OMRON

# TM
# Conveyor Tracking

## User's Manual

TM ROBOT

Original Instruction

I853-E-02

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# Contents


1. Revision History ..... 5
2. Introduction ..... 6
    2.1 Scope of Use ..... 6
    2.2 Limitations of Use ..... 6
    2.3 Warning and Caution Symbols ..... 6
    2.4 Safety Precautions ..... 7
    2.5 Validation and Liability ..... 7
    2.6 Limitation of Liability ..... 8
    2.7 Functional Note Symbols ..... 8
3. Hardware Requirements ..... 9
    3.1 TM Dongle ..... 9
    3.2 Applicable EtherCAT Coupler and Encoder Modules ..... 9
    3.3 Code Wheel ..... 10
    3.4 Camera ..... 10
    3.4.1 Lens ..... 11
    3.5 Reference Guide for Light Source Setup ..... 11
    3.6 Sensor ..... 11
    3.7 Light box design reference ..... 12
    3.8 Hardware Connection Diagram ..... 12
4. Operating Guide ..... 13
    4.1 Sensor Mode ..... 13
    4.2 ETH Mode ..... 14
5. Software Functions ..... 15
    5.1 Conveyor Tracking Setting ..... 15
    5.1.1 Encoder setting ..... 15
    5.1.2 Boundary setting ..... 16
    5.1.3 Advanced setting ..... 18
    5.2 CVSensor1 ..... 19
    5.3 Main Thread Nodes ..... 21
    5.3.1 CVNewObj Node ..... 21
    5.3.2 CVPoint Node ..... 22
    5.3.3 CVCircle Node ..... 25
6. Quick Walk-through ..... 27
    6.1 Sensor Mode ..... 27
    6.2 ETH Mode ..... 36

**Tables**

Table 1: Applicable EtherCAT coupler models ..... 9
Table 2: Applicable Encoder Modules ..... 9
Table 3: Camera ..... 10

**Figures**

Figure 1 Code wheel ..... 10
Figure 2 Hardware connection diagram ..... 12
Figure 3 Create new project ..... 13
Figure 4 Sensor Mode diagram ..... 14
Figure 5 ETH Mode diagram ..... 14
Figure 6 Conveyor Tracking Setting ..... 15
Figure 7 Encoder setting ..... 16
Figure 8 Boundary setting ..... 17
Figure 9 Advanced Setting ..... 18
Figure 10 CVSensor ..... 19
Figure 11 Sensor calibration ..... 21
Figure 12 CVNewObj ..... 22
Figure 13 CVPoint ..... 23
Figure 14 Teach ..... 24
Figure 15 Get Point ..... 24
Figure 16 Get Point ..... 26
Figure 17 Create new project ..... 27
Figure 18 Start the project ..... 27
Figure 19 Conveyor Tracking Setting ..... 28
Figure 20 CVSensor ..... 29
Figure 21 Sensor calibration ..... 29
Figure 22 Two calibration points ..... 30
Figure 23 Point Node ..... 31
Figure 24 Select conveyor number ..... 31
Figure 25 Set CVNewObj ..... 32
Figure 26 Select conveyor number and path ..... 33
Figure 27 CVPoint ..... 33
Figure 28 Teach ..... 34
Figure 29 Get Point ..... 35
Figure 30 Form a loop ..... 35

Figure 31 Open new project ..... 36
Figure 32 Sub-thread ..... 36
Figure 33 Conveyor Tracking Setting ..... 37
Figure 34 Vision Job ..... 37
Figure 35 Input vision job name ..... 38
Figure 36 Conveyor Tracking camera ..... 38
Figure 37 Camera calibration ..... 39
Figure 38 Set Workspace ..... 40
Figure 39 Calibrate Workspace ..... 41
Figure 40 Shift Workspace ..... 42
Figure 41 Save result once calibration is finished ..... 43
Figure 42 Load workspace ..... 43
Figure 43 Pattern matching ..... 45
Figure 44 Confirm and exit ..... 45
Figure 45 Confirm “FIND” pattern ..... 46
Figure 46 Save vision task ..... 46
Figure 47 Check vison job on list ..... 47
Figure 48 Point Node ..... 47
Figure 49 Select conveyor ..... 48
Figure 50 Set CVNewObj ..... 48
Figure 51 Set conveyor for CVPoint ..... 49
Figure 52 Set path ..... 49
Figure 53 Get Point ..... 50
Figure 54 Form a loop ..... 50

# 1. Revision History

| Revision | Date | Revised Content |
|---|---|---|
| 01 | April, 2020 | Original release |
| 02 | August, 2020 | Added 1.80 features |

# 2. Introduction

TM Converyor Tracking can obtain the position and motion of the object on a converyor using vision and/or a sensor. The conveyor tracking software runs on TMflow and comes with sensor mode and ETH mode. Sensor Mode is the default function mode and does not require a license dongle to activate it.

To activate ETH mode on TMflow, users shall connect the TM license dongle supplied in the TM Conveyor Tracking product package into any USB port on the control box. Be careful that when editing, running trials or operating, the license dongle must remain connected with the control box. Otherwise, the project cannot be edited or the robot may stop.

## 2.1 Scope of Use

1. A single robot can support two conveyors.
2. Conveyor speed < 300 mm/s, average precision±1mm (when the workpiece angle variation within±15˚).

## 2.2 Limitations of Use

1. Functional mode combination per robot: Sensor Mode + Sensor Mode or ETH Mode + Sensor Mode for maximum two conveyors (ETH +ETH is not supported, and ETH mode requires use of license dongle)
2. Does not support two robots using one single Encoder + EtherCAT IO
3. Only supports linear conveyor (Does not support circular conveyor).
4. Does not support multiple types of objects.

**NOTE:**
The precision specifications in this manual only serves as reference. Upon the actual completion of automation setting, the precision specifications and calibration accuracy are influenced by environmental factors, workpiece variation, visual patterns, editing, and conveyor stability. Users still need to take actual tests.

This manual applies to TMflow Version 1.80 or later. There may be differences between the functions and interfaces of different software versions. Confirm the software version before using and reading this manual. To confirm the software version, click at the top right of the screen for the information.

## 2.3 Warning and Caution Symbols

The Table below shows the definitions of the warning and caution levels used in our manuals. Pay close attention to them when reading each paragraph, and observe them to avoid personal injuries or equipment damage.

**DANGER:**
Identifies an imminently hazardous situation which, if not avoided, is likely to result in serious injury, and might result in death or severe property damage.

**WARNING:**
Identifies a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, and might result in serious injury, death, or significant property damage.

**CAUTION:**
Identifies a potentially hazardous situation which, if not avoided, might result in minor injury, moderate injury, or property damage.

## 2.4 Safety Precautions

**DANGER:**
This product can cause serious injury or death, or damage to itself and other equipment, if the following safety precautions are not observed:

- All personnel who install, operate, teach, program, or maintain the system must read the *Hardware installation Manual*, *Software Manual*, and *Safety Manual* according to the software and hardware version of this product, and complete a training course for their responsibilities in regard to the robot.

Read Manual Label; Impact Warning Label

- All personnel who design the robot system must read the *Hardware installation Manual*, *Software Manual*, and *Safety Manual* according to the software and hardware version of this product, and must comply with all local and national safety regulations for the location in which the robot is installed.
- The TM Robot must be used for its intended use.
- Results of the risk assessment may require the use of additional risk reduction measures.
- Power to the robot and its power supply must be locked out and tagged out or have means to control hazardous energy or implement energy isolation before any maintenance is performed.
- Dispose of the product in accordance with the relevant rules and regulations of the country or area where the product is used.

## 2.5 Validation and Liability

The information contained herein neither includes how to design, install, and operate a complete robotic arm system, nor involves the peripherals which may affect the safety of the complete system. The integrators of the

robot should understand the safety laws and regulations in their countries and prevent hazards from occurring in the complete system.

This includes but is not limited to:

- Risk assessment of the whole system
- Adding other machines and additional risk reduction measures based on the results of the risk assessment
- Using appropriate software safety features
- Ensuring the user will not modify any safety measures
- Ensuring all systems are correctly designed and installed
- Clearly labeling user instructions
- Clearly marked symbols for installation of the robot arm and the integrator contact details
- Making accessible relevant documents, including the risk assessment and this Manual

**CAUTION:**
This product is a partly complete machine. The design and installation of the complete system must comply with the safety standards and regulations in the country of use. The user and integrators of the robot should understand the safety laws and regulations in their countries and prevent major hazards from occurring in the complete system.

## 2.6 Limitation of Liability

No safety-related information shall be considered a guarantee by the Corporation that a TM Robot will not cause personnel injury or property damage.

## 2.7 Functional Note Symbols

The following table defines the functional note symbols used in this manual. Read the paragraphs carefully.

**IMPORTANT:**
This symbol indicates the relevant functional details to assist programming and use.

**NOTE:**
This symbol indicates the relevant functional use tips to assist programming efficiency.

# 3. Hardware Requirements

## 3.1 TM Dongle

Use the included TM license dongle to activate ETH Conveyor Tracking function.

## 3.2 Applicable EtherCAT Coupler and Encoder Modules

Refer to tables below regarding compatible EtherCAT couplers and encoder modules.

| EtherCAT Coupler Model | VIPA: 053 -1EC00 | Beckoff: EK1100 | OMRON: NX-ECC201 | OMRON: NX-ECC202 | OMRON: NX-ECC203 |
|---|---|---|---|---|---|
| Rated voltage | DC24 V | DC24 V | DC24 V | DC24 V | DC24 V |
| Rated current | 950mA | 570mA | 417mA | 417mA | 417mA |
| Support Encoder Module Model | VIPA: 050-1BA00 | Beckoff: EL5151/EL5152 | OMRON: NX-EC0112/NX-EC0122/NX-EC0132/NX-EC0142/ NX-EC0212/NX-EC0222 | | |

**Table 1: Applicable EtherCAT coupler models**

| Encoder Module Model | VIPA: 050-1BA00 | Beckoff: EL5151/ EL5152 | OMRON: NX-EC0112 | OMRON: NX-EC0122 | OMRON: NX-EC0132 | OMRON: NX-EC0142 | OMRON: NX-EC0212 | OMRON: NX-EC0222 |
|---|---|---|---|---|---|---|---|---|
| Rated voltage | DC24 V | DC24 V | DC24 V | DC24 V | DC24 V | DC24 V | DC24 V | DC24 V |
| Rated current | 75mA | 130mA | 35 mA | 39 mA | 39 mA | 44 mA | 35 mA | 39 mA |
| Number of encoder | 1 | 1or2 | 1 | 1 | 1 | 1 | 2 | 2 |
| ON volatge | 15-28.8V | 15-30V | 19.6-28.8V | 19.6-28.8V | 19.6-28.8V | 19.6-28.8V | 19.6-28.8V | 19.6-28.8V |
| OFF volatge | 0-5V | 0-5V | 0-4V | 0-4V | 0-4V | 0-4V | 0-4V | 0-4V |

**Table 2: Applicable Encoder Modules**

**NOTE:**
Equipment needs to be connected to external power supply for proper use. For detailed product information, visit the product's official website.
Suggested Encoder Model: E6C3-CWZ5GH

**IMPORTANT:**
Techman Robot Inc. is not liable for any imcompatibility issue due to use of equipments not listed above.

### 3.3 Code Wheel

Reference specifications: wheel resolution 300 mm

*If a different sized wheel is used, see **5.1.1** for setting details.

If a different sized wheel is used, go to Encoder Setting (**Section 5.1.1**) to adjust the paramemters for perimeters.

Make sure that the code wheel is flat against the conveyor to ensure its accuracy.

**Figure 1 Code wheel**

### 3.4 Camera

For detailed information about the cameras, please visit the official website of the cameras.

| Specifications | Camera | | |
|---|---|---|---|
| Model | Basler acA2440-20gc | Basler acA2500-20gc | Basler acA2500-14gc |
| Shutter | Global | | Rolling |
| Sensor | Color 2/3 inch | Color 1 inch | Color 1/2.5 inch |
| Connection interface | GigE interface | | |
| Remark | When conveyor speed < 300 mm/s, the average tolerance is ±1 mm. | When conveyor speed < 300 mm/s, the average tolerance is ± 1 mm. | Rolling shutter camera is recommended to be used at low speed (conveyor speed < 100 mm/s) and when precision requirement is lower. |

**Table 3: Camera**

**IMPORTANT:**
Techman Robot Inc. is not liable for any imcompatibility issue due to use of equipments not listed above.

### 3.4.1 Lens

It is strongly recommended to use an industrial-grade C/CS Mount lens. The lens focal distance should be set based on the real-world applications.

Lens selection example (object is 500 mm away from the camera)

Reference for calculation:

- When using a 12 mm lens, the field is 232 x 174 $mm^2$; pixel resolution is 232/2590 ~ 0.09 mm/pixel.
- When using an 8 mm lens, the field is 351 x 263 $mm^2$; pixel resolution is 351/2590 ~ 0.14 mm/pixel.

## 3.5 Reference Guide for Light Source Setup

To obtain decent image quality and rapid imaging time, it is strongly recommeneded that the light source intensity of the image range can reach to 2500 Lux, with uniformity higher than 90% to avoid light reflection.

At light levels below 2500 LUX, it may be necessary to increase the camera exposure time and decrease the conveyor belt speed.

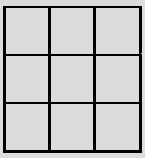
For example (when the camera is 500 mm from the focus object):

When the light intensity is 2500 Lux, exposure time setting should be set as 0.5 msec, and the conveyor speed shall be set to 300 mm/sec;

Note

**Calculation of Uniformity：**

Divide the camera field into a 3 x 3 grid as in the following figure. Measure the brightness in the center of each cell and obtain the maximum and minimum value,



Substitution：

$$\text{Uniformity} = \left|1 - \frac{(Max - Min)}{(Max + Min)}\right| \times 100\%$$

## 3.6 Sensor

Choose the most appropriate sensor based on the object material that needs to be detected.

When using Sensor Mode, it is strongly recommended using the official TM Robot Calibration Set for positioning.

When setting CVPoint is required, switch back to the specific tool for your application.

**NOTE:**
To purchase TM Calibration Set, contact your local distributor or dealership.

## 3.7 Light box design reference

For relevant details about reference design of light box, contact your local distributor or dealership.

## 3.8 Hardware Connection Diagram

The diagram below shows the recommended hardware connection.

For details about the supply voltage of the power socket, refer to the robot in use.

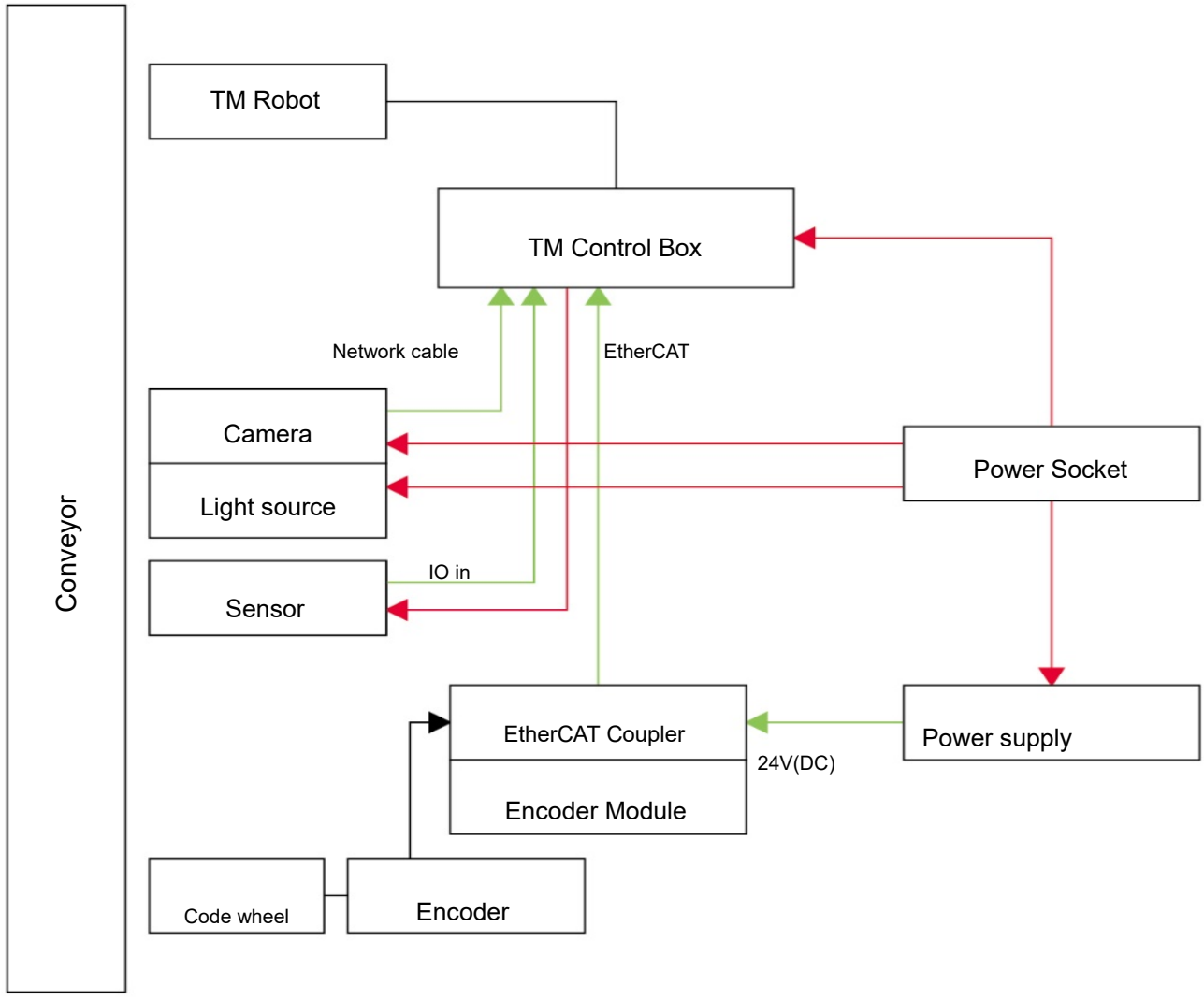



**Figure 2 Hardware connection diagram**

# 4. Operating Guide

Once user has inserted the TM license dongle, click “New” on the top-left corner of TMflow and then “Conveyor Tracking” to create a new conveyor tracking project. Remember to enter a project name.

