# **Mech-Mind User's Manual**

**Mech-Mind** 

Mar 06, 2023

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This section introduces the process of setting up master-control of a Techman (TM) robot.

- Prerequisites
- Get Control of the Robot
- Load the Program Files
- Run the Program
- Test Robot Connection
- Appendix

### CHAPTER

# PREREQUISITES

Before you perform any operation on the TM robot, please make sure that the following requirements have been met.

- 1. The controller software (TMflow) version is 1.84 or above.
- 2. The version of the Mech-Mind Software Suite you use is 1.6.1 or above.
- 3. You have known the IP address of the robot, e.g., 192.168.2.10.

# CHAPTER

# GET CONTROL OF THE ROBOT

There are two ways to control the robot, and you can choose either one according to the actual situation.

- Control the Robot via the Controller
- Control the Robot via the IPC

# 2.1 Control the Robot via the Controller

1. Connect the monitor, keyboard, and mouse to the controller through the controller's USB and HDMI ports accordingly.



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- 3. Connect the robot in any of the following ways:
  - Double-click the robot icon.

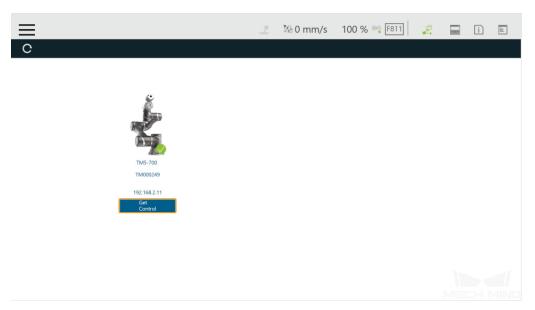
- Double-click the robot ID.
- Double-click the IP address of the robot.



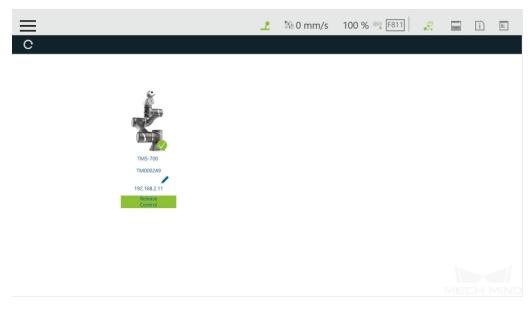
4. Enter your ID and password in the **Log in** window, and click *OK*. You can use the default ID *administrator* to log in without a password.

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C		
TM5-700 TM000249 192.168.2.11 Controlled by	Log in ID administrator PW OK Cancel	

5. Click Get Control to control the robot.



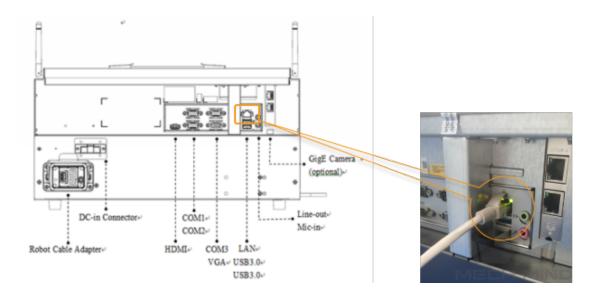
If the robot is controlled successfully, the window will be shown as below.



# 2.2 Control the Robot via the IPC

#### 2.2.1 Connect Hardware

Plug the Ethernet cable into the LAN port of the robot controller to connect it with the IPC.

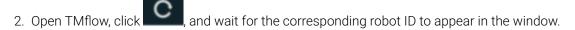


#### 2.2.2 Set the IP Address of the IPC

Attention: Set the IP addresses of the IPC and robot to be in the same subnet, or else the robot cannot be connected successfully.

#### 2.2.3 Control the Robot with the IPC

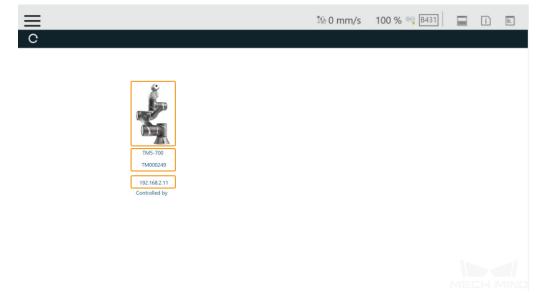
1. Download and install the TMflow software on your IPC from Techman Robot's website.



