TCyc
T2
JOINT
100
%
SETUP Host Comm
TCP/IP
2/42
Robot name:
ROBOT
Port#1 IP addr:
192.168.1.1
Subnet Mask:
255.255.255.0
Board address:
Router IP addr:
PC Jog IP addr:
192.168.0.100
OP Panel IP addr:
192.168.0.100
Host Name (LOCAL)
Internet Address
1
2
[TYPE]
DHCP
PORT
PING
HELP
PREV
SHIFT
MENU
SELECT
EDIT
DATA
FCTN
SHIFT
NEXT
STEP
HOLD
FWD
BWD
DISP
RESET
BACK SPACE
ITEM
ENTER
TOOL
-X (J1)
+X (J1)
-Y (J2)
+Y (J2)
-Z (J3)
+Z (J3)
OFF ON
7
8
9



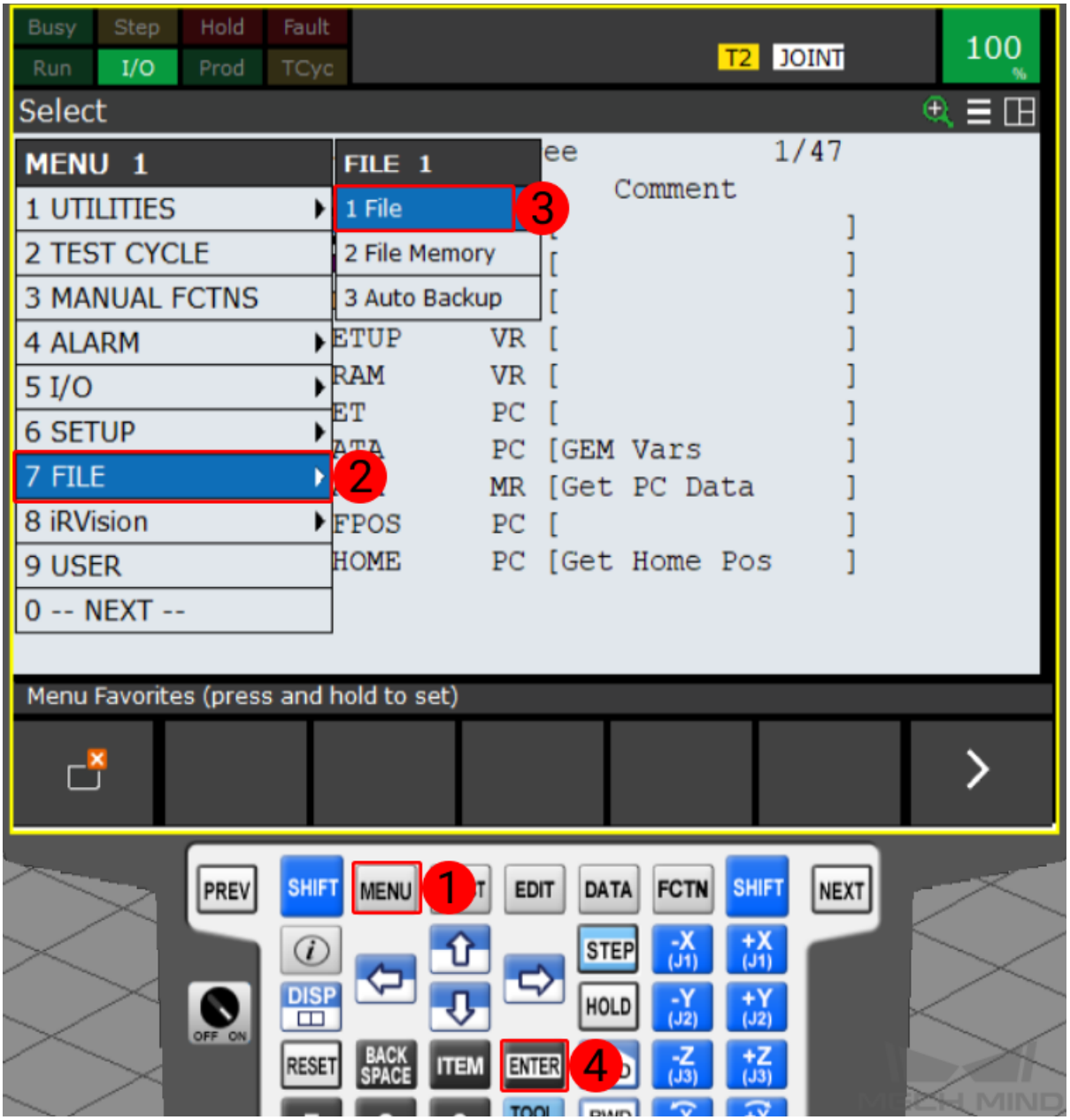
4. If the Ethernet cable is connected to port 2, please press *Port* to switch the port. Then you can enter the robot IP in the **IP address** line.