Select “**Conveyor_0**” or “**Conveyor_1**”

- Conveyor_0: application requires only one conveyor
- Conveyor_1: application requires two conveyors

**IMPORTANT:**
When starting any new Conveyor Tracking project with one connected conveyor, **Conveyor_0** will be automatically checked.

TM Conveyor Tracking supports two operating modes:

- **Sensor Mode**: detect the objects passing through the sensor beam (default mode)
- **ETH Mode**: obtain object position through camera imaging (requires use of a license dongle)

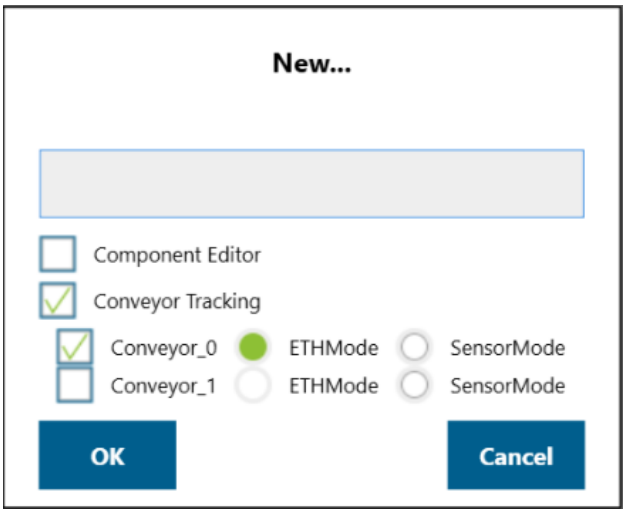



**Figure 3 Create new project**

## 4.1 Sensor Mode

SensorMode consists of a robot and external sensors. The sensor will detect objects passing through the sensor beam. Application diagram of SensorMode is presented in **Figure 4**.

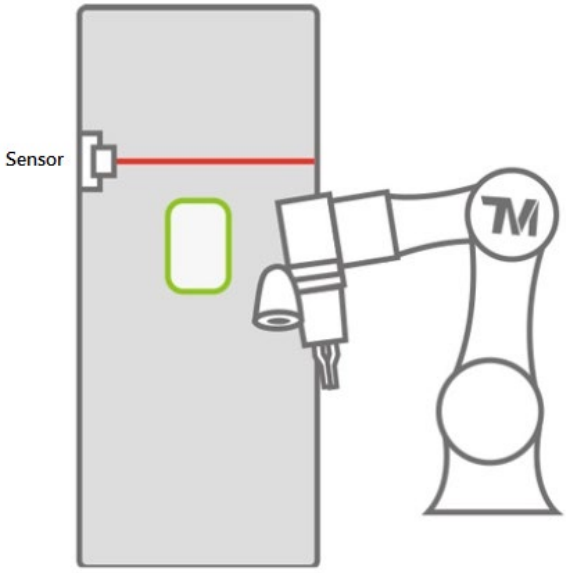



**Figure 4 Sensor Mode diagram**

## 4.2 ETH Mode

ETH Mode is composed of a robot, an external camera, and light sourcing devices. Application diagram of ETH Mode is shown in **Figure 5**.

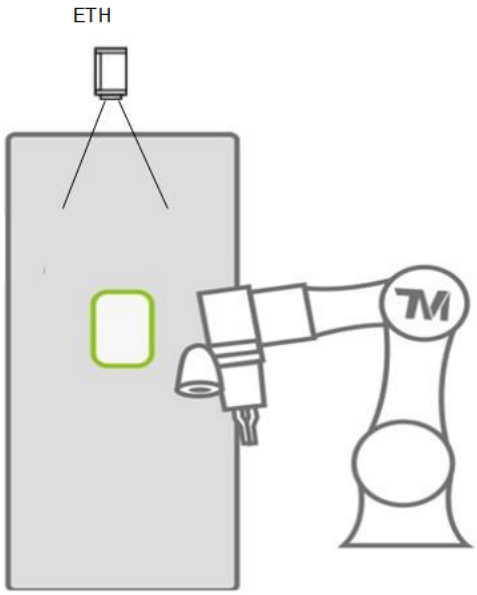



**Figure 5 ETH Mode diagram**

***** Currently, TM Conveyor Tracking only supports Sensor Mode by default. For purchase of ETH Mode license, consult with your local representatives.

# 5. Software Functions

## 5.1 Conveyor Tracking Setting

After opening the Converyor Tracking project, selecting the Start Node sets encoder parameters, working boundary, camera and advanced conveyor parameters like vectors. Further description will be discussed in the following:

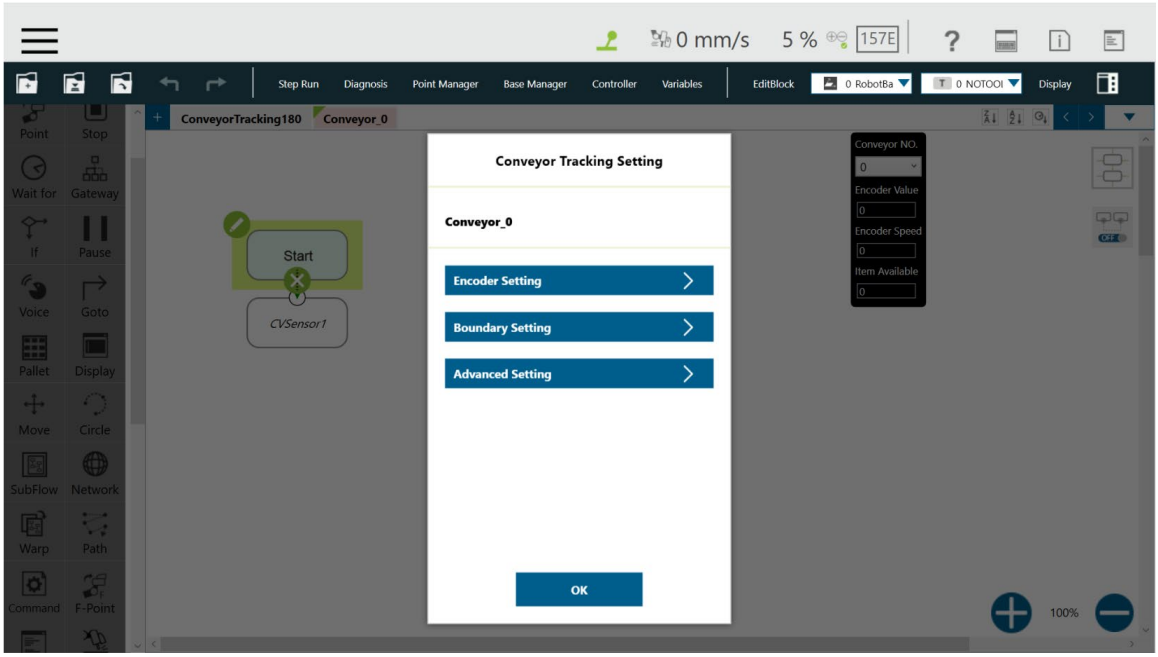



**Figure 6 Conveyor Tracking Setting**

### 5.1.1 Encoder setting

Encoder setting allows users to set resolution and encoder wheel perimeters.

**Encoder Resolution:** Encoder resolution by Pulse/Rev

**Wheel Resolution:** encoder wheel circumference (mm).

**Reverse** (Reverse rotation): when the conveyor is operating, the speed indicator should be in positive values. If shown in negative values, select “Reverse”.

The officially designated encoder model is the Omron E6C3- CWZ5GH 2000P/R 2M. However, settings shall be based on the actual encoder hardware used by users.

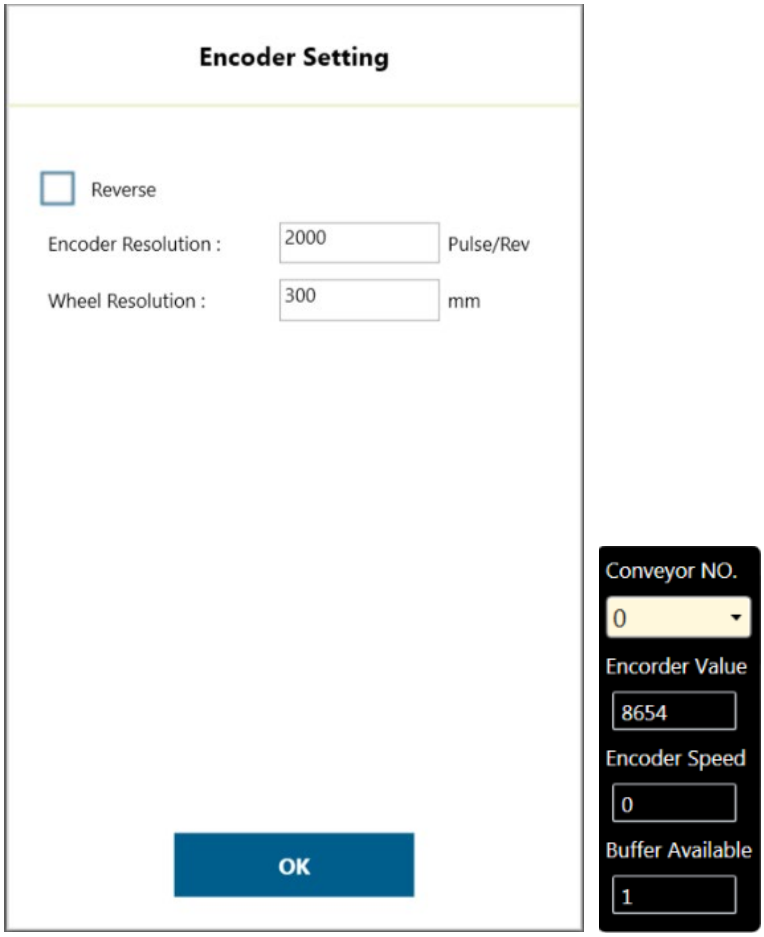



**Figure 7 Encoder setting**

### 5.1.2 Boundary setting

Set the working area boundary for the robot.

**B Start:** Work start point
**B End:** Work end point
**Range:** Robot working range
Recommended maximum ranges:

- 650 mm (TM5-700 model)
- 850 mm (TM5-900 model)
- 1250 mm (TM12)
- 1050 mm (TM14)

  *Regarding the actual movement range, please refer to the 6DOF Workspace for the respective user manual of each robot model.

**New object range:** the range robot selects new object (this range is executed in CVNewObj node)
**Working Area:** Actual work range, based on the intersecting boundaries of B Start and B End.
If there is no intersecting point, in the case that B Start is set to be small while B End is set to be very large, the system will use the distance of range to determine the working area.
**Robot Base:** Robot placement position.

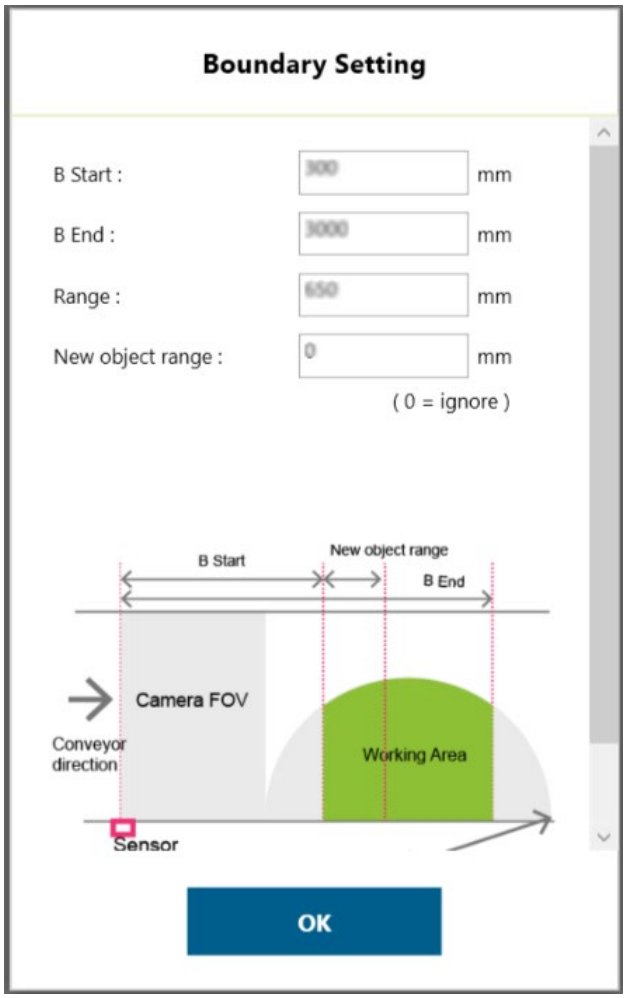
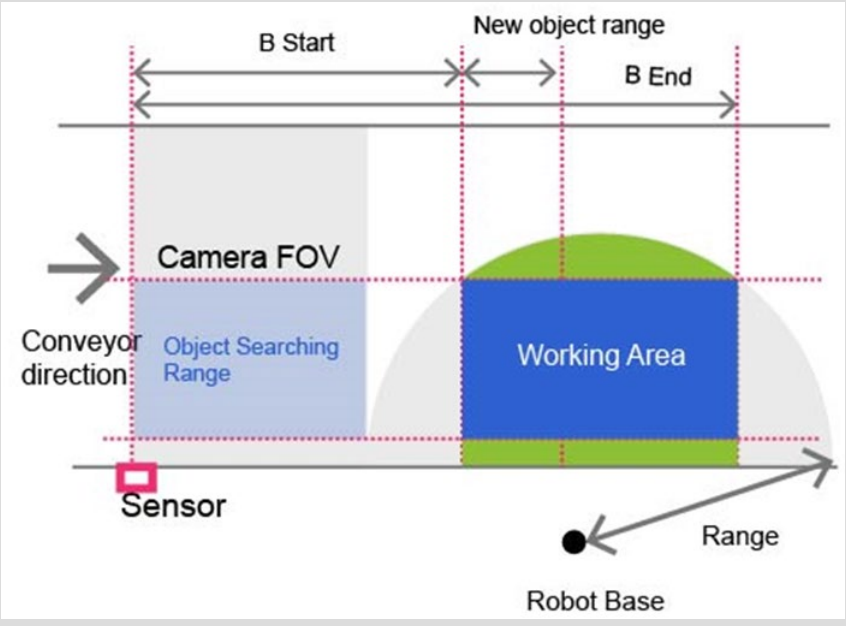



**Figure 8 Boundary setting**

**NOTE:**

In ETH mode, user can use "Set Search Range" on ETH camera vision job "Find" to limit the width of working area on the conveyor belt, which constitutes an rectangular robot working area.



### 5.1.3 Advanced setting

Advanced Setting is used for setting conveyor object compensation. Description is as follows:

**Conveyor Vector Compensate**

**(Calibration Point 2** )

**X offset (mm)**: when adjusting calibration, compensate the calibration plate x direction offset

**Y offset (mm)**: when adjusting calibration, compensate the calibration plate y direction offset

**Z offset (mm)**: when adjusting calibration, compensate the calibration plate Z direction offset

(Based on Robot Base coordinates, correct the X/Y/Z offset of Calibration Point 2 coordinates)

**Maximum object moving distance in a frame (ETH Mode only):** this function prevents a single object from being detected as multiple objects.

- If a single object is detected as multiple objects, increase the value.
- If multiple objects are detected as a single object, decrease the value.

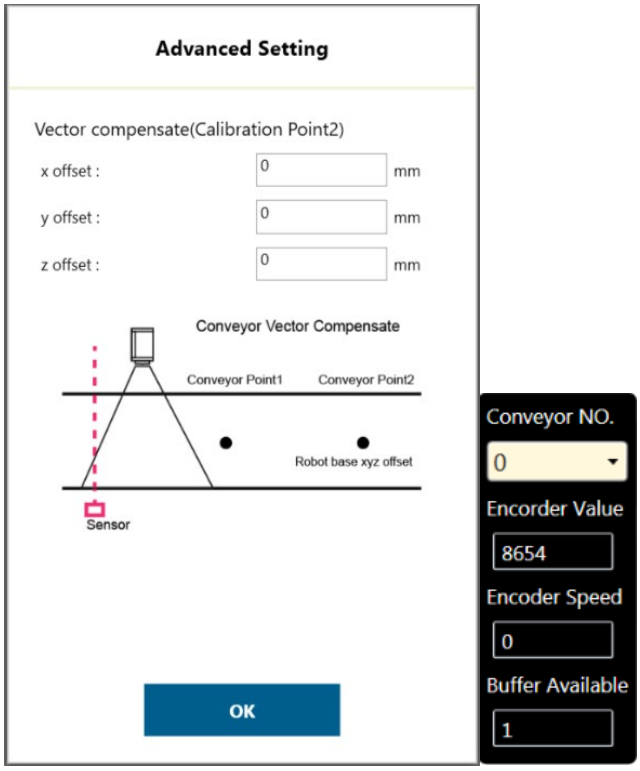



**Figure 9 Advanced Setting**

Note

**NOTE:**

- When executing Conveyor Tracking project, click “View Page” from the drop-down menu on the top-left corner of TMflow and click “Conveyor Data” to adjust Advanced Setting.
- Advanced Setting does not support Warp Node project switching. If your project would use Warp Node, remember to set Advanced Setting first and then use Warp.