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3. Connect the robot in any of the following ways:

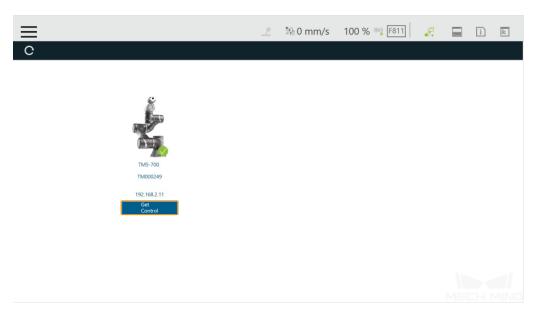
- Double-click the robot icon.
- Double-click the robot ID.
- Double-click the IP address of the robot.



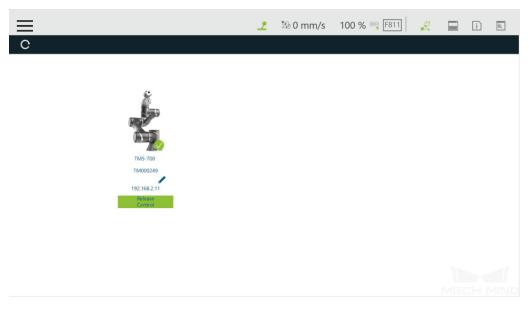
4. Enter your ID and password in the **Log in** window, and click *OK*. You can use the default ID *administrator* to log in without a password.

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TM5-700 TM00024 192.166.2 Controlled E	49 OK				Met		

5. Click Get Control to control the robot.



If the robot is controlled successfully, the window will be shown as below.



# CHAPTER THREE

# LOAD THE PROGRAM FILES

The example below uses an IPC to load the program files, and the method to load the program files with a controller is similar.

### 3.1 Prepare the Files

- 1. Plug the USB flash drive into the USB port of the IPC.
- 2. Rename the USB flash drive to **TMROBOT**, or else the USB flash drive cannot be recognized by the robot controller.
- 3. Copy the program files to the USB flash drive. The files are stored in the xxx\Mech-Mind Software Suite-x.x.x\Mech-Center\Robot\_Server\Robot\_FullControl\tm folder.

Attention: Please copy the entire *TM\_Export* folder to your USB flash drive.

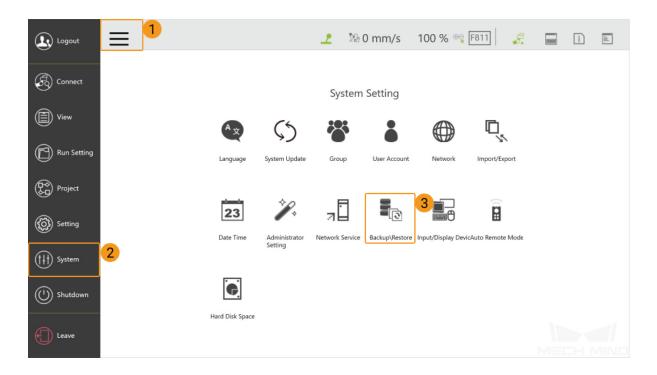
4. Plug the USB flash drive with the program files into the USB port of the robot controller.

### 3.2 Back up Robot System Files

**Hint:** It is recommended to back up robot system files before loading master-control program files to avoid system corruption that may be caused by the loading operation. In case any issue occurs, you can use the backup file to restore the robot system.

1. Open the TMflow software, click the System  $\rightarrow$  Backup\Restore.

icon in the upper left corner of the window, and select



2. Click *Backup*, enter a File Name for the backup file, and then click *Backup*.

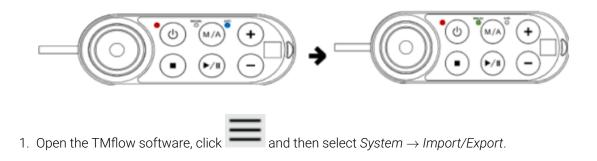
$\Rightarrow$		2	≌6 0 mm/s	100 % 😁 F811	8	(THE OWNER)	i	
Backup\Restore	)							
Backup	Size: File Name: backup			2				
Restore	Backup 3							