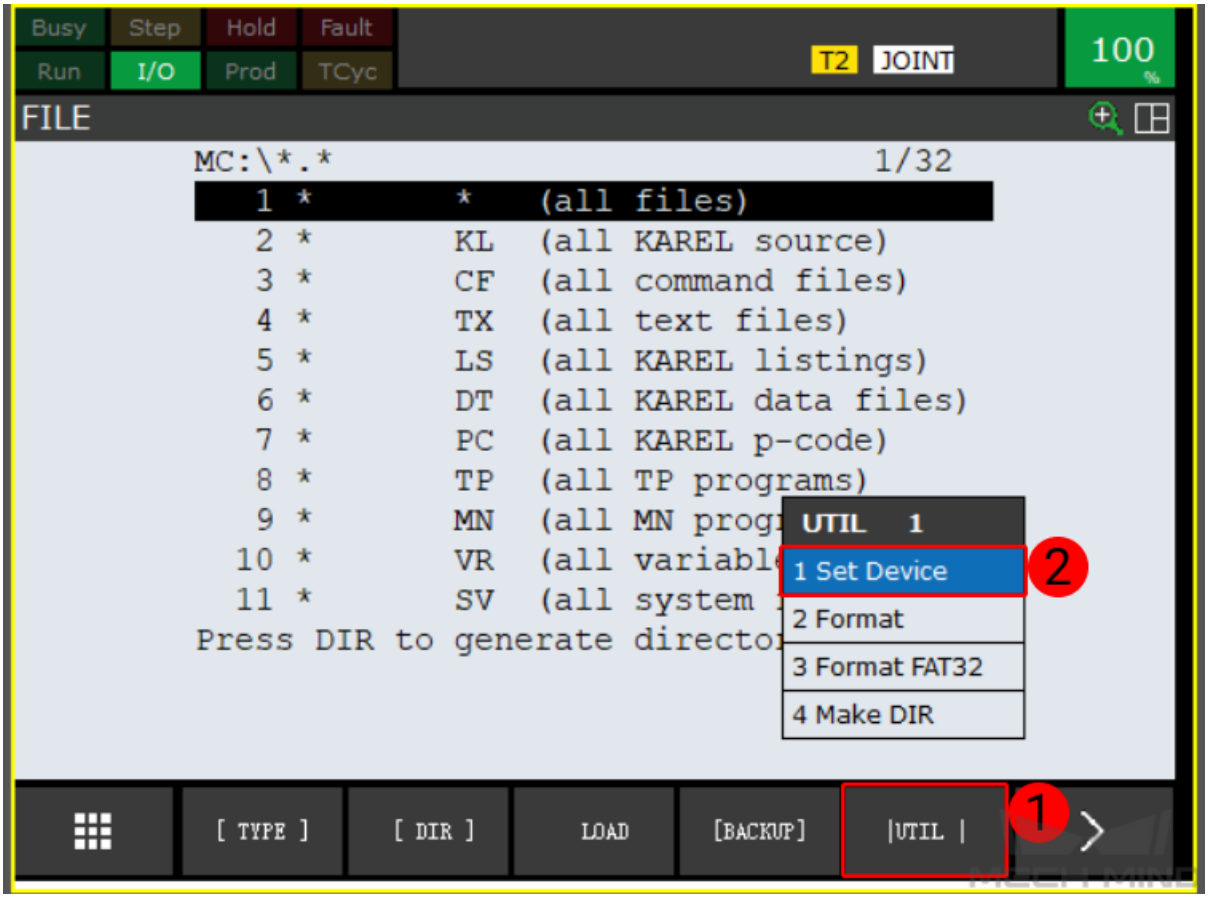
1.3 Load the Program Files

1.3.1 Backup

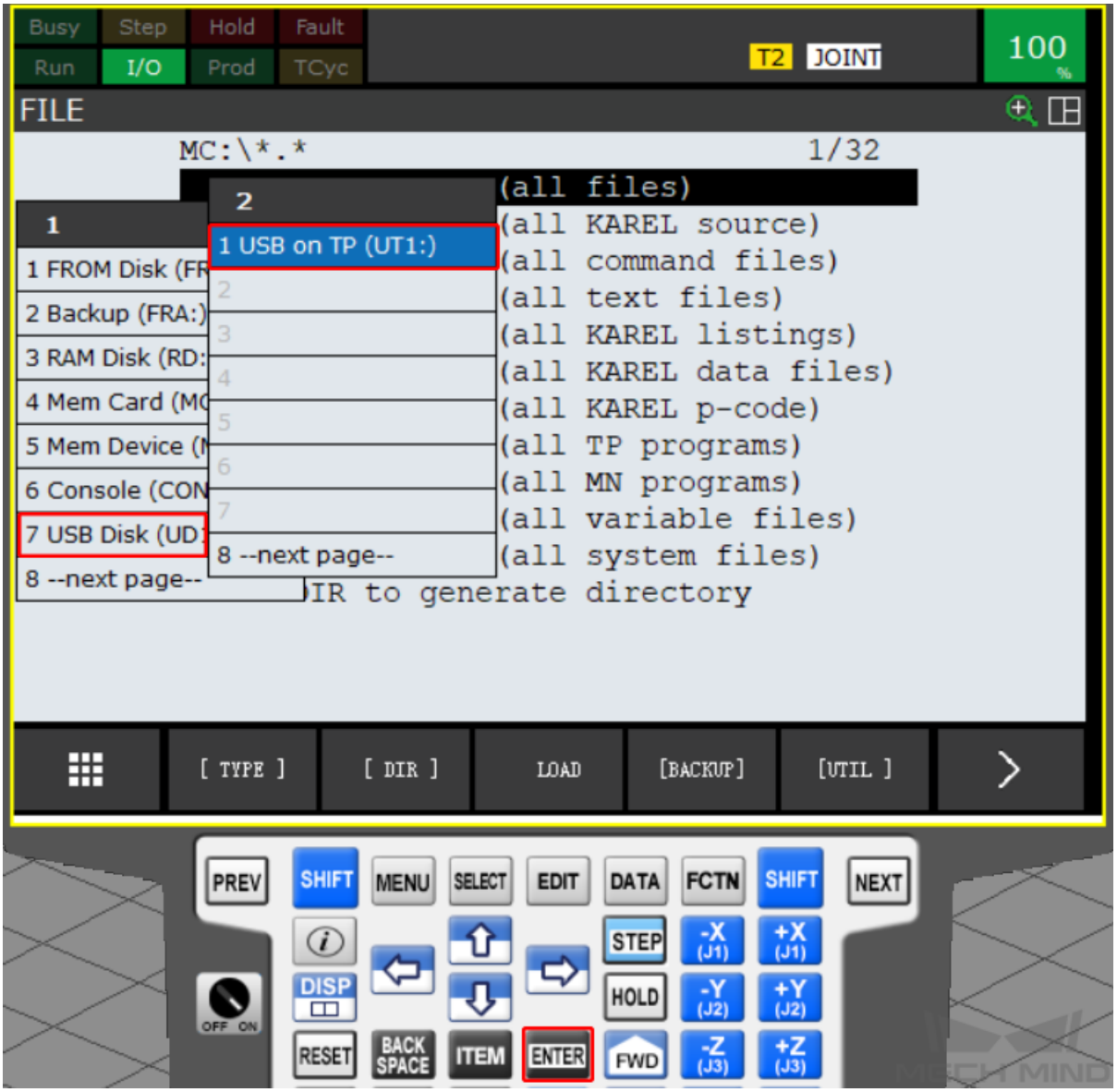
1. Connect the flash drive to the robot controller or the teach pendant.
2. Press on the `MENU` button, and select *FILE* → *File* on the screen, and then press on `ENTER` to open the **FILE** window.