## 5.2 CVSensor1

Click the pencil icon of CVSensor1 to set the sensor calibration.

**Conveyor NO.**: current conveyor in use. It is a fixed number.

**I/O Number**: The number of Digital Input channel of the control box connected to the sensor. The number must be set inorder to trigger the sensor.

**Enable Time**: sets the minimum trigger time of the sensor. If the sensor trigger time is lower than Enable Time, this signal will not be considered as an object moving pass the sensor.

**Rising Edge Detect**: the default is checked, indicating the signal is active High when an object is detected by the sensor.

- When no object passes through the sensor beam, the signal is Low.
- When an object passes through the sensor beam, the signal is High.

Then, click "**Start Calibration**".

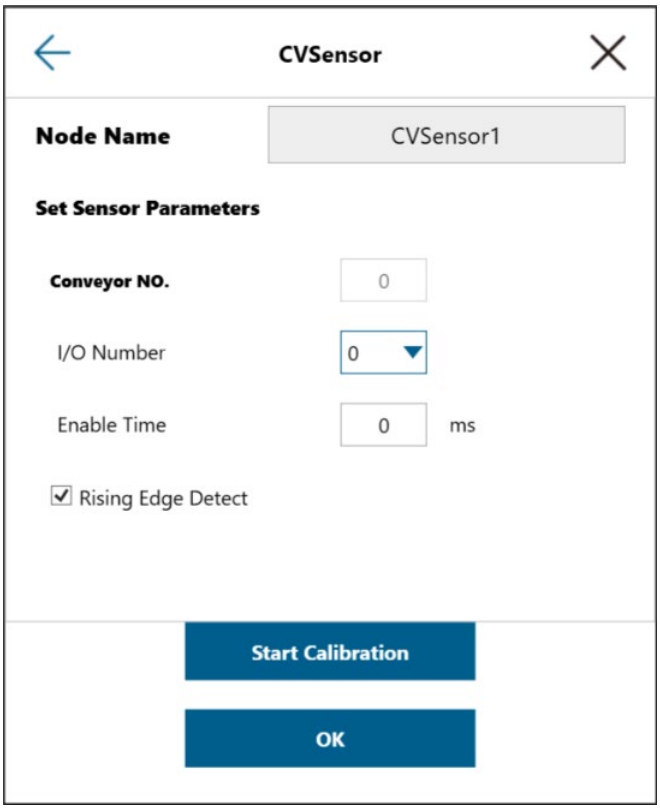
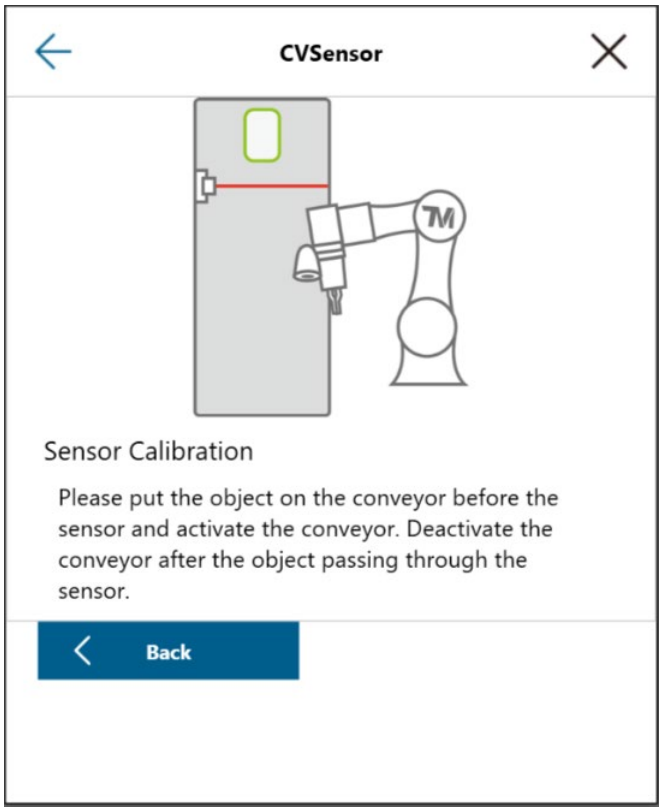


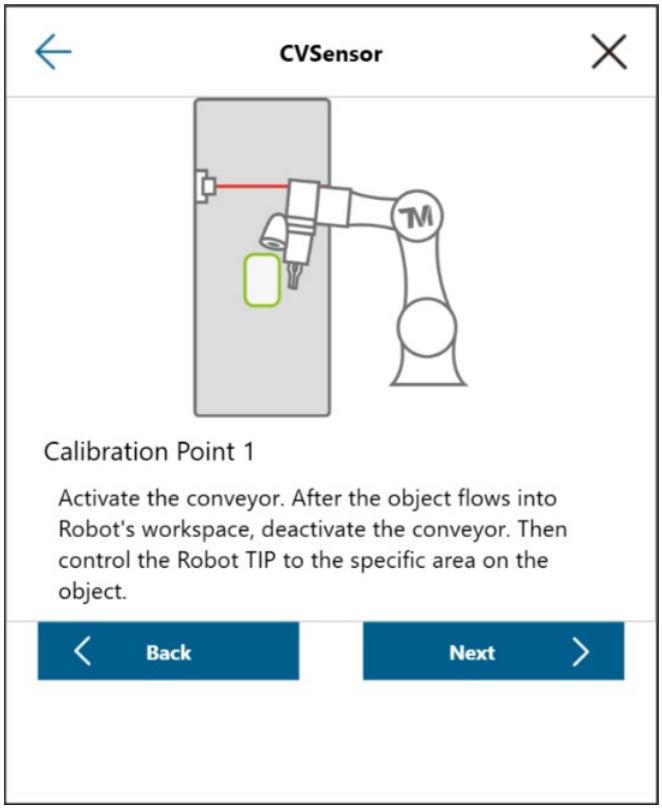

**Figure 10 CVSensor**

Follow the instruction on the screen to perform calibration. Users have to calibrate two Calibration Points.




Note

**NOTE:**
Users are not required to move the robot arm when clicking Next and Finish.



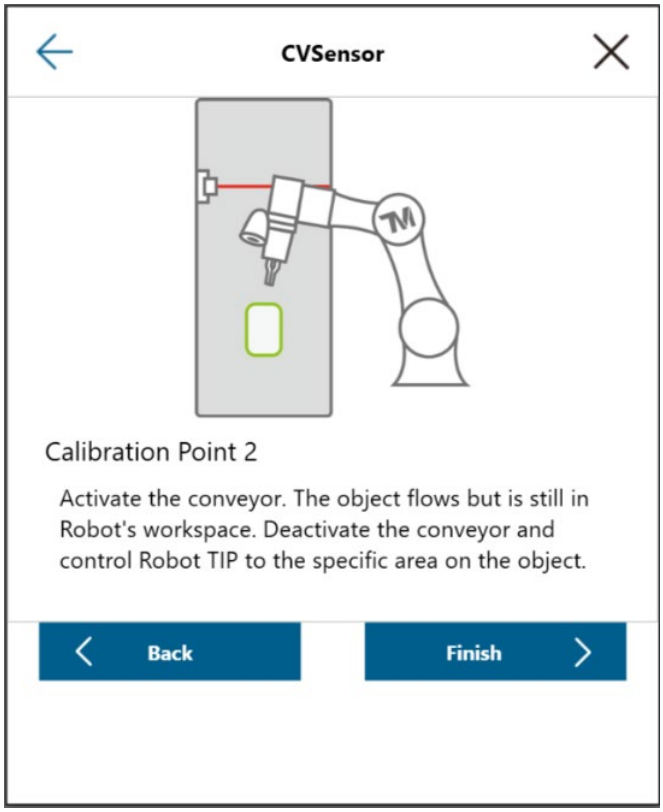



**Figure 11 Sensor calibration**

## 5.3 Main Thread Nodes

### 5.3.1 CVNewObj Node

Return to **Conveyor main thread** to select **CVNewObj** node.

This node indicates that the robot is waiting for valid objects that have been detected by the sensor and will move to the robot's New Object Range within the Working Area (refer to **Section 5.1.2** for details about range and area).

When dragging this node, users are required to select Conveyor_0 or Conveyor_1.

**Conveyor NO**: Selected conveyor.

**Time Out:** Set the waiting time for a valid object, which is detected within New Object Range.

- When Time Out = 0, it indicates no time out is set.

When a valid object enters the robot operating range, the thread will go to the next node.

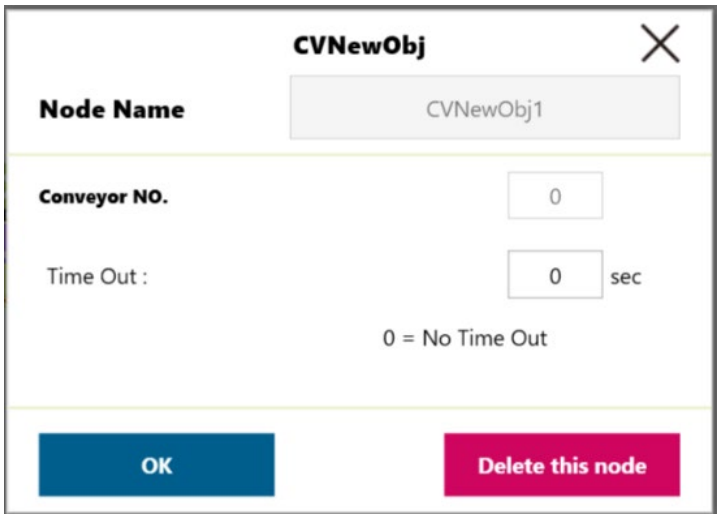


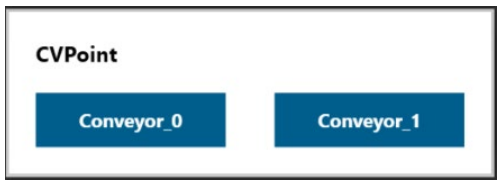

**Figure 12 CVNewObj**

### 5.3.2 CVPoint Node

CVPoint Node sets the linear motion under Conveyor main thread. This node is mainly used to track object motion through the conveyor in linear motion.

**NOTE:**
Under ETH Mode, the tool end will rotate along with the object. However, in Sensor Mode, the tool end will not rotate along with the object.

When dragging the CVPoint node, users are required to select Conveyor_0 or Conveyor_1, and then set Pass Path or Fail Path.




**Pass Path:** If the time for a valid object to reach New Object Range is less than Time Out, it is a Pass Path.

**Fail Path**: If the time for a valid object to reach New Object Range is greater than Time Out, it is a Fail Path. Users may drag the Fail Path to connect other nodes, such as Display, for error handling purposes.

**Conveyor NO:** Selected conveyor

**Follow Time:** Set the stopping time after the CVPoint tracks to position.

**Get Point:** set CVPoint above the object.

**Teach:** Set the steps for objects that pass the sensor on the conveyor.

**Stop Criteria**

**Analog Input:** set stop criteria via analog I/O setting for control box, end module or other peripherals

**Digital Input:** Robot tool end's end effector is the End Module_DO 0.

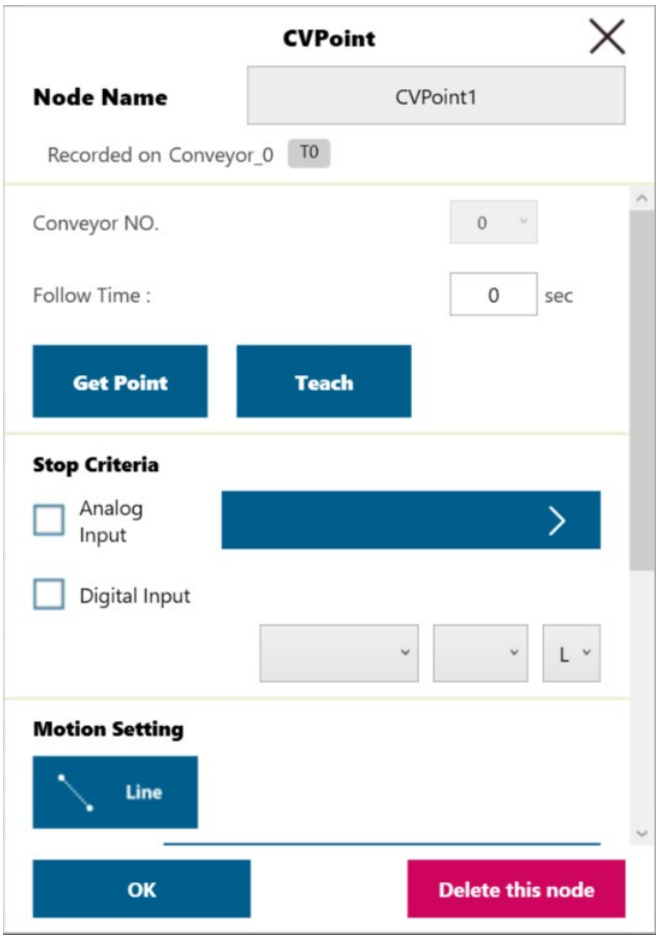



**Figure 13 CVPoint**

Note

**NOTE:**

1. If the object remains in its original position, users do not have to re-teach the robot in sensor-setting nodes CVPoint and CVCircle.
2. Methods to reset corresponding relations between the robot and the object:
   - Sensor Mode: re-do **6.1 Step.10.** If the Encoder device has been replaced, resume to the thread with CVSensor1 to reset the sensor.
   - ETH Mode: re-do **6.2 Step.9~Step.18**. If the Encoder device has been replaced, create new vision job in sub-thread.

The following provides instructions about "**Teach**" and "**Get Point**" under CVPoint Node.

- When entering "Teach", follow the instruction to place object on the conveyor and in front of the sensor. Activate the conveyor. When the object is within robot working area, deactivate the conveyor.

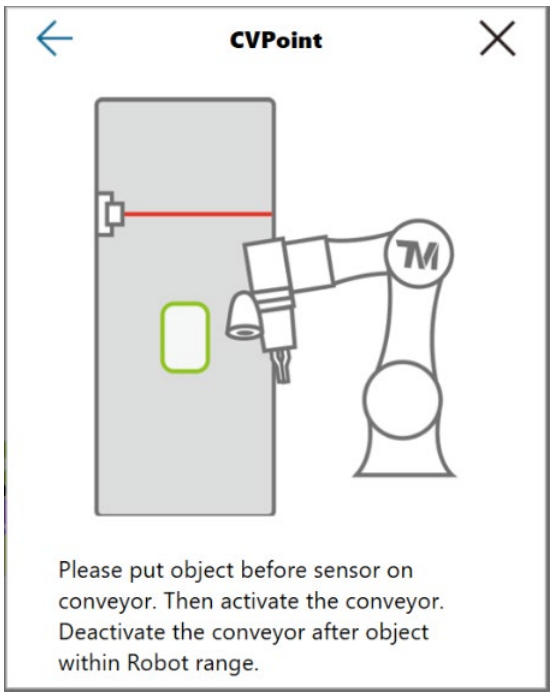



**Figure 14 Teach**

- **Get**: automatically obtains the corresponding position values in all identification points: X, Y. Z, Rx, Ry, and Rz.
- **OK**: saves result and returns to the previous page.

  Other CVPoint settings are the same as the parameters in Point Node.

**Figure 15 Get Point**

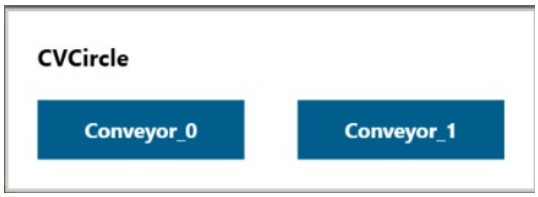
**NOTE** :

- If the Get Point values are unreasonable, users have to recalibrate their part location (calibrate for Sensor Mode, and save new source image in the vision job for ETH Mode).
- If the project has CVPoint Node with pre-obtained values, users may just enter values to update the pre-obtained values when adding a new CVPoint Node. Then click OK to save the results.
- Analog/Digital IO could be set to control the component to grip/release or other implementation before the Follow Time of CVPoint.

### 5.3.3 CVCircle Node

CVCircle Node is a circular motion setting node under Conveyor main thread, used for specific applications, such as a gluing operation where a circular part is placed on a moving linear conveyor.

When dragging the CVCircle node, users are required to select Conveyor_0 or Conveyor_1.




**Conveyor NO.:** shows the selected conveyor. It is a fixed number.

**Follow Time:** Set the stopping time after the CVCircle tracks to position.

**Degree:** Set the movement path circular angle according to the established arc. Set the degrees for the movement path based on the arc established by the points.

**Teach:** Set the steps for objects that pass the sensor on the conveyor (Re-teach is not necessary if the object remains in the same position under CVPoint and CVCircle)

**Get Point:** Set CVCircle point. (P1 starting point, P2 midpoint, and P3 end point). Similar to CVPoint, the only difference is that three different points need to be set to form an arc.

The remaining setting of the CVCircle is the same as the CVPoint.