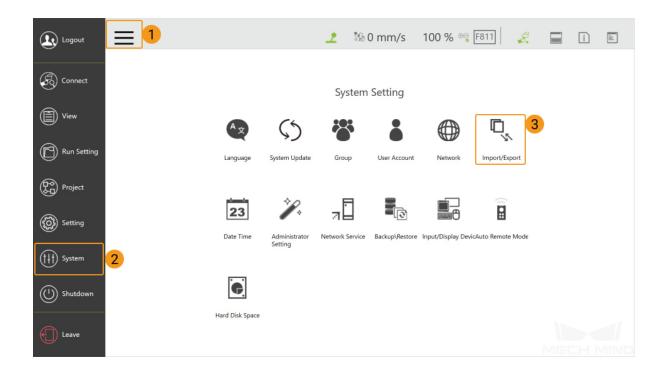
If you need to restore the robot system with the backup file, click *Restore* and then *Restore*.

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Bac	kup\Restore								
	Backup	Name							
	Restore 1	Restore 2							

# 3.3 Load the Files to the Robot

Before loading the files to the robot, please press and hold the M/A button on the Robot Stick to switch the robot to the Manual mode (the green Manual light is on).





2. Click *Import*, and a **Robot List** window will pop up, select the program file **TM000249\_AC173610** and click *OK*.

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Import Export Select files	Selected files
E Log	
Hardware Record	Robot List
Project TM000249_	AC173610
Ф ТСР	
Command	
입 Component	
Point Base	
Operation Space	
Var Global Variable	Cancel
Device 0 \US8\TMROBOT	Free Space: 28920 MB     Import

3. Click **Project**, and select **mmMain.zip** in the **Select files**, and then it will be displayed in the **Selected files** panel on the right.

$\equiv$ $\leftarrow$		🕸 0 mm/:	s 100 % 😌 F811	<i>\$</i>	i 🖹
Import Exp	Select files TM000249_AC173610	Selected files			
Project	<ul> <li>Imm_calibration.zip</li> <li>Imm_vision_pick_and_place.zip</li> <li>Imm_viz_pick_and_place.zip</li> <li>ImmMain.zip</li> <li>Ipreception_mm_mm_V01_appendPoint.zip</li> </ul>				
Command	<pre>preception_mm_mm_v01_cali.zip preception_mm_mm_v01_init.zip preception_mm_mm_v01_recvvis.zip preception_mm_mm_v01_recvviz.zip</pre>				
Point Base	<pre>preception_mm_mm_v01_runvis.zip preception_mm_mm_v01_runviz.zip</pre>				
Var Global Variable					
😽 Path					
Solution Record					
(中) Modbus	_ Device 0 \USB\TMROBOT	▼ Fr	ee Space: 28920 MB		Import

4. Click Ethernet Slave, and select Transmit/mmEthernet, and then it will be displayed in the Selected files panel on the right.

$\equiv$ $\leftarrow$	👤 🧌 0 mm/s 100 % 👒 F811 🛛 🎜 🔲 👔 🗈
Import Export Select files TM000249_AC173610 (2)	Selected files
Var Global Variable	Project mmMain.zip
Path	
% Motion Record	
() Modbus	
F/T Sensor	
Network Service	
E Text file	
IODD Files	
⊟ <sup>1<sup>1</sup></sup> Ethernet Slave	
Backup File	Free Space: 28920 MB     Import

←	👤 💱 0 mm/s 100 % 🕫 F811 🛃 📰 👔 🖹
Import Export Select files TM000249_AC173610	Selected files
Var Global Variable	Project mmMain.zip     EthSlave Transmit/mmEthernet
🔀 Path	
Source Motion Record	
(‡) Modbus	
F/T Sensor	
Network Service	
E Text file	
IODD Files	
⊟ <sup>ti</sup> Ethernet Slave	
Backup File Device 0 \USB\TMROBOT	Free Space: 28920 MB     Import