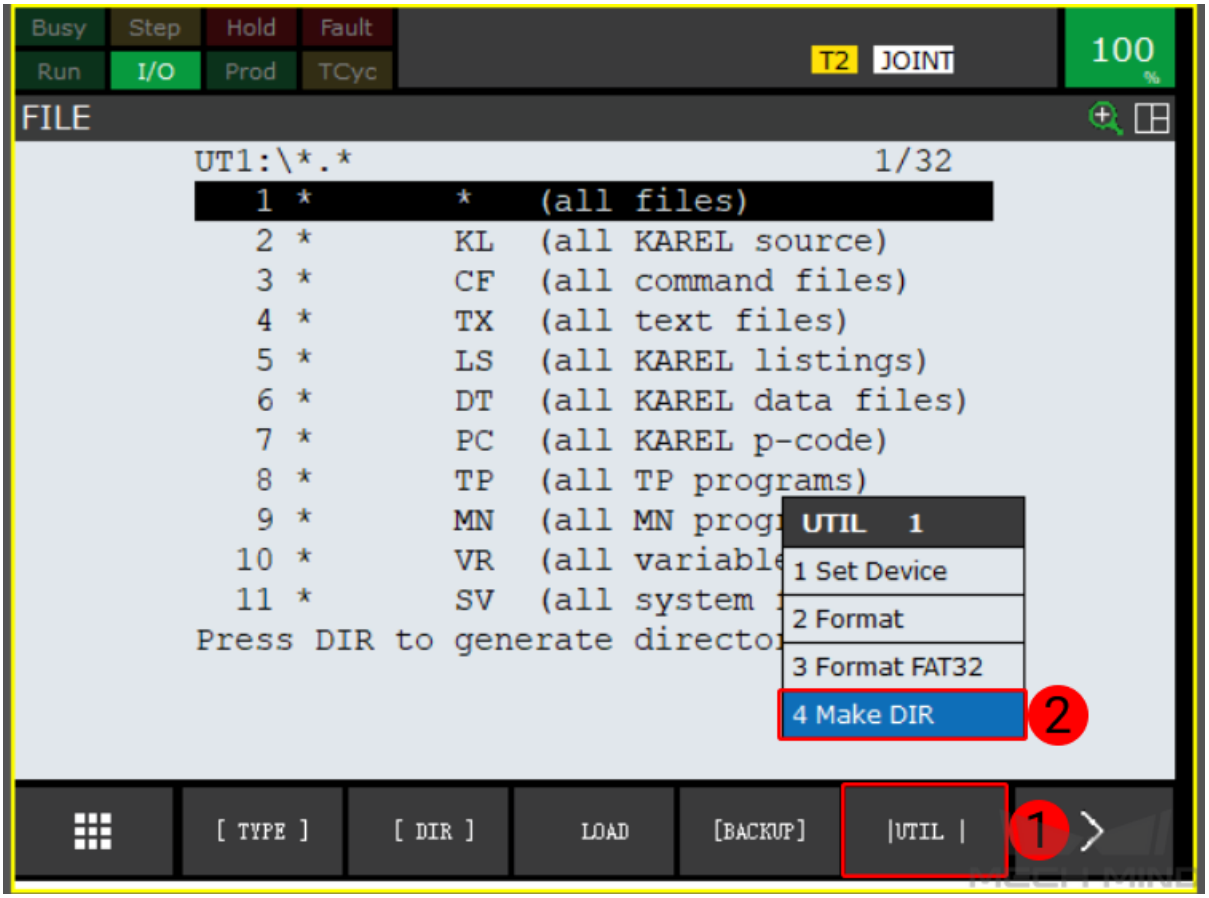
3. Select *UTIL* → *Set Device*, and press on `ENTER` to open the USB folder.



4. If your flash drive is connected to the **controller**, please select **USB Disk (UD1:)**; if your USB flash drive is connected to the **teach pendant**, please select **USB on TP (UT1:)**.