**Analog Input:** set stop criteria via analog I/O setting for control box, end module or other peripherals

**Digital Input:** Robot tool end's end effector is the End Module_DO 0.

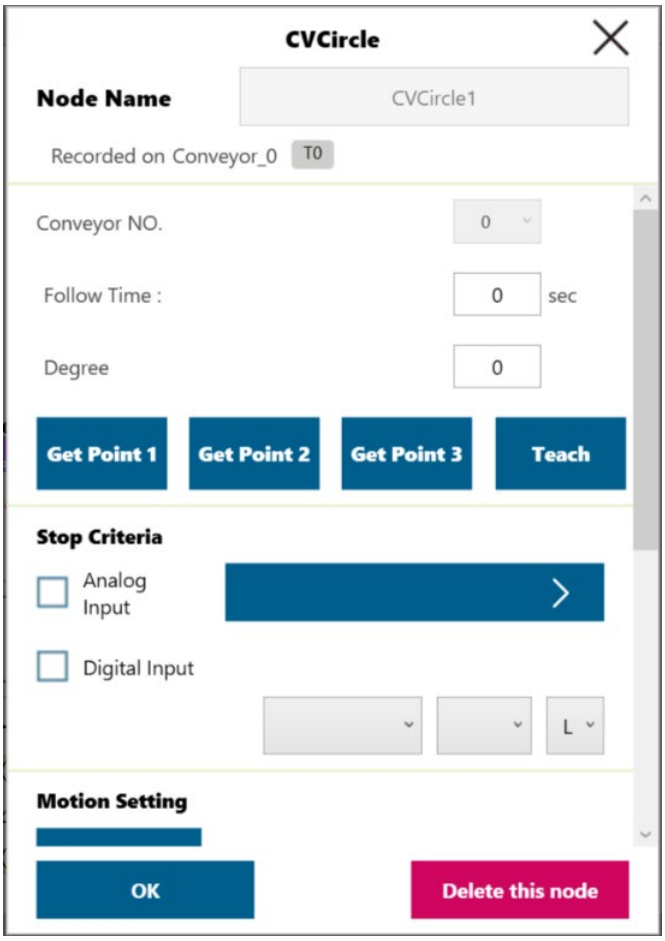



**Figure 16 Get Point**

# 6. Quick Walk-through

## 6.1 Sensor Mode

1. Create new Conveyor Tracking project

   - Start a new project by clicking “New Project” from the Project page in TMflow
   - Check the Conveyor Tracking box
   - Select the conveyor
     - Choose Conveyor_0 if 1 conveyor is used
     - Choose both Conveyor_0 and Conveyor_1 if 2 conveyors are used

   Enter project name and click OK.

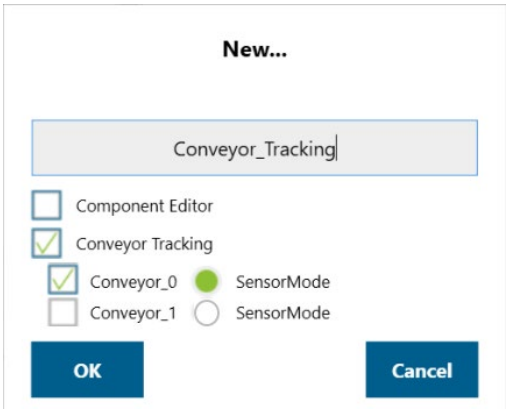



**Figure 17 Create new project**

2. Conveyor Tracking project appears

   - Two threads appear
   - One is the main thread to edit the movement procedure of the robot (the name of this thread shall appear identical to the project name you entered in **Step 1**)
   - Another is the sub-thread, which is Conveyor_0 in **Figure 18**. This thread is configuration-only and cannot add any node.
   - The sub-thread must be edited before the main thread can be edited.

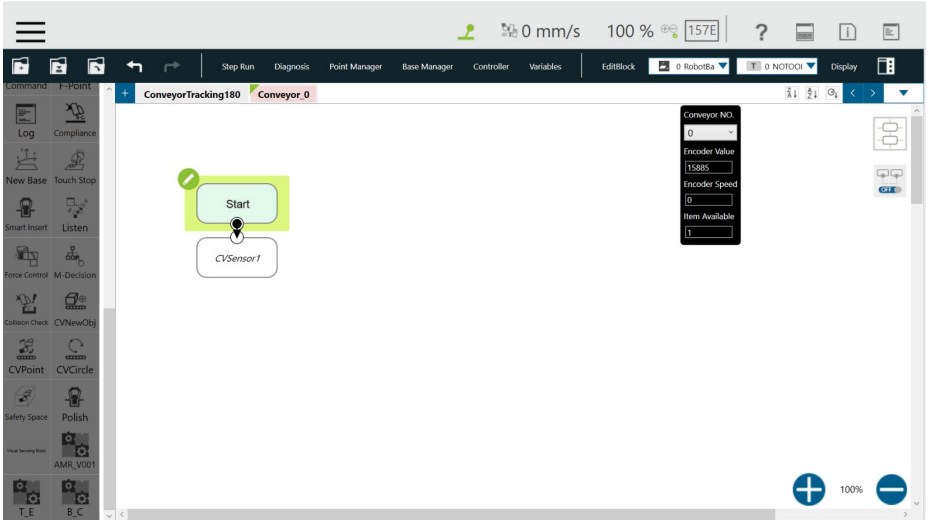



**Figure 18 Start the project**

3. Enter Conveyor Tracking Setting

- Click the of sub-thread's **Start Node** to proceed with Conveyor Tracking Setting.
- For details about sub-thread setting, see **4.1**

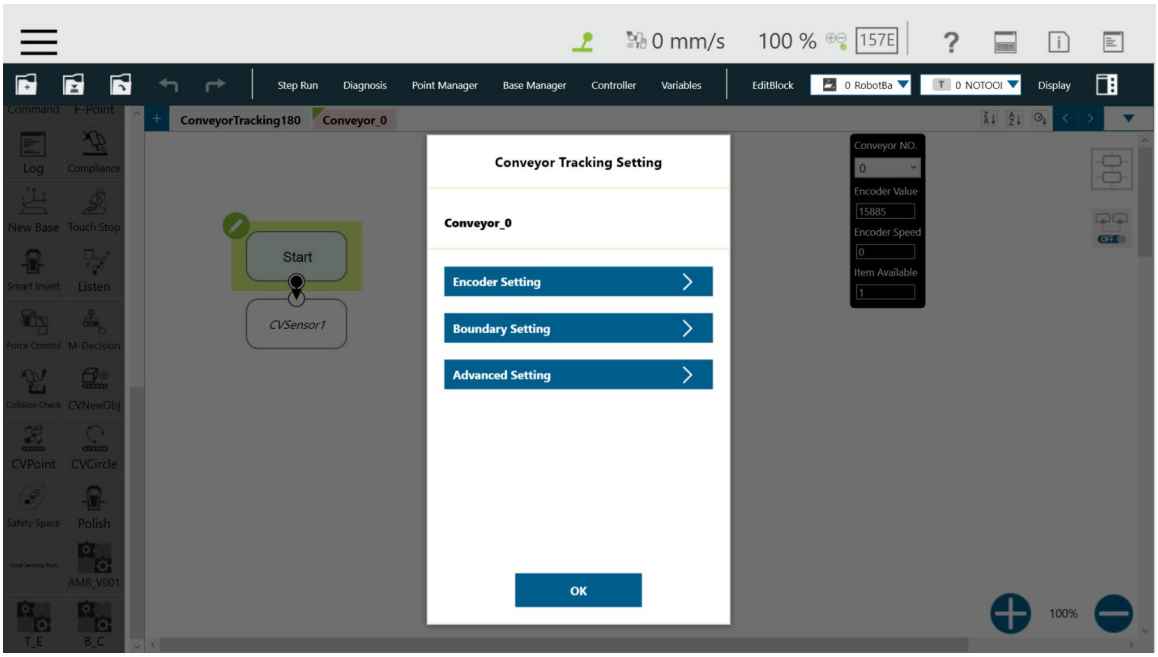
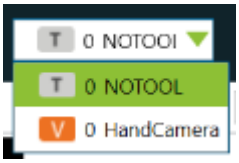



**Figure 19 Conveyor Tracking Setting**

4. Select Tool for your conveyor tracking project.

   Default options are "NOTOOL" and "HandCamera".




   To ensure consistent precision, it is strongly recommended to use TM Calibration Set while teacing the 2 CV points.

5. Click CVSensor's .

   Set IO parameters based on the sensor's IO position and the sensor trigger signal.

   - **Conveyor NO.**: it's a fixed number for the selected conveyor number
   - **I/O Number**: The number of DI (Digital Input) on the control box connected to sensor. The number ranges from 0 to 15.
   - **Enable Time** setting
   - If the trigger signal is high, select Rising Edge Detect.
   - For details about I/O Number and Enable Time settings, refer to **5.2**.
   - Then click **Start Calibration** for the sensor.

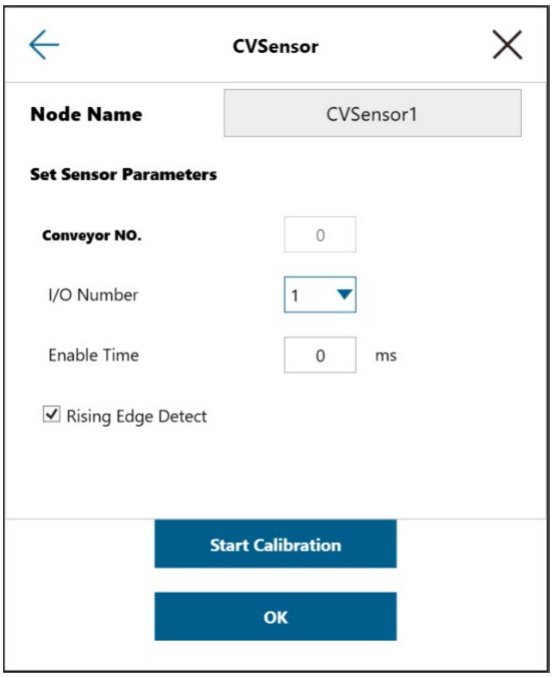



**Figure 20 CVSensor**

- Upon entering calibration, follow the instructions shown in the image (**Figure 22**).

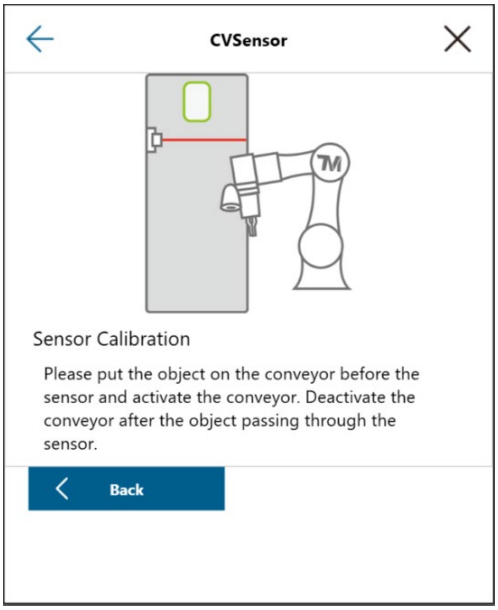
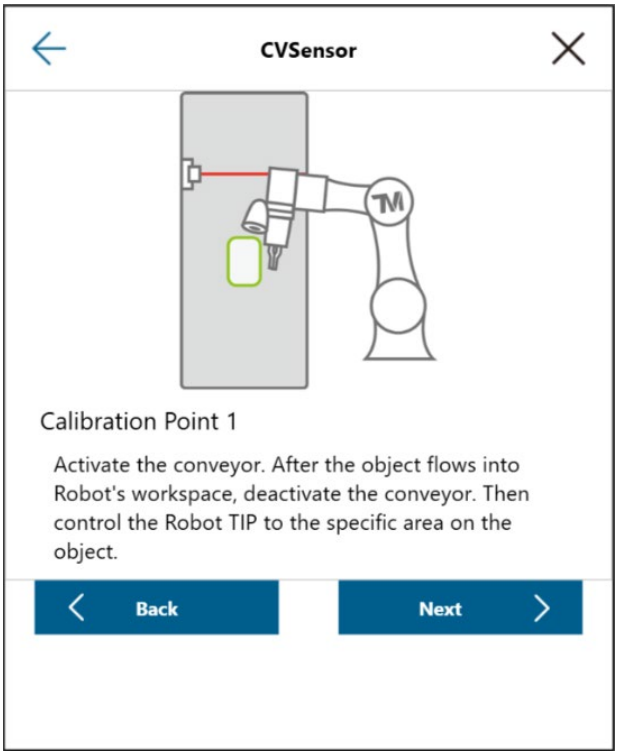



**Figure 21 Sensor calibration**

6. Calibration
   - When the conveyor is stopped as instructed in the last step, click NEXT.
   - Activate the conveyor again to set it in motion. Stop the conveyor when the part is in the robot's working area.
   - Click “Finish” to set Calibration Point 2.



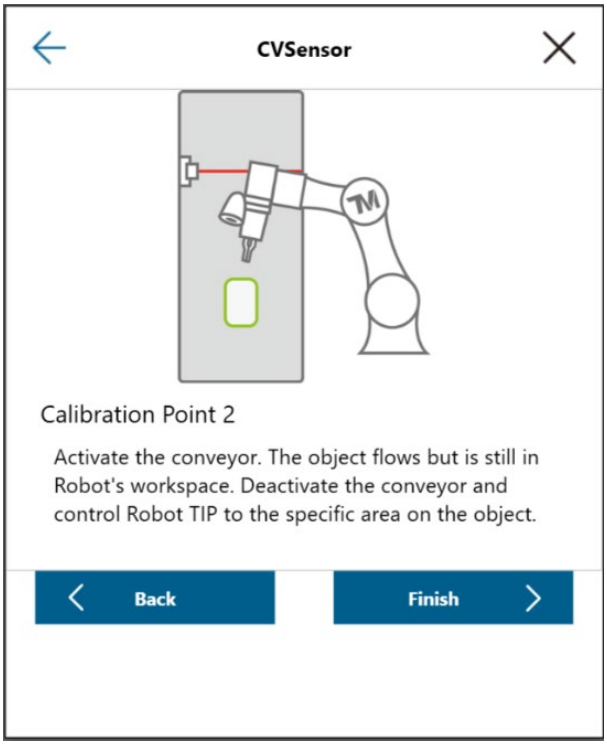




**Figure 22 Two calibration points**

7. Select Tool
   - Switch back to main thread to select the tool you will use during the application

8. Set initial point
   - Drag Point Node to the screen and set it as the robot's initial work point.

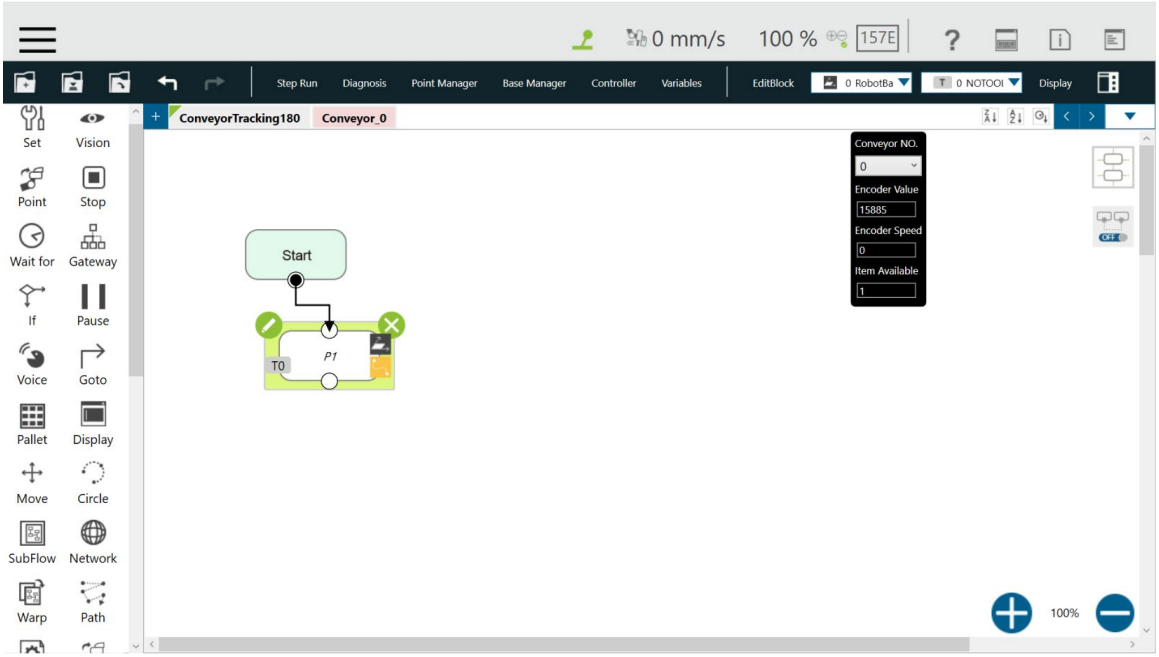



**Figure 23 Point Node**

9. Drag CVNewObj Node


   - Select the conveyor number.