5. Click *Import*. After the files have been imported successfully, click *OK* in the **Import complete** pop-up window.

		👤 🕼 0 mm/s 🛛 100 % 😁 F811	i 🗈
Import Export Select f	iles TM000249_AC173610	Selected files	
Operation Space		Project mmMain.zip EthSlave Transmit/mmEthernet	
Var Global Variable			
😽 Path		ок	
Source Motion Record	Import com	nplete 2	
😟 Modbus		OK	
F/T Sensor			
Network Service			
E Text file			
IODD Files			
⊟ <sup>†↓</sup> Ethernet Slave Device	0 \USB\TMROBOT	Free Space: 28920 MB	

6. Unplug the USB flash drive from the IPC after you have completed the above steps.

# FOUR

### **RUN THE PROGRAM**

# 4.1 Enable the Ethernet Slave Service

Logout	=	_	월0 mm/s	100 % 🔫 F811	1 5	i E
Connect			Robot Setting			
View	Ŷ.		at 10	**		
Run Setting	Wizard	Vision Setting TCF	P Setting I/O Setup	Safety C	Controller	
Project	( s		°o-		↓↑ ✓	
Setting	Speech	End Button Cor	mponent Operation Space	Command Co	onnection	
$(\uparrow\downarrow\uparrow)$ System						
() Shutdown			Var	-=C-1	¢\$⊅	
	Posture Setting	TMmanager Glob	al Variable Text File Manager	Motion Setting	TM AI+	
Leave						

1. Select Setting  $\rightarrow$  Connection.

2. Select Ethernet Slave  $\rightarrow$  Data Table Setting.

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Modbus Slave Ethernet Slave							
Data Table Setting	Disable						
	STATUS: Ena	able					
	IP Filter:		. ~	Write Permission	0		

3. Set the Communicate Mode to JSON, and click Open.

	d Data Table S	-			Tranco	nit File (Data	Table)					
redefined	User defined	Global Variable						2	6			
						Transmit File	Name:			nicate Mod	e :	
					mmEthe	ernet		Open	JSON		•	
Item	Description		Data Type			Item	Description			Data Type	^	
Robot_Error	Error or Not		bool		×	Joint_Angle	Joint 1 angle - Joint	6 angle		float		
Project_Run	Project Running or Not		bool			Coord_Robot _Flange	Cartesian coordinate without tool	e w.r.t. Robot	Base	float		
Project_Edit	Project Editing or Not		bool			Ctrl_DI0	Digital Input 0			byte		
Project_Pause	Project Pause or Not		bool			Ctrl_DI1	Digital Input 1			byte		^
Get_Control	Get Control or Not		bool	>>		Ctrl_DI2	Digital Input 2			byte		v
Safeguard_A	Safety IO (Safeguard Po	ort A trigger)	bool			Ctrl_DI3	Digital Input 3			byte		
ESTOP	Emergency Stop		bool			Ctrl_DI4	Digital Input 4			byte		
Camera_Light	Light		byte			Ctrl_DI5	Digital Input 5			byte		
Robot Model	Robot Model		string			Ctrl DI6	Digital Input 6			byte	~	

4. Select mmEthernet in the pop-up Save Transmit File Name window, and click OK.

Receive/Send Data Table Setting			Save Transmit F	ile Name			
redefined	User defined Global Variable				le)		
			mmEthernet		ne: Co	mmunicate Mode :	
			mmEthernet	1	Open	JSON	
Item	Description	_			cription	Data Type	
Robot Error	Error or Not				it 1 angle - Joint 6 angle	float	
Project_Run	Project Running or No	t			tesian coordinate w.r.t. Robot Base		
Project_Edit	Project Editing or Not				ital Input 0	byte	
Project_Pause	Project Pause or Not				ital Input 1	byte	^
Get_Control	Get Control or Not				ital Input 2	byte	v
Safeguard_A	Safety IO (Safeguard P	ort A trigger)			ital Input 3	byte	
ESTOP	Emergency Stop				ital Input 4	byte	
Camera_Light	Light				ital Input 5	byte	
Robot Model	Robot Model				ital Input 6	byte	