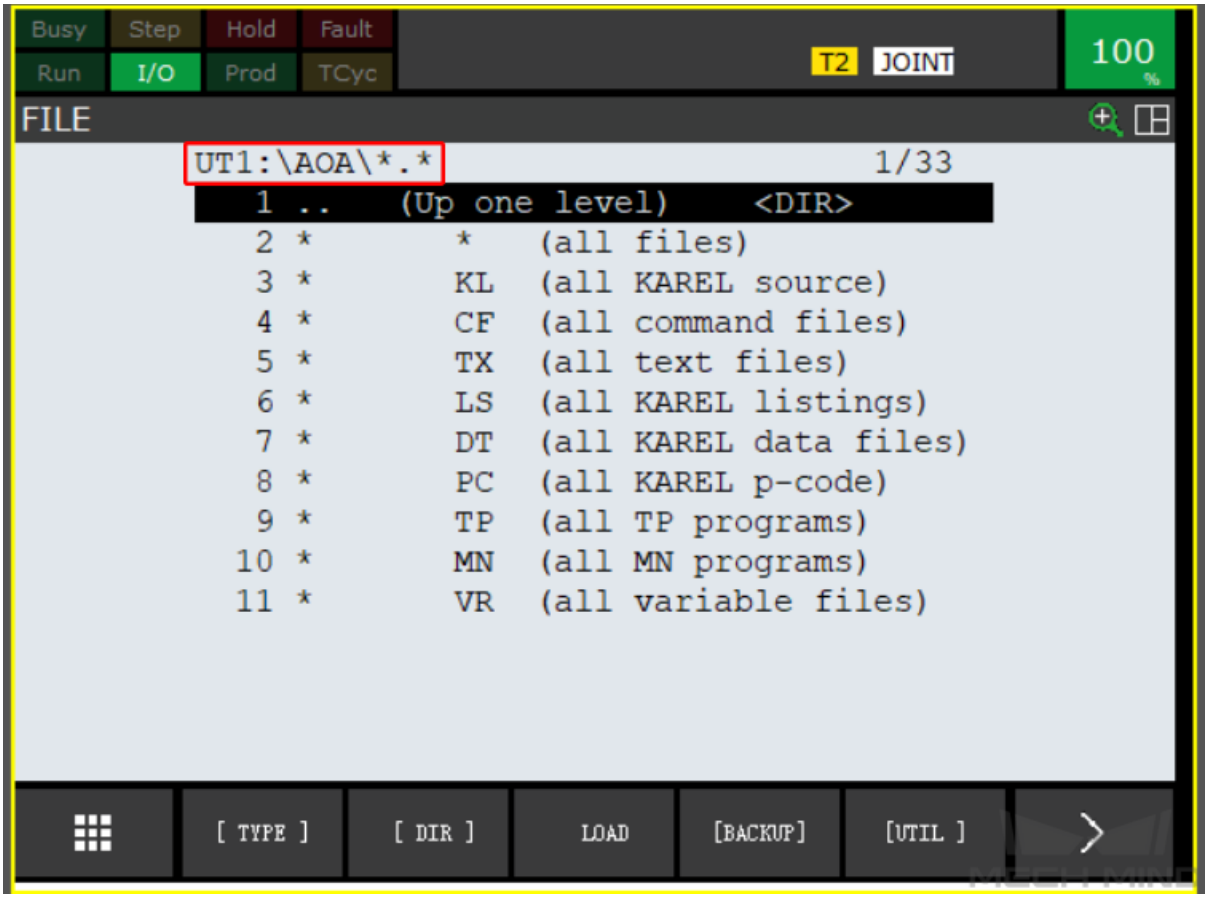


5. In the USB FILE window, select *UTIL* → *Make DIR* to create a new folder.



6. Select **Words**, **Upper Case**, **Lower Case**, or **Options/Keybd** to name the folder, and then press on `ENTER` to confirm and enter the new folder.

Busy
Step
Hold
Fault
Run
I/O
Prod
TCyc
T2
JOINT
100
%
FILE
UT1:*.*
1/32
1 * * (all files)
2 * KL (all KAREL source)
3 * CF (all command files)
4 * TX (all text files)
5 * LS (all KAREL listings)
6 * DT (all KAREL data files)
7 * PC (all KAREL p-code)
8 * TP (all TP programs)
9 * MN (all MN prog
10 * VR (all variabl
11 * SV (all system
Directory name: AOA
Alpha input 1
Words
Upper Case
Lower Case
Options/Keybd
3
ABCDEF
GHIJKL
MNOPQR
STUVWX
YZ_@*.
4
PREV
SHIFT
MENU
SELECT
EDIT
DATA
FCTN
SHIFT
NEXT
DISP
STEP
HOLD
RESET
BACK SPACE
ITEM
ENTER
5
-X (J1)
+X (J1)
-Y (J2)
+Y (J2)
-Z (J3)
+Z (J3)
OFF ON