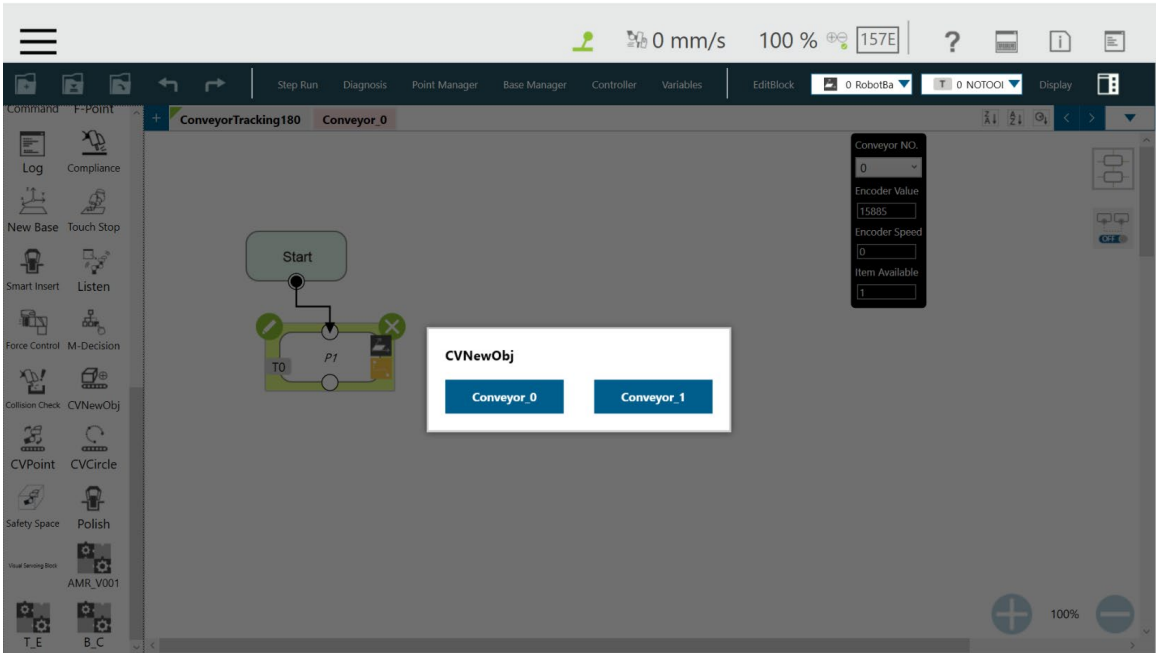
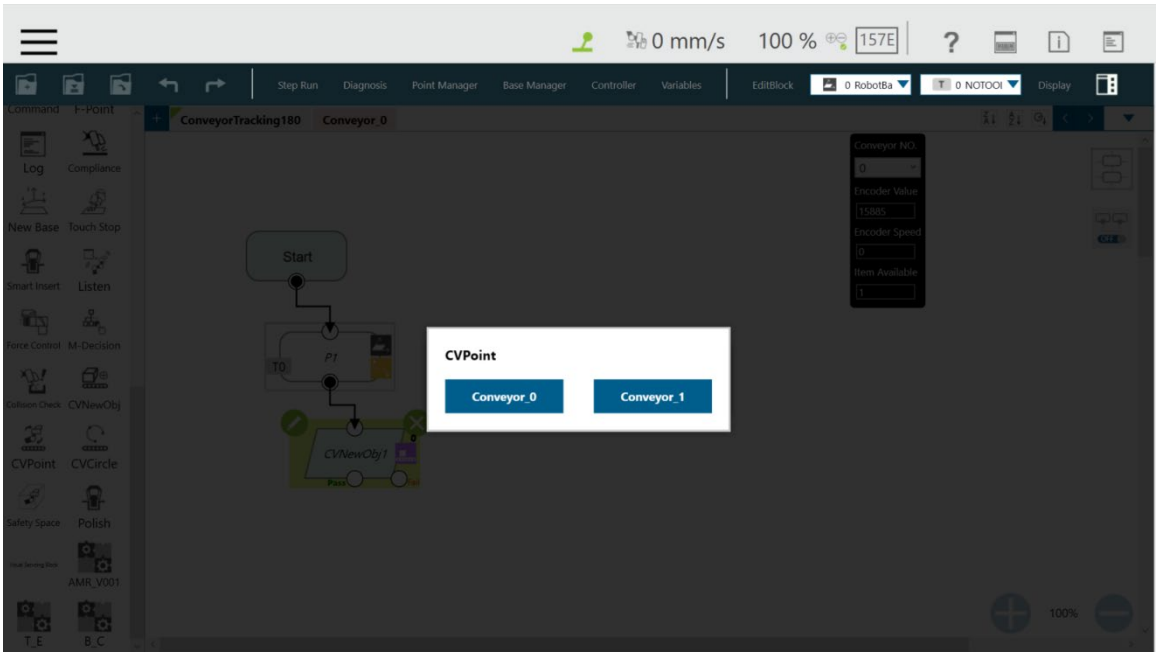



**Figure 24 Select conveyor number**

10. Set CVNewObj Time Out. For details, refer to **5.3.1**.

**Figure 25 Set CVNewObj**

11. Drag CVPoint Node to the screen. Users have to select their conveyor. Set Pass Path or Fail Path. For details about path setting, refer to **5.3.2**.



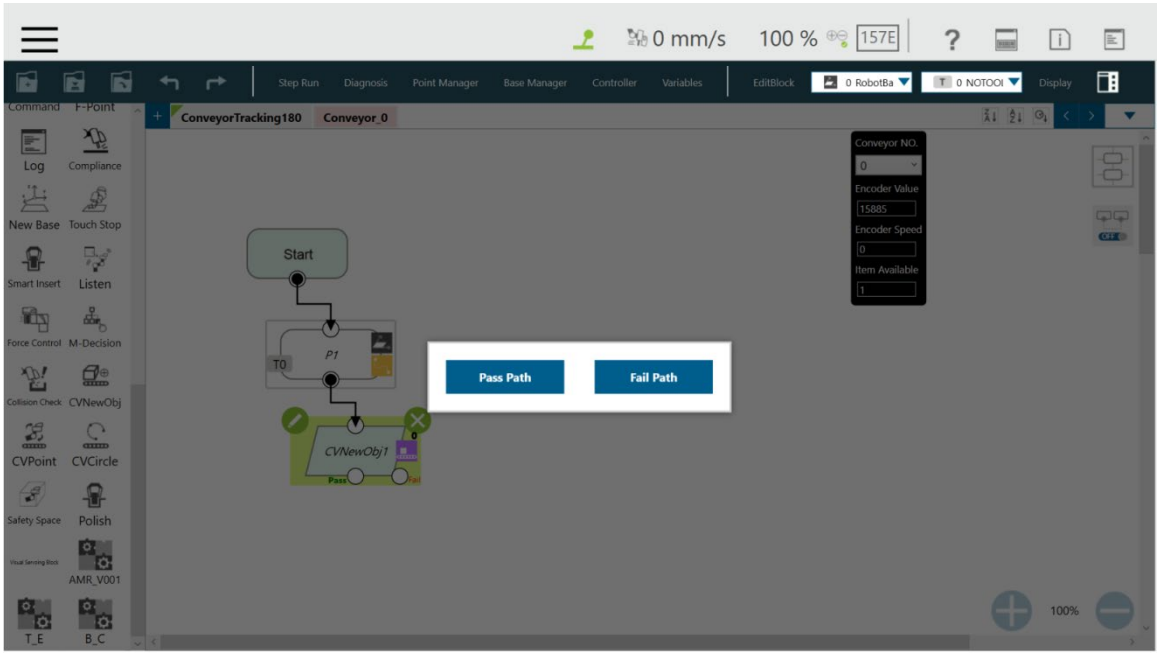



**Figure 26 Select conveyor number and path**

12. Click CVPoint's , then click Teach.

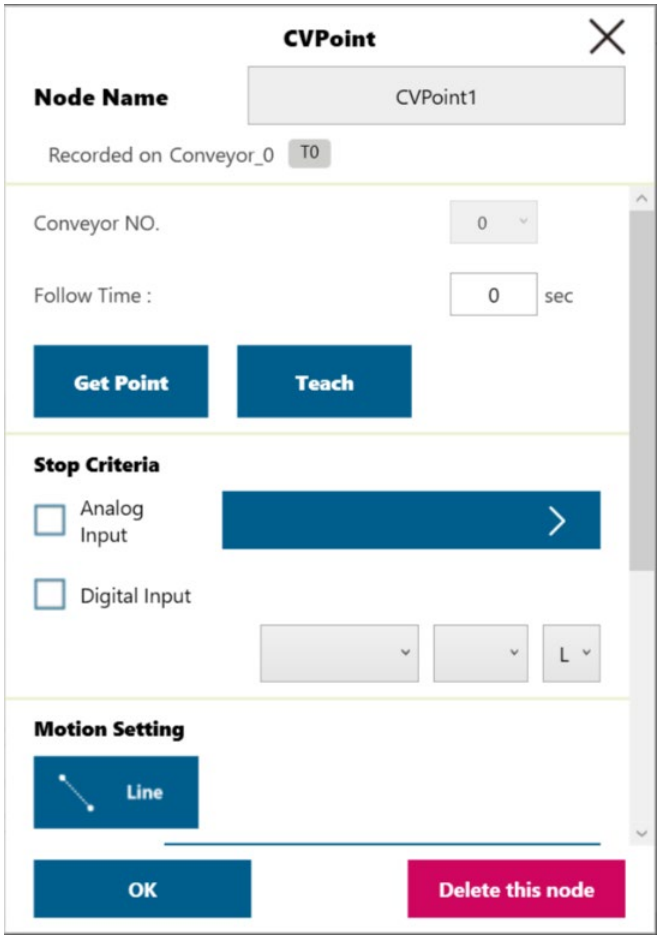



**Figure 27 CVPoint**

- Upon entering "Teach", follow the instructions shown on the screen.

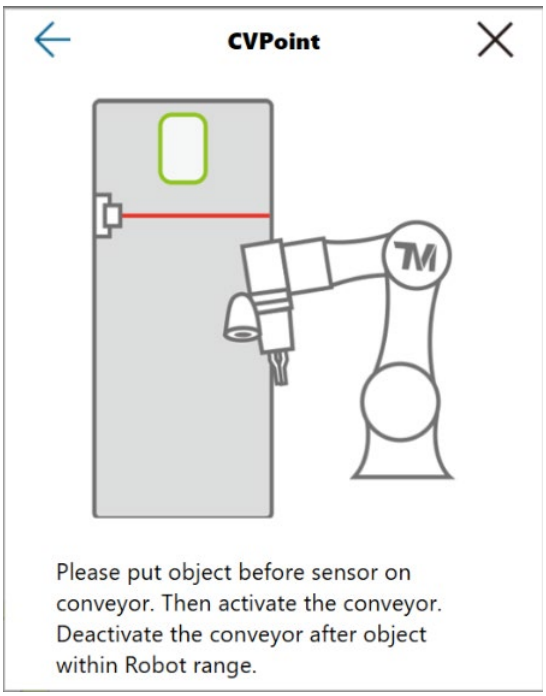
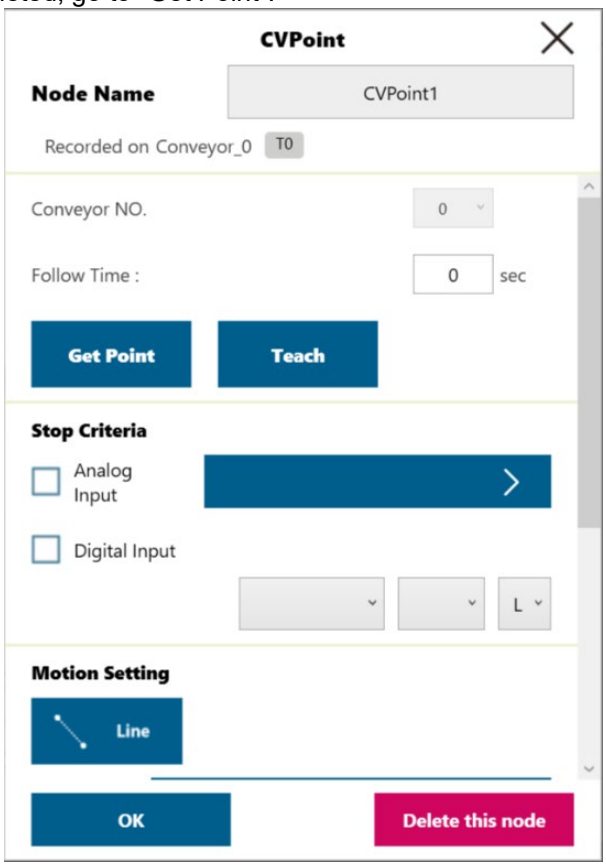



**Figure 28 Teach**

- When “Teach” is completed, go to “Get Point”.




- Click “Get” to obtain the corresponding point values and click “OK” to save the result.

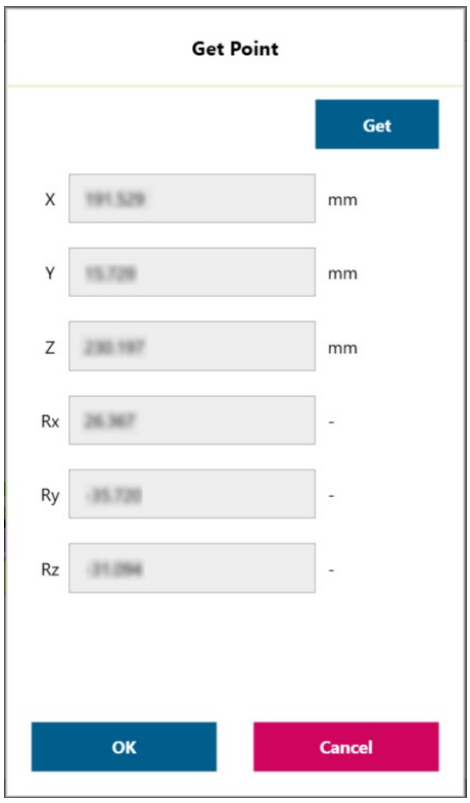



**Figure 29 Get Point**

13. Form a repeated loop

- Drag a path line back to the P1 starting point to form a repeating loop to complete a simple object tracking procedure.

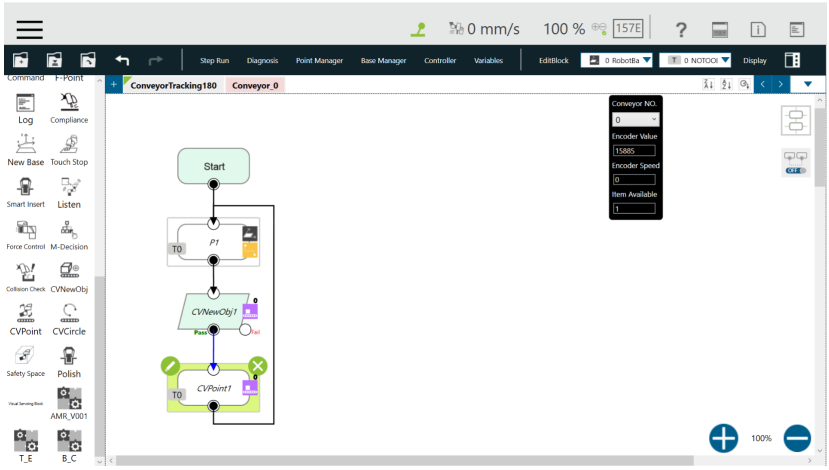



**Figure 30 Form a loop**

Note

**NOTE**：

User can set end effector I/O status in CVPoint to control the component to complete grip, release grip or other procedure.

## 6.2 ETH Mode

ETH requires additional purchase of license dongle.

1. Create new Conveyor Tracking project
   - Insert TM licensed dongle
   - Start a new project by clicking “New Project” from the Project page in TMflow
   - Check the Conveyor Tracking box
   - Select the conveyor
     - Choose Conveyor_0 if 1 conveyor is used
     - Choose Conveyor_1 if 2 conveyors are used
   - Select ETH Mode

   Enter project name and click OK.

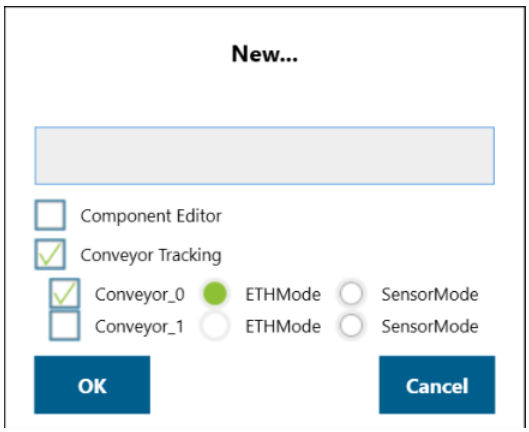



**Figure 31 Open new project**

2. Conveyor Tracking project appears
   - Two threads appear
   - One is the main thread to edit the movement procedure of the robot (the name of this thread shall appear identical to the project name you entered in **Step 1**)
   - Another is the sub-thread, which is Conveyor_0 in **Figure 33**. This thread is configuration-only and cannot add any node.

   Users must have edited the sub-thread before the main thread.