#### 5. Click ${\tt I}$ in the Receive/Send Data Table Setting window.

Receive/Ser	d Data Table S	Setting									
redefined	User defined	Global Variable			Transm	it File (Data	Table)				
	_				Setting	Transmit File	Name:	Com	municate Moo	de :	
					mmEthe	rnet	Ope	n J	SON	•	
ltem	Description		Data Type			Item	Description		Data Type	^	
Robot_Error	Error or Not		bool			Joint_Angle	Joint 1 angle - Joint 6 angle		float		
Project_Run	Project Running or Not		bool			Coord_Robot _Flange	Cartesian coordinate w.r.t. Ro without tool	bot Base	float		
Project_Edit	Project Editing or Not		bool			Ctrl_DI0	Digital Input 0		byte	_	
Project_Pause	Project Pause or Not		bool			Ctrl_DI1	Digital Input 1		byte		^
Get_Control	Get Control or Not		bool	**		Ctrl_DI2	Digital Input 2		byte		v
Safeguard_A	Safety IO (Safeguard Po	rt A trigger)	bool			Ctrl_DI3	Digital Input 3		byte		
ESTOP	Emergency Stop		bool			Ctrl_DI4	Digital Input 4		byte		
Camera_Light	Light		byte			Ctrl_DI5	Digital Input 5		byte		
Robot Model	Robot Model		string			Ctrl DI6	Digital Input 6		byte	~	

#### 6. Click Enable.

$\equiv$ $\leftarrow$		2	화 0 mm/s	100 % 😁 F811	8.	31000 M	i	
Modbus Slave Ethernet Slave								
Data Table Setting	Enable							
		sable	. ~ ~	Write Permission	0			
					Ŭ.			

# 4.2 Run the mmMain Program

1. Select Run Setting  $\rightarrow$  mmMain.

Logout	=	2	월0 mm/s	100 % 😁 F811	8.	-	i	iii
	Run Setting							
View	Tested	sted						
Run Setting		I: 100 % Speed: 100 % Main test	Speed: 5 % test0914					
Project								
Setting								
(†††) System								
() Shutdown								
Leave								

2. Click Yes in the pop-up window to set mmMain as the current project.

≡				2	월 0 mm/s	100 % 😋 F811	8.	2002	i	i:
Run Settin	g									
	Tested Speed: 5 %	Tested Speed: 100 %	Tested Speed: 100 %							
	listentest	mmMain	test	? Que	estion					
				Set mmMain as cur	rented project?					
					Yes No					

3. Press the M/A button on the Robot Stick until you hear a beep, which suggests that the Manual mode has been disabled.

Press the buttons + - + + - in sequence, and the blue Auto light will be on, suggesting that the robot has been switched to the Auto mode.



4. Then press the Run button on the Robot Stick, and the program will be run after three beeps.

# **TEST ROBOT CONNECTION**

# 5.1 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.

### 5.2 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.

### 5.3 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.

# 5.4 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!

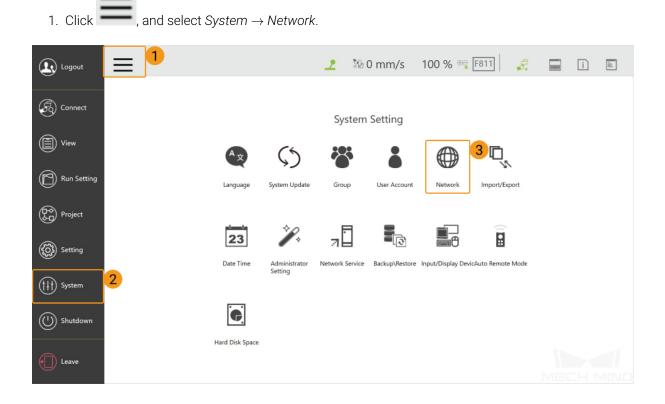
**Note:** After running the mmMain program on the robot side but Mech-Center fails to connect the robot, you can use **NetAssist** in the *xxx\Mech-Mind Software Suite-x.x.x\Mech-Center\tool* directory as a client to connect the 5890 and 5891 ports of the robot to check if these two ports are opened successfully.

- If port 5890 cannot be connected successfully, please check whether the mmMain program on the robot side has been run successfully.
- If port 5891 cannot be connected successfully, please check whether the Ethernet Slave on the robot has been enabled or restart the robot.

#### CHAPTER

# APPENDIX

# 6.1 Modify the IP Address of the Robot



2. Set the IP Address and Subnet Mask in the **Network setting** window. Please make sure that IP addresses of the robot and the IPC belong to the same subnet.