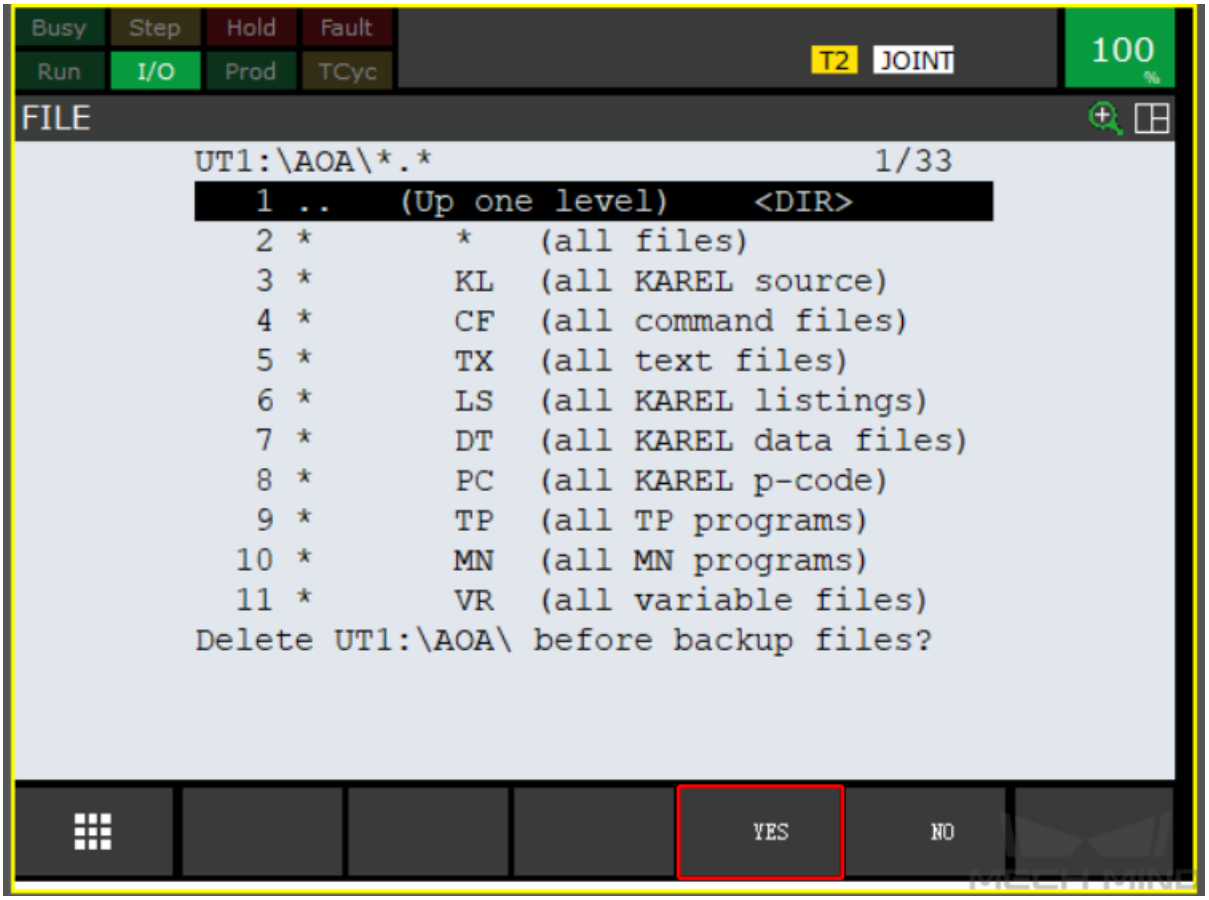


Hint:

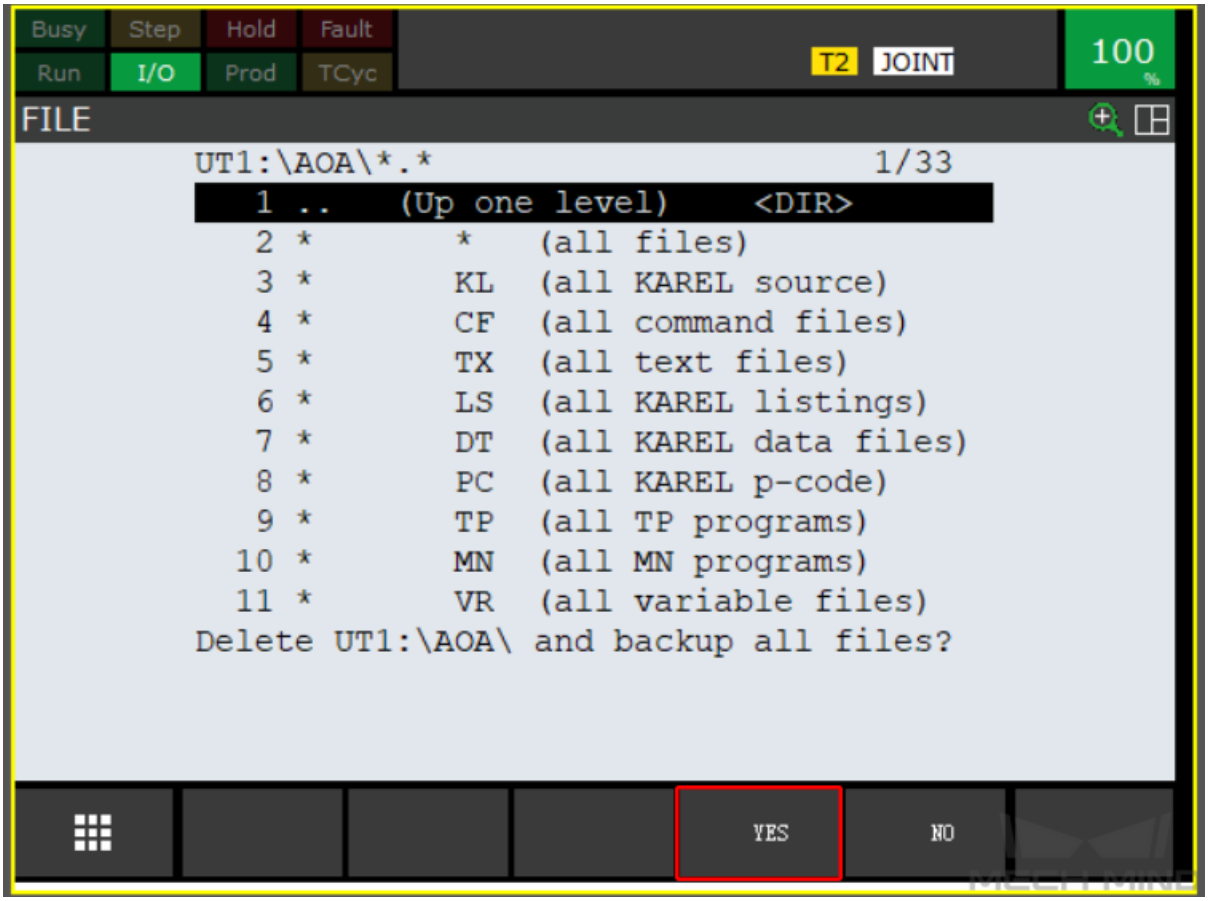
- In this example, **Upper Case** is selected, and the folder name is **AOA**.

7. Select *BACKUP* → *All of above* → *ENTER* to backup the files.

8. A message asking whether to delete the new folder before backup files will display on the screen. Select `Yes`.



9. Then a message asking whether to delete the new folder and backup all files will display on the screen. Select `Yes` to start backuping.