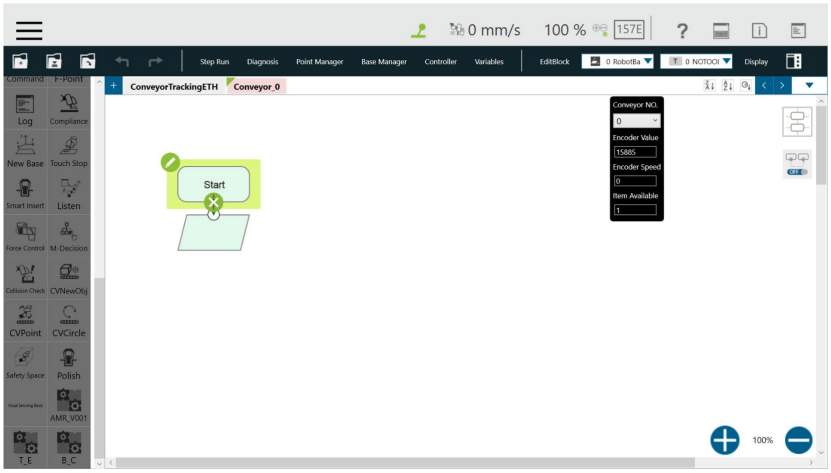



**Figure 32 Sub-thread**

3. Enter Conveyor Tracking Setting

- Click the of sub-thread's Start Node to proceed with Conveyor Tracking Setting.
  For details about sub-thread setting, see **5.1**

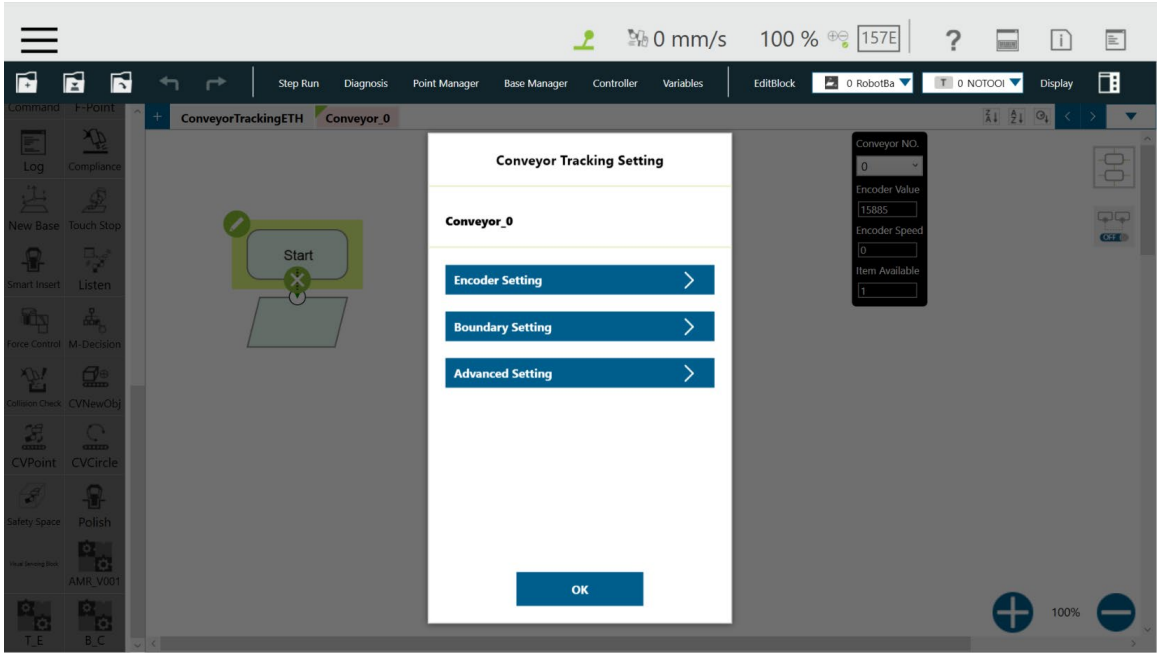



**Figure 33 Conveyor Tracking Setting**

4. Start a Vision Job

- Once the settings in Start Node are completed, click the of Vision Node and then Vision Job to proceed.

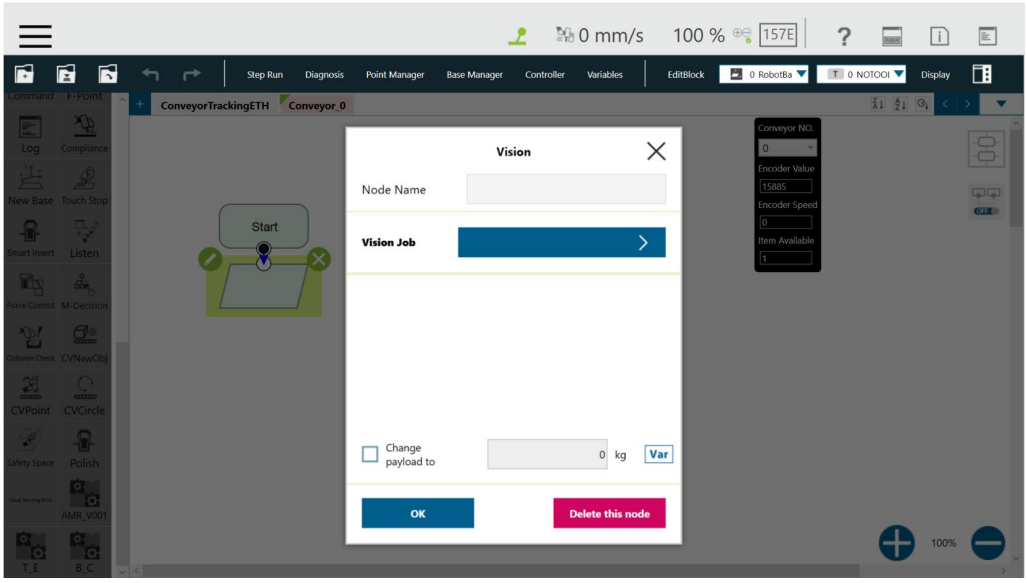



**Figure 34 Vision Job**

5. Input Vision Job Name

- Under the Vision Job page, click + and input the vision task name.Then click OK to start new vision task.

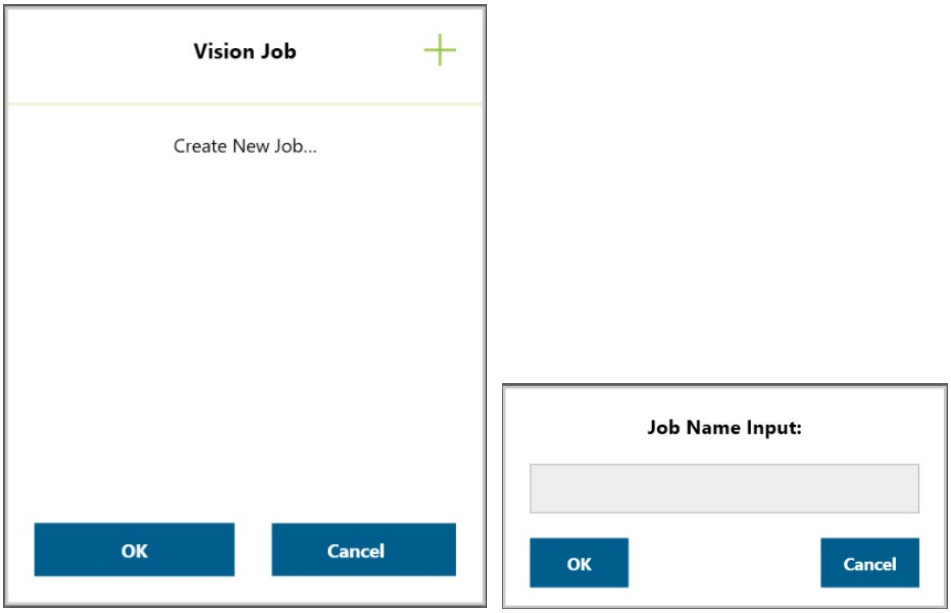



**Figure 35 Input vision job name**

6. Enable Conveyor Tracking Camera

- Upon entering vision task screen, choose Conveyor Tracking camera on the Camera List at the left side (the example screen is a “calibrated” example)

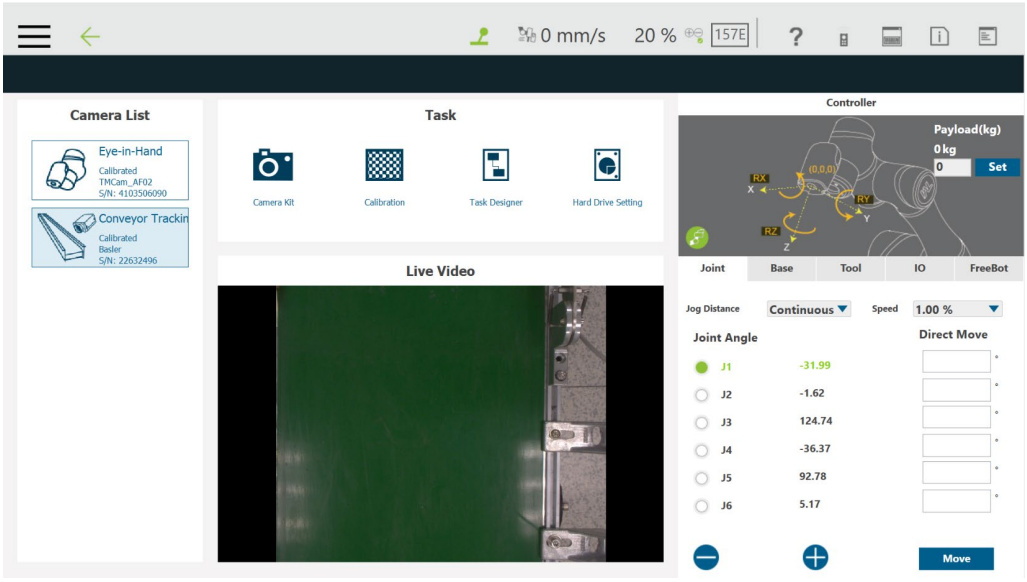
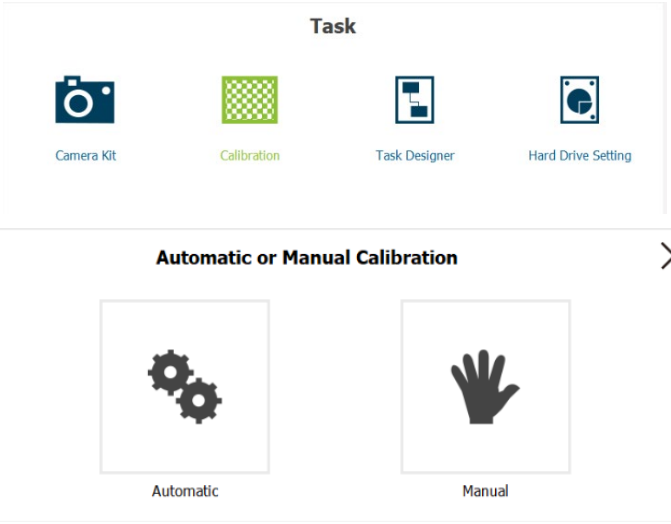



**Figure 36 Conveyor Tracking camera**

7. Go to “Calibration” → “Automatic”.




- **Camera calibration:** based on instructions on the screen, users are instructed to place the calibration plate (Diceboard) under the Conveyor Tracking camera. In addition, users are advised to place the board at different positions or angles and click “Next” 15 times to obtain 15 photoshoot. After 15 images taken, the “Success” message will appear if the instructions are performed properly.

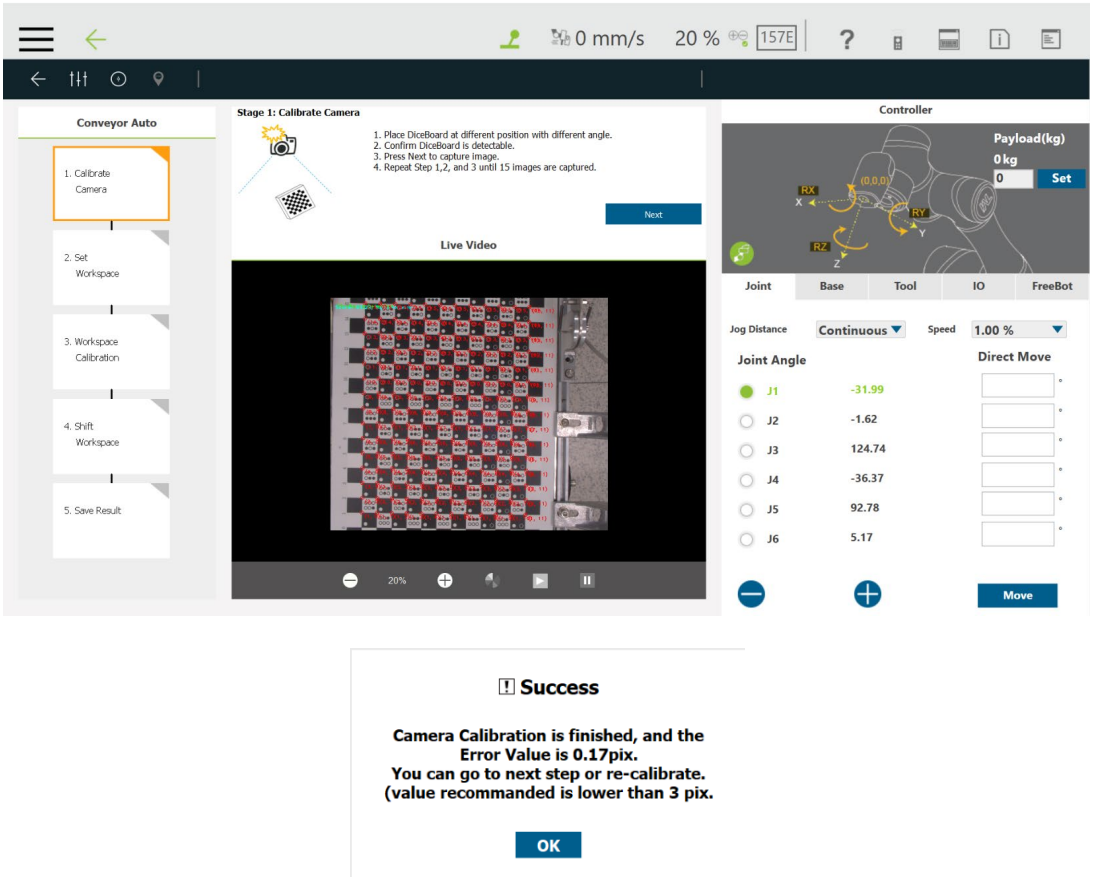



**Figure 37 Camera calibration**

- **Set Workspace:** Align X=0 line to the bottom of the screen (camera screen) and X-axis along the conveyor movement direction. The benefits are
  - Obtain a precise value from object position to camera FOV edge
  - Obtain a more precise value to avoid repeated phototaking of objects

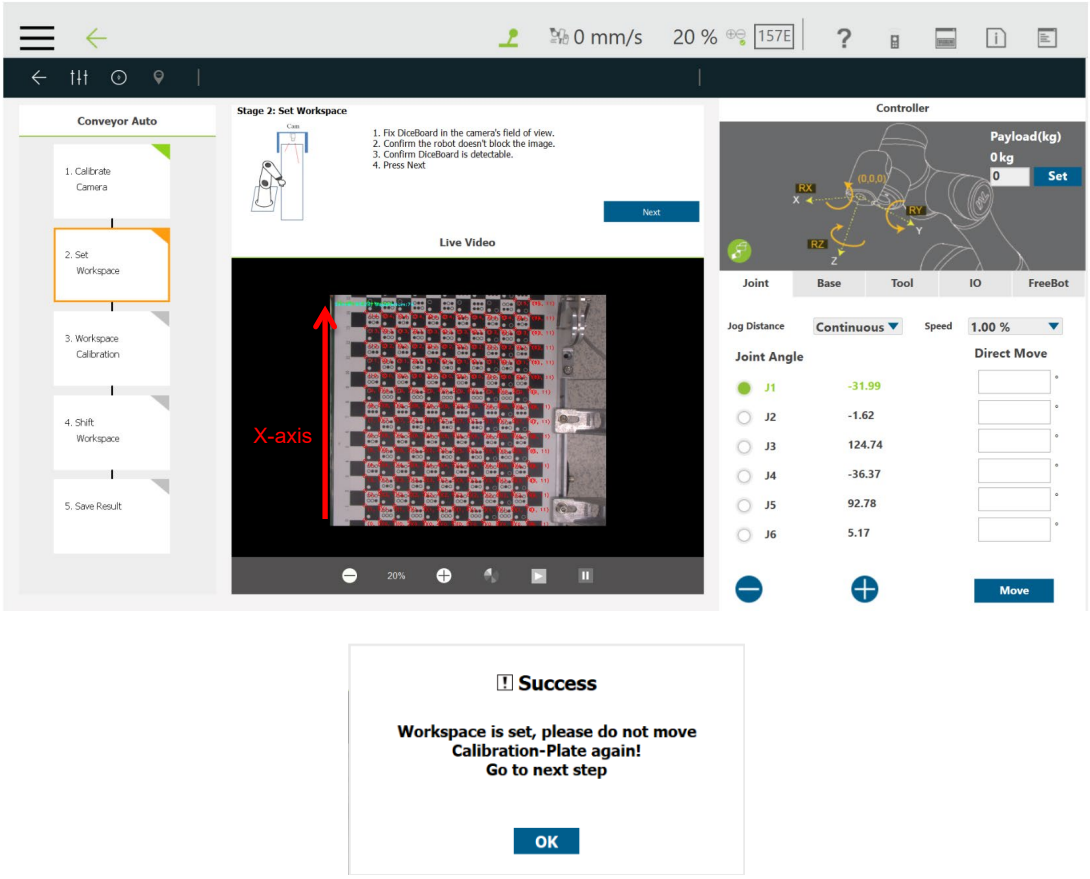






**Figure 38 Set Workspace**

- **Calibrate Workspace**: upon entering **Calibrate Workspace**, first follow the instructions on the screen, and move the robot camera above the calibration board to enable visual navigation. Second, press **Next** and the **visual navigation message** will appear. Then press and hold the PLAY/PAUSE button the robot stick.