10. After the backup is complete, select **all files** and press on `ENTER` to view all backuped files.

Busy
Step
Hold
Fault
Run
I/O
Prod
TCyc
T2
JOINT
100
%
FILE
UT1:\AOA*.*
2/33
1 .. (Up one level) <DIR>
2 * * (all files)
3 * KL (all KAREL source)
4 * CF (all command files)
5 * TX (all text files)
6 * LS (all KAREL listings)
7 * DT (all KAREL data files)
8 * PC (all KAREL p-code)
9 * TP (all TP programs)
10 * MN (all MN programs)
11 * VR (all variable files)
1
[TYPE]
[DIR]
LOAD
[BACKUP]
[UTIL]
PREV
SHIFT
MENU
SELECT
EDIT
DATA
FCTN
SHIFT
NEXT
STEP
HOLD
DISP
RESET
BACK SPACE
ITEM
ENTER
2
-X (J1)
+X (J1)
-Y (J2)
+Y (J2)
-Z (J3)
+Z (J3)
OFF ON

1.3.2 Prepare the Files

The program file is stored in the installation directory of Mech-Mind Software Suite.

Navigate to *xxx\Mech-Mind Software Suite-x.x.x\Mech-Center\Robot_Server\Robot_FullControl\fanuc*, and copy all the contents of this folder to your flash drive:

Note:

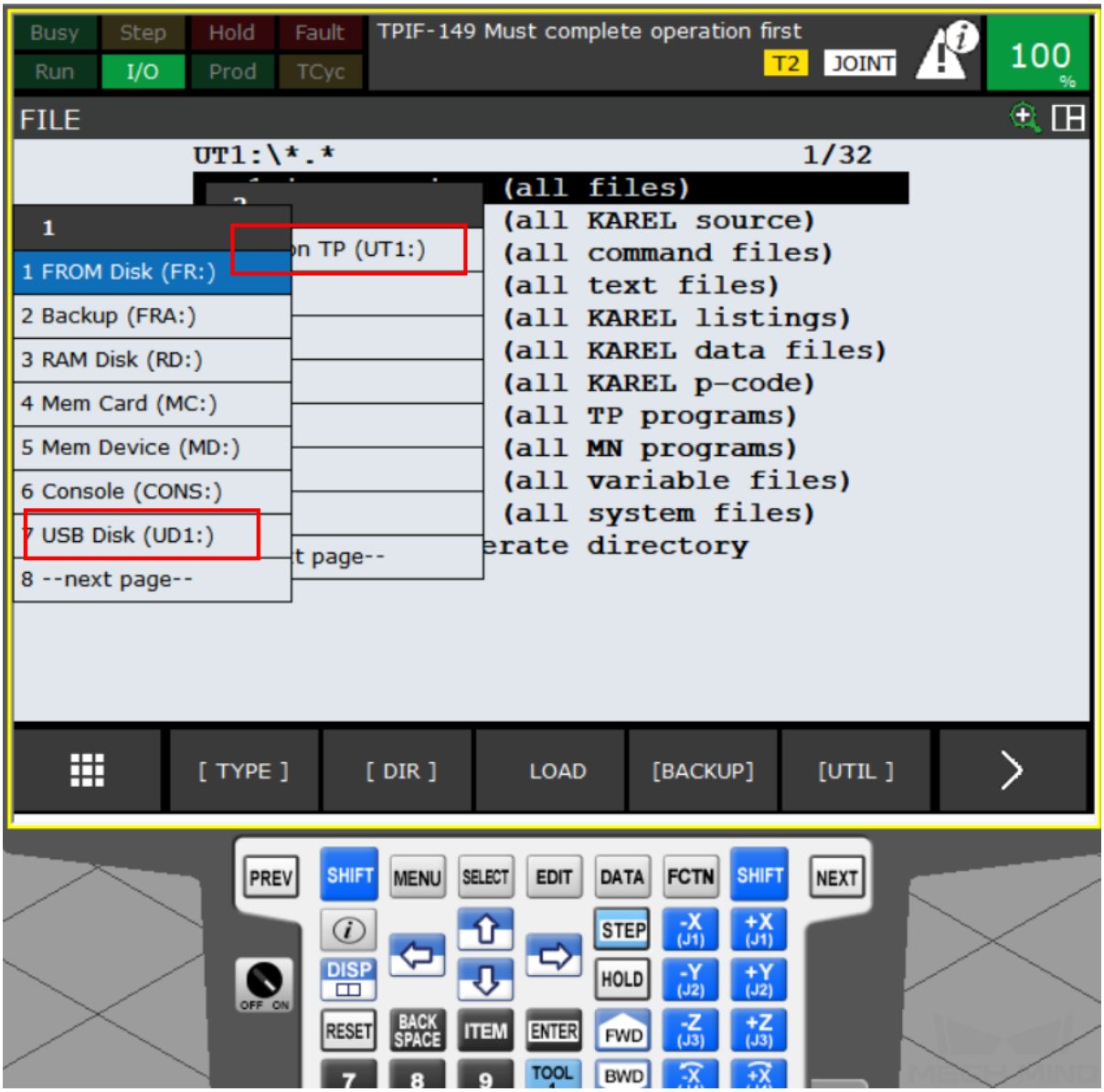
- Please save all the contents in the root directory of the USB flash drive. Do not rename them.
- Please copy all the contents in the folder instead of copying the whole folder directly.

1.3.3 Load the Files to the Robot

1. After connecting the USB flash drive, press `MENU` and select *FILE* → *File*, and then press `ENTER` to open the **FILE** window.

2. Press *UTIL* and select **Set Device** in the context menu.

3. Select the USB flash drive. If your flash drive is connected to the **controller**, please select **USB Disk (UD1:)**; if your USB flash drive is connected to the **teach pendant**, please select **USB on TP (UT1:)**.



4. Select the first line **(all files)** and press `ENTER` to enter the root directory of the USB flash drive.

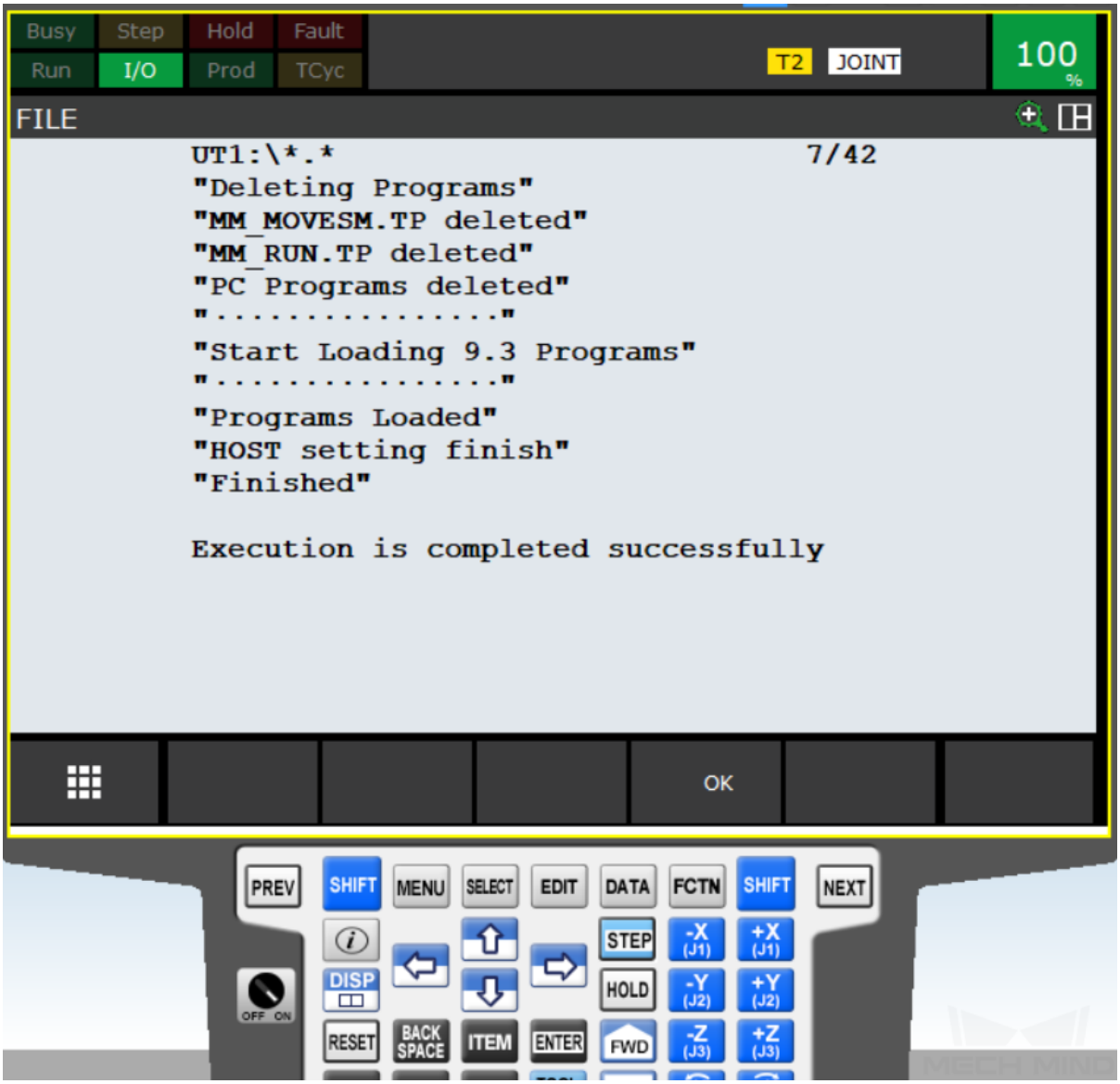
Hint: For the next step:

- If the USB flash drive is connected to the **robot controller**, please select **INSTALL_UD.cm**.
- If the USB flash drive is connected to the **robot teach pendant**, please select **INSTALL_UT.cm**.

---

1. Select the corresponding CM file and press `ENTER` key on the teach pendant. Choose *YES* to start loading the programs.

2. When the following screen is displayed, the loading and relavent configuration are completed. Press `F4` to exit the program.