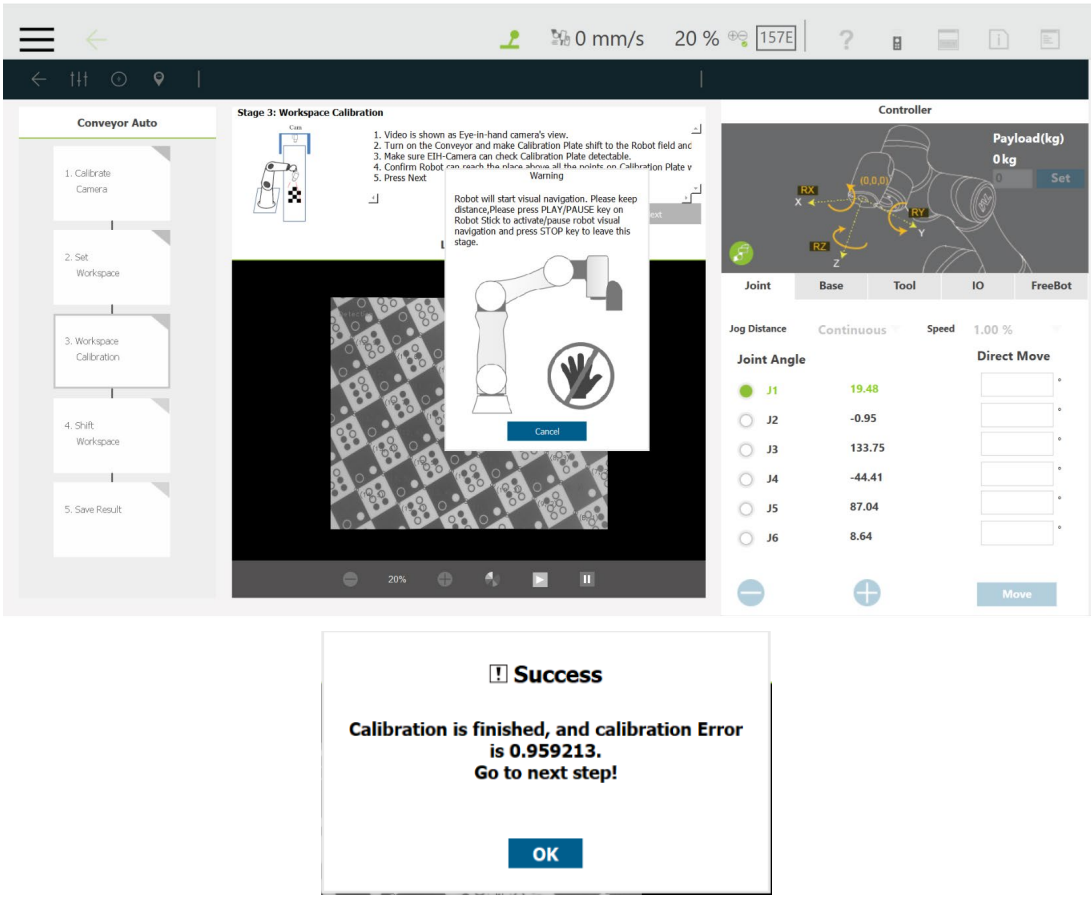
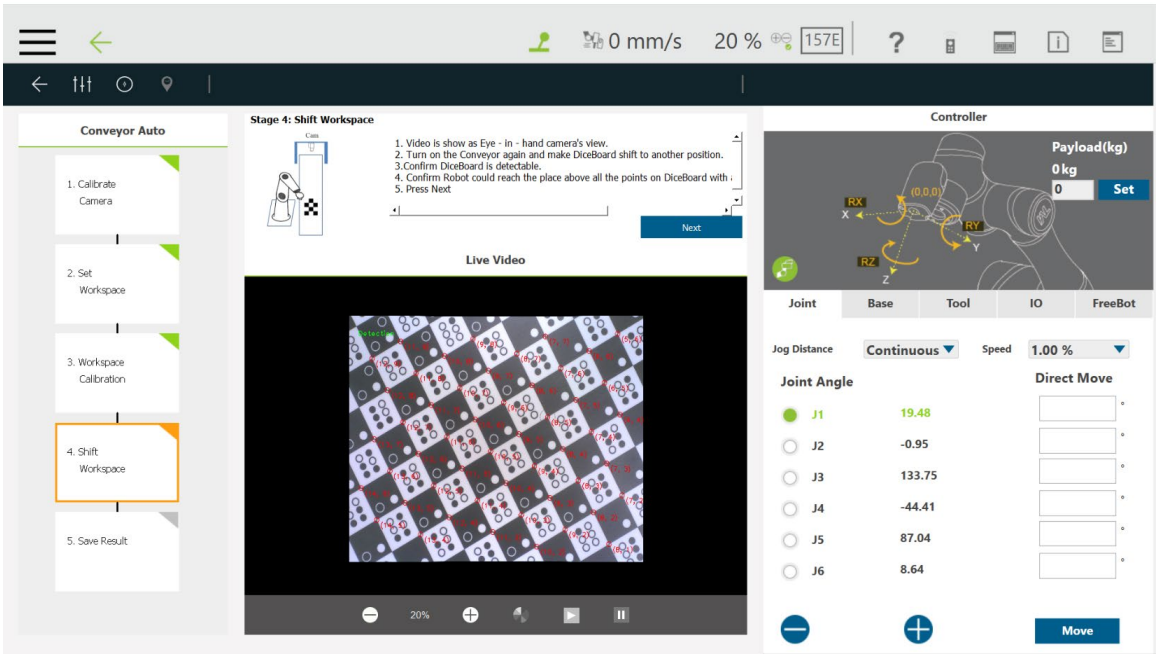



**Figure 39 Calibrate Workspace**

- **Shift Workspace**: at this stage, users are instructed to turn the conveyor on again and make the calibration board (the diceboard) shift to another position. Other procedures are similar to the last stage.



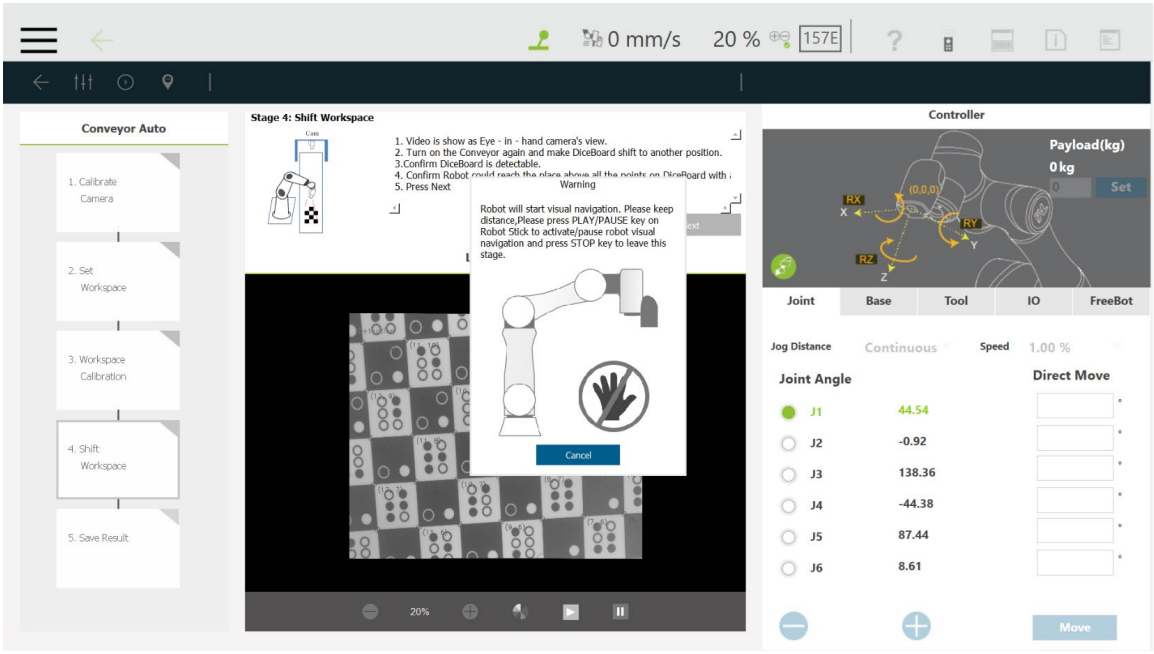
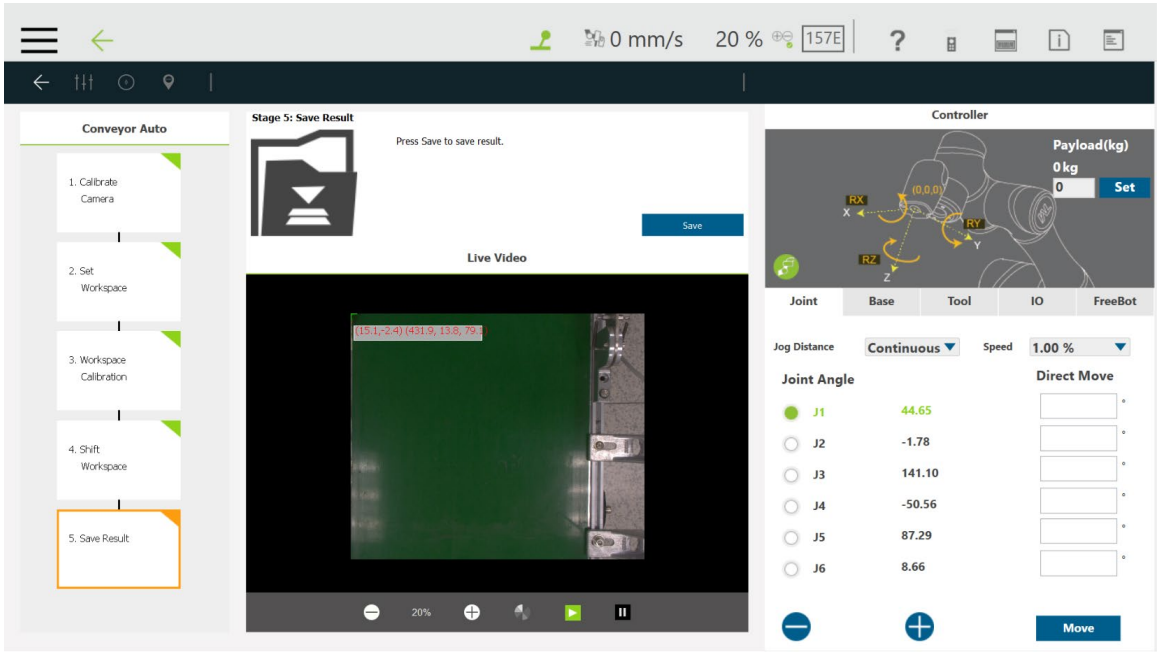



**Figure 40 Shift Workspace**

- **Save Result**: if the last stage has been properly conducted, it means the entire calibration is finished. Users can save their result.



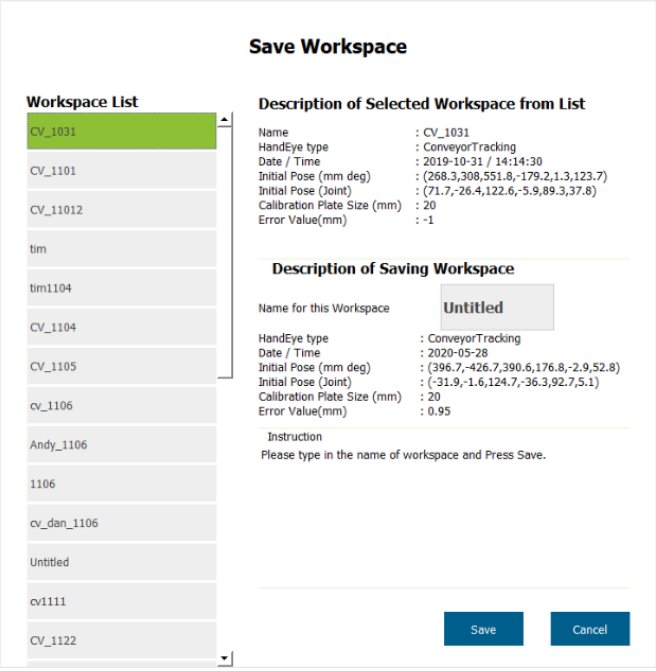



**Figure 41 Save result once calibration is finished**

8. Load Workspace

- After camera calibration is completed, click Task Designer.
- Choose the required Workspace (make sure the Hand-Eye type is ConveyorTracking). Click Load button.

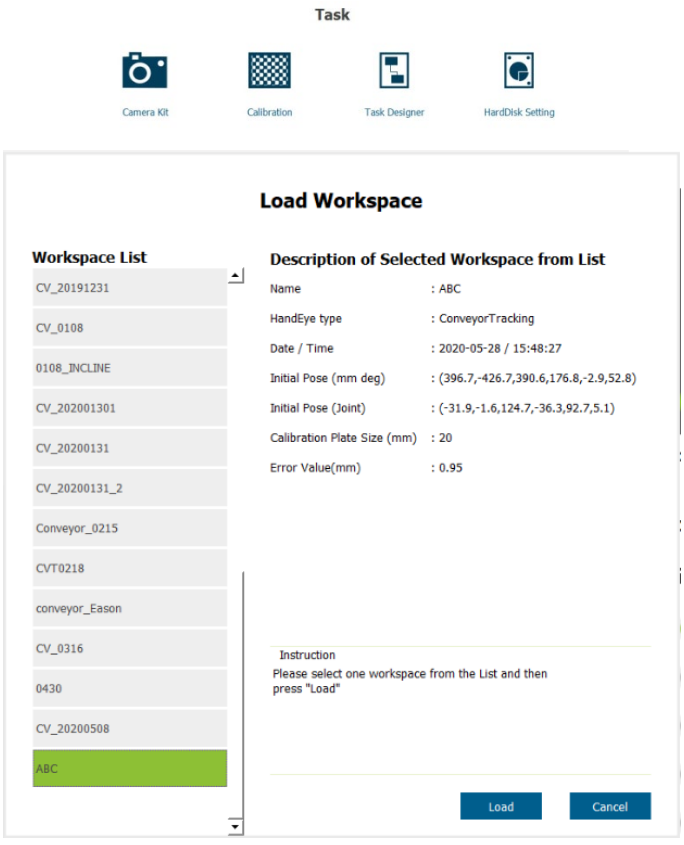
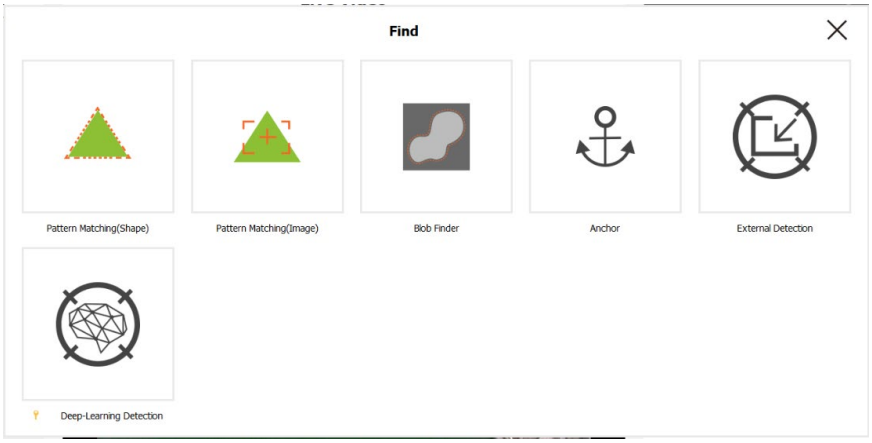
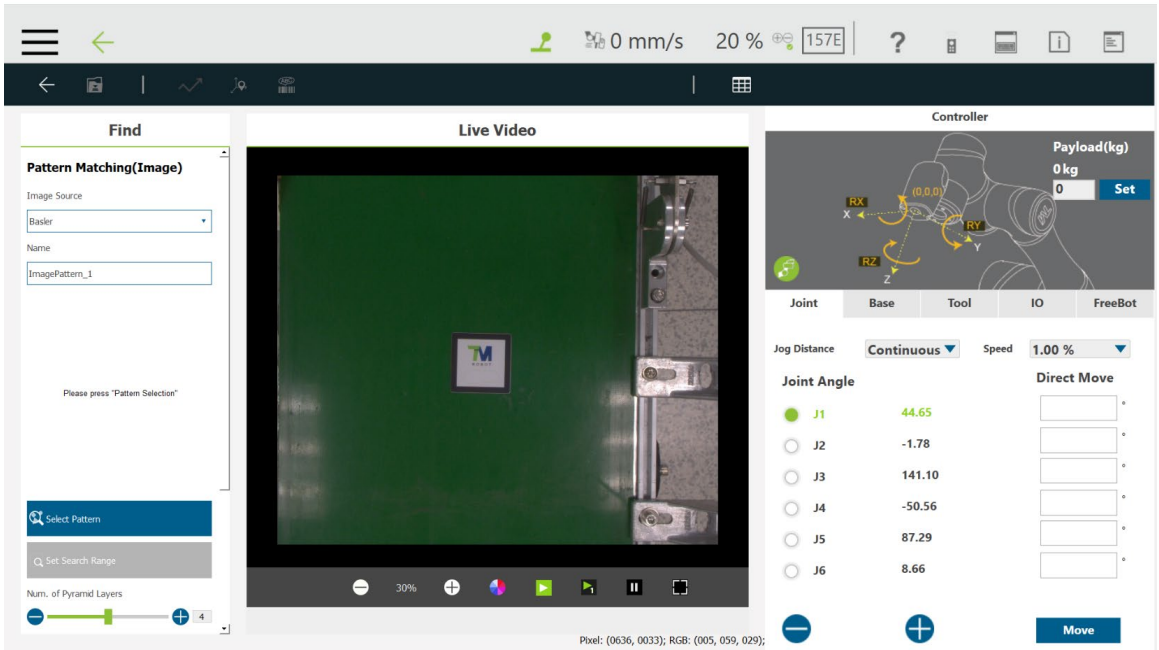



**Figure 42 Load workspace**

9. Pattern Matching

Place an object in the center of the vision area. Then go to “Find” → “Pattern Matching” and the robot will recognize the pattern and range.




Users may use mouse to highlight the pattern and range of the object.

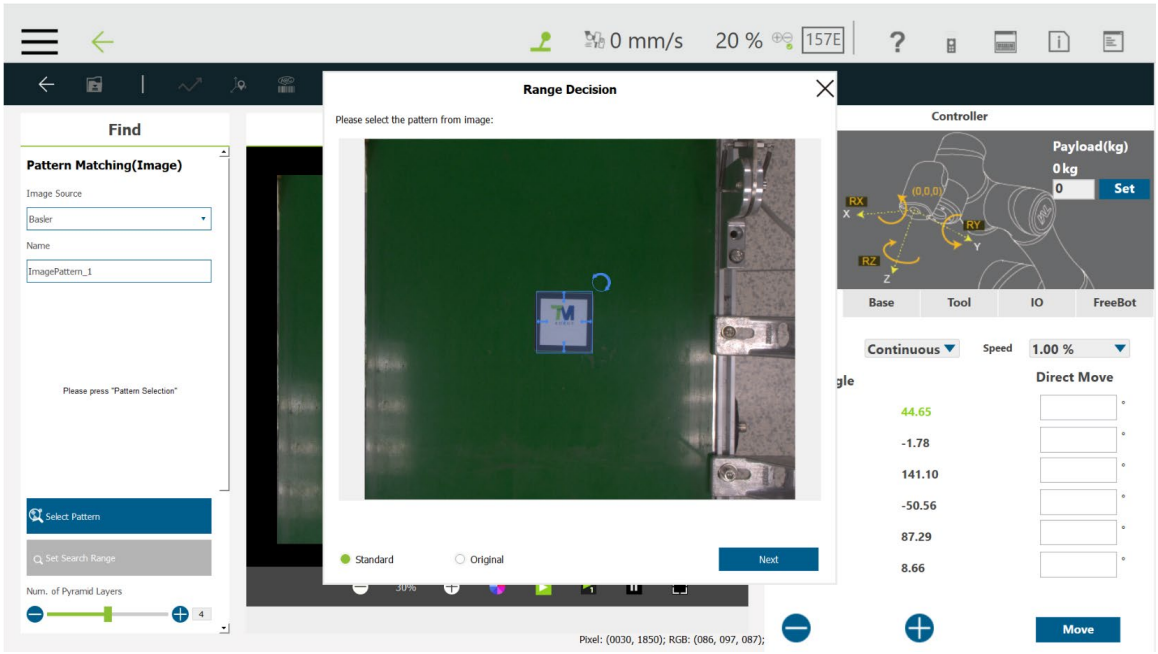



**Figure 43 Pattern matching**

10. Confirm and Exit

- Once the pattern recognition is completed and the positioning values are confirmed, click .

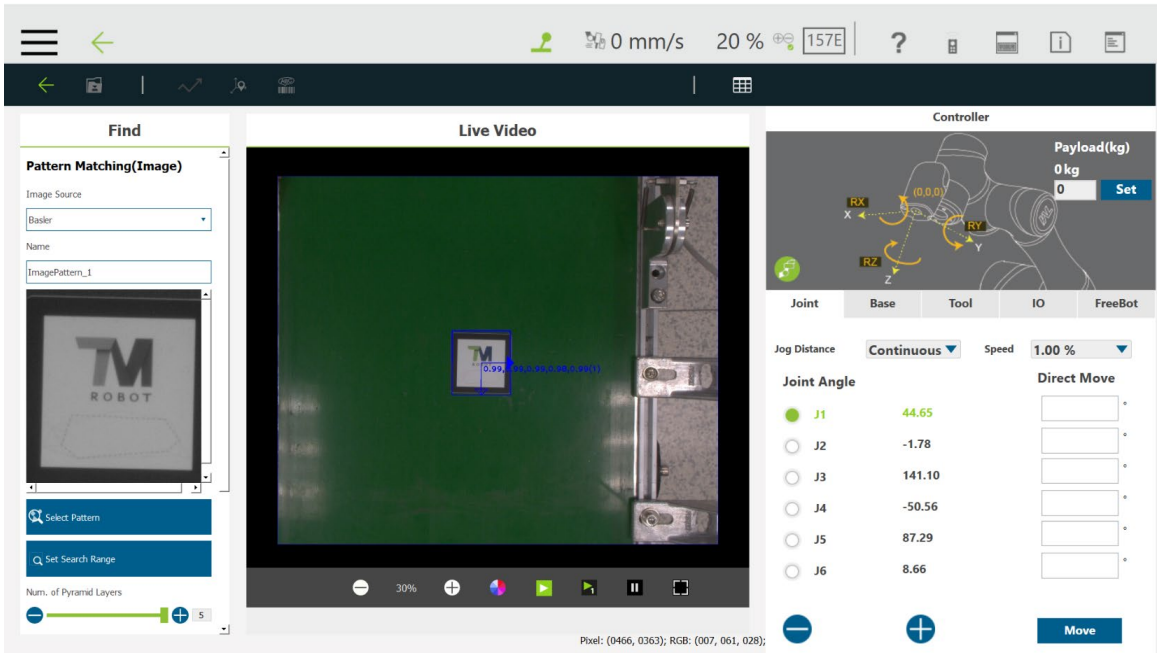



**Figure 44 Confirm and exit**

11. Check the editing procedure

- The editing procedure on the left side will show a “FIND”.
- The “FIND” is supposed to appear in **green**. If it appears in **orange**, it indicates the pattern recognition is not completed.

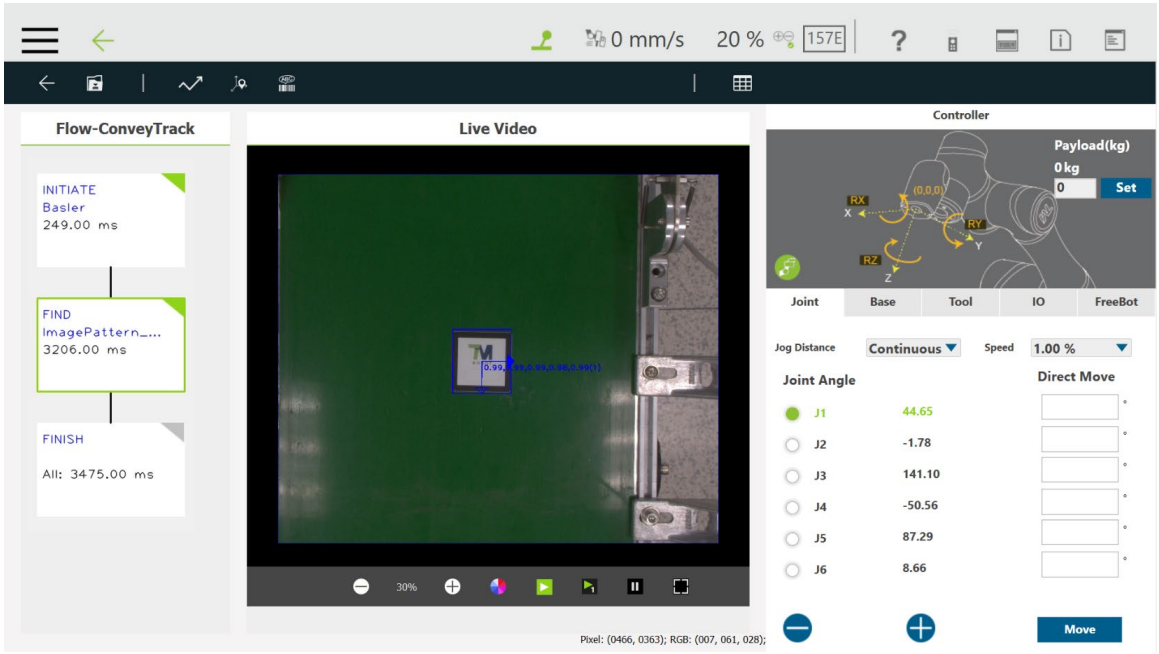



**Figure 45 Confirm "FIND" pattern**

12. Save Vision Job

- Click to save visual task, and input a name for the visual task.

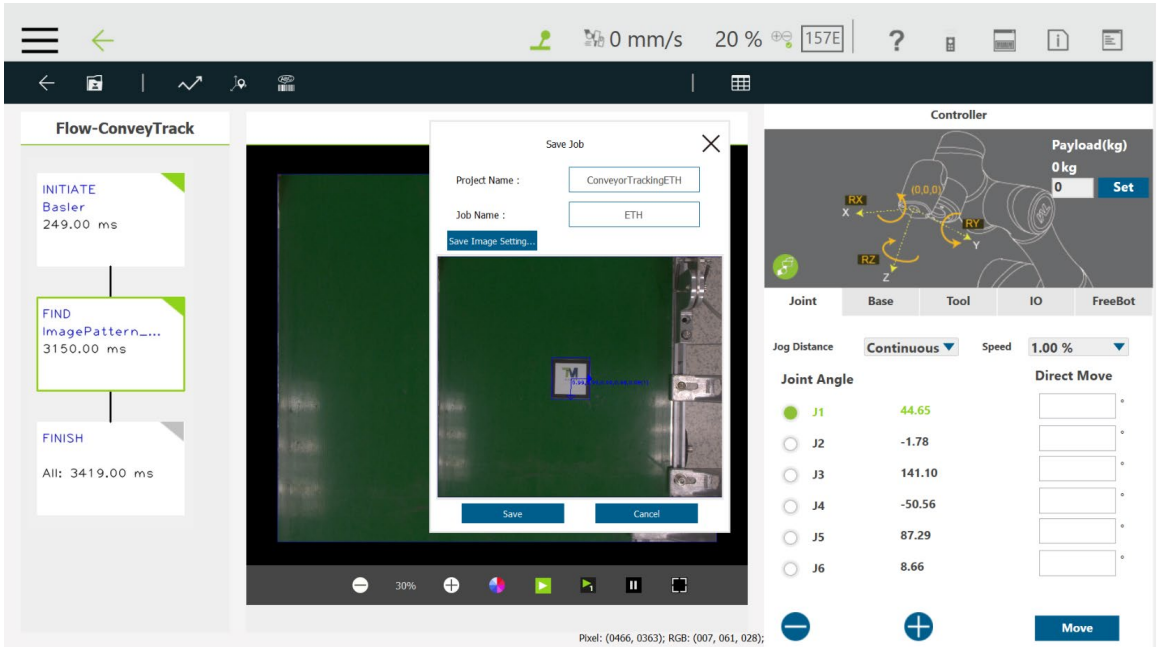



**Figure 46 Save vision task**

13. Check if Vision Job is successfully created

- Upon returning to TMflow, make sure the vision task you just edited appears on Vision Job. Then click “OK” to complete the setting.

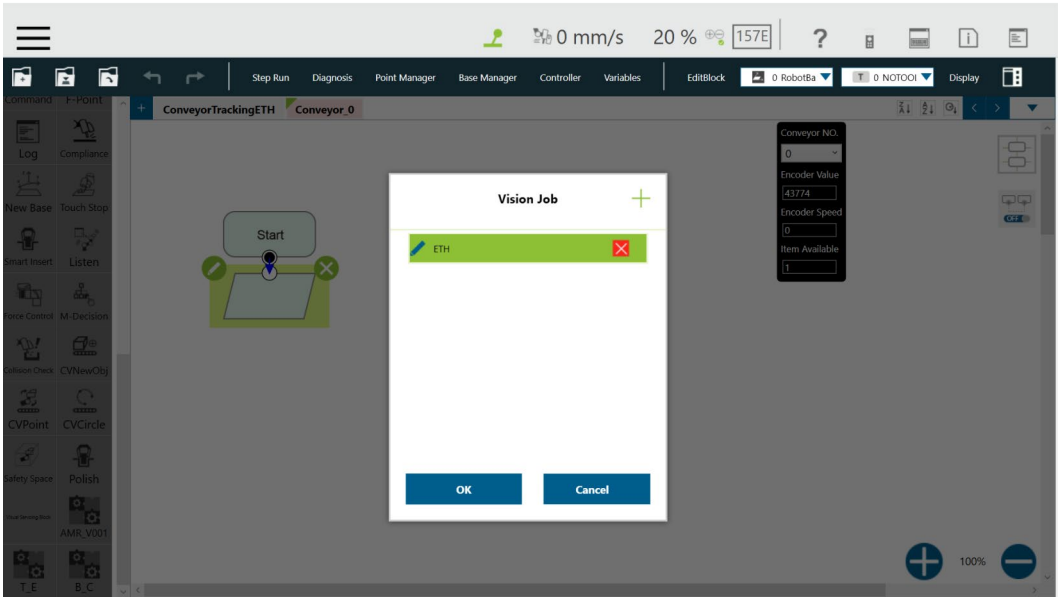



**Figure 47 Check vison job on list**

14. Select Tool

- Switch to the main thread and select the tool for your application.

15. Drag Point Node


- Set as the robot’s initial work point.

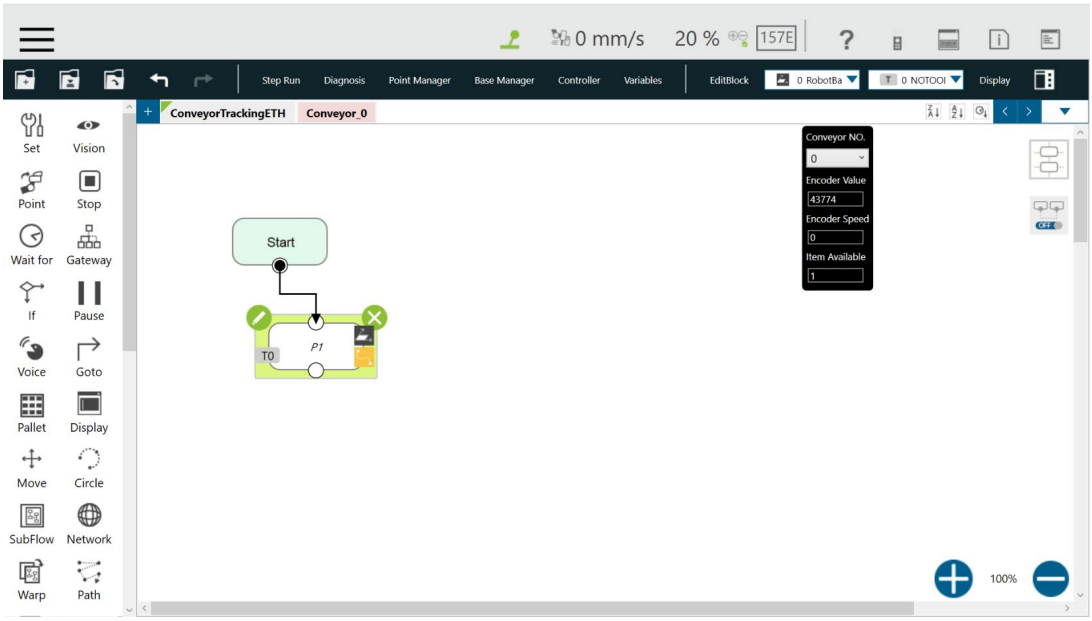



**Figure 48 Point Node**

16. Drag CVNewObj to the screen and choose the conveyor number.



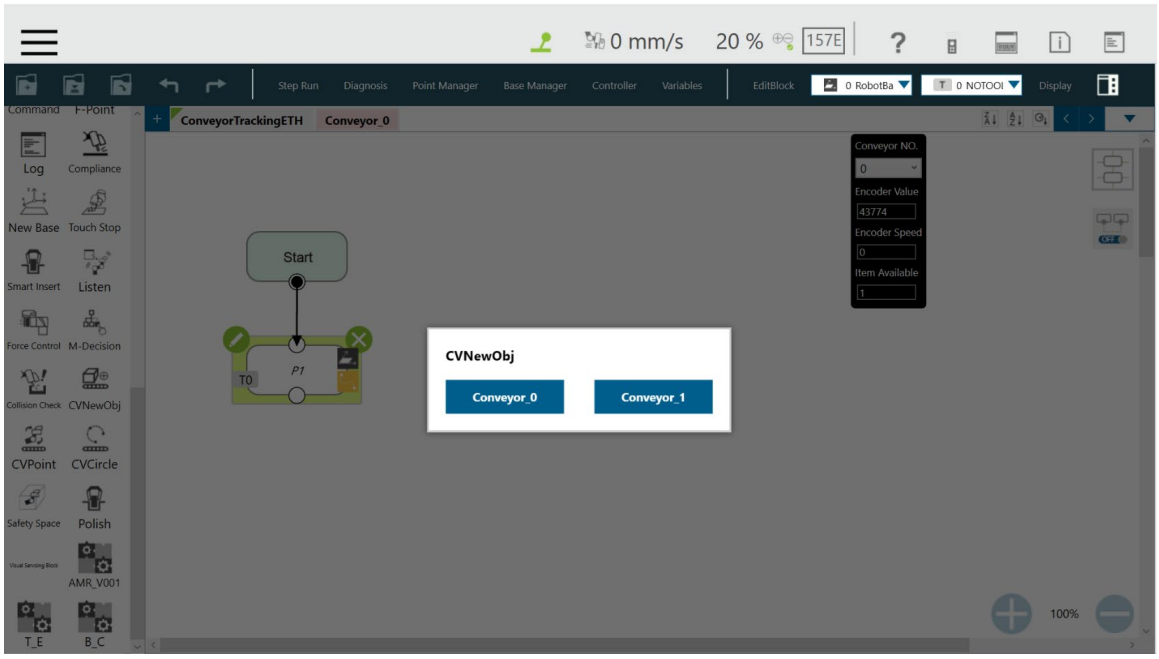



**Figure 49 Select conveyor**

Set CVNewObj Time Out. For details, refer to **5.3.1**.

**Figure 50 Set CVNewObj**

17. Drag CVPoint to the screen. Users