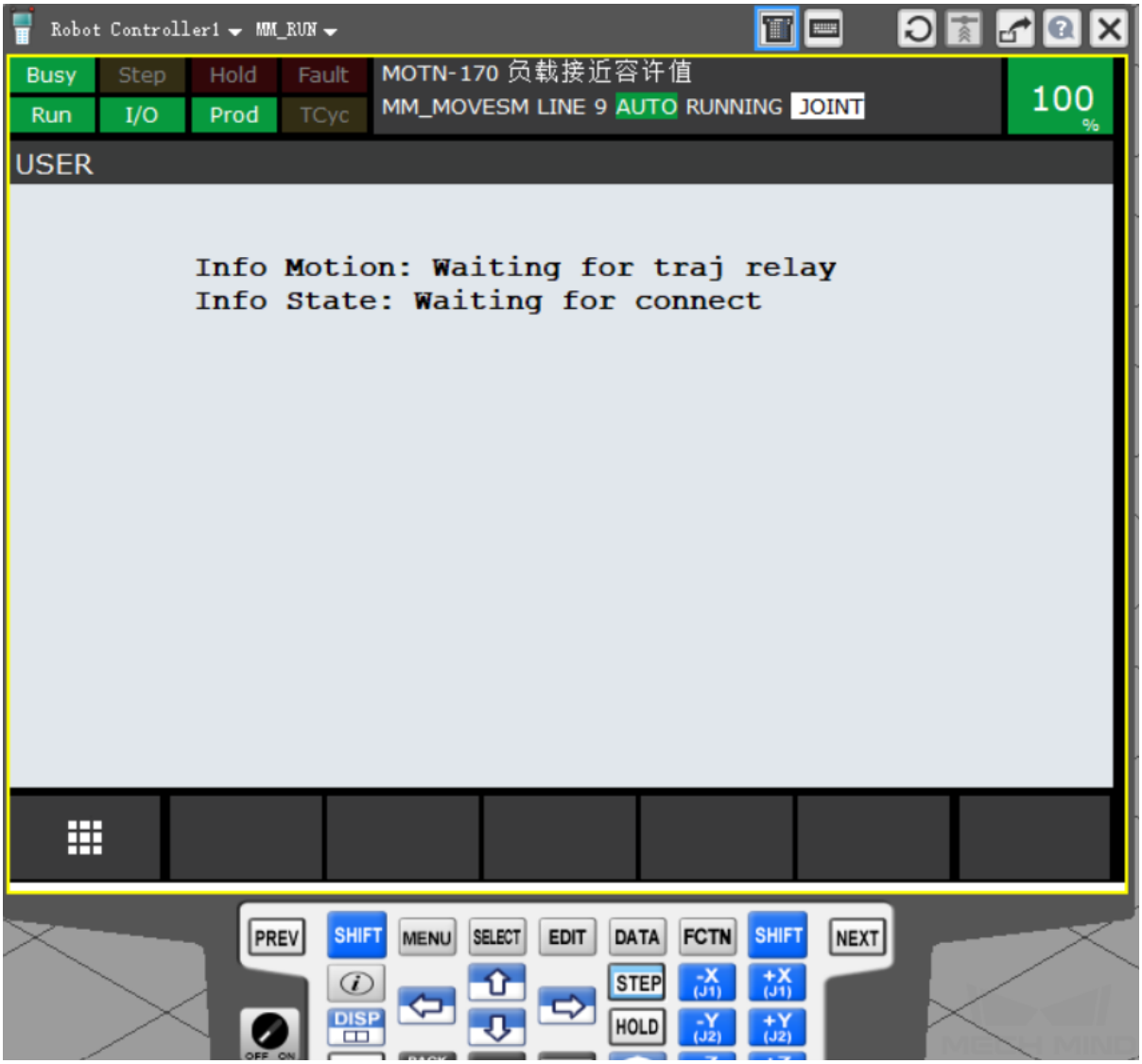
Attention:	Please restart the robot after exiting the program.

1.3.4 Run the Program

1. Press `SELECT` key on the teach pendant to open the program selection window, and then select *TYPE→ TP Programs*, as shown below.

2. Select **MM_RUN** and press `ENTER` to open the program. Then press the green button on the controller to auto-run the program.

3. If the following screen is displayed, you can proceed to the next section.



1.4 Test Robot Connection

1.4.1 Configure Robot in Mech-Viz

1. Open Mech-Viz, click *New project* to create a new project.
2. Select the robot model in use in the next page.
3. Save the project by pressing `Ctrl` + `S`.
4. In the toolbar, change the **Vel.** (velocity) and **Acc.** (acceleration) parameters to **5%**.
5. Right-click the project name in **Resources** and select **Autoload Project**.

1.4.2 Configure Settings in Mech-Center

1. Open Mech-Center and click on *Deployment Settings*.
2. Go to **Robot Server**, and make sure **Use robot server** is checked.
3. Check if the robot model displayed next to **Robot type in Mech-Viz project** matches the one in use.
4. Set the Robot IP address, and click **Save**.

1.4.3 Connect to Robot in Mech-Center

1. Click *Connect Robot* in the Toolbar.
2. The robot is successfully connected if:
   - A message saying **Robot: server connected to the robot** shows up in the **Log** panel, and
   - A robot icon with the robot model shows up in the **Service Status** panel.

1.4.4 Move the Robot

1. In Mech-Viz, click *Sync Robot* in the toolbar to synchronize the pose of the real robot to the simulated robot. Then, click *Sync Robot* again to disable the synchronization.
2. Click the **Robot** tab in the lower right, and change the joint position of J1 slightly (for example, from 0° to 3°). The simulated robot will move accordingly.
3. Click *Move real robot*, the real robot should move accordingly.

Attention: When moving the robot, please pay attention to safety hazards. In the case of an emergency, press the emergency stop button on the teach pendant!

CHAPTER

TWO

FANUC PROGRAM DESCRIPTION

2.1 Program Module

Program Modules	Description
mm_relay	background program used to receive Robserver data
mm_state	background program used to send data of robot pose, signal, and status
mm_movesm	foreground program used to guide the robot to move
mm_moveid	background program used to write the data received by mm_relay to the register
mm_run	automatically run the foreground and background program after running this module
mm_struct_h	defined struct data

2.2 Occupied Registers

Register		Description
MOVE_SPD_REG	180	integer register: motion velocity (in %)
MOVE_CNT_REG	181	integer register: motion termination (in %)
MOVE_TYP_REG	182	indicate the move type J or L
MOVL_RG_SPD	183	move L velocity
RI_C_BRANCH	184	mm control branch

Position Register		Description
MOVE_PREG	80	position register for current point

2.3 Occupied FLAGs

FLAG		Description
F_MSM_RDY	180	ready signal flag
F_MSM_DRDY	181	data ready signal flag
F_TK_CTRL	182	takes control flag
RI_MM_LOCK	183	trajectory lock flag
R_STOP_MOVE	190	stop move flag
F_STOP_CLR	191	clear data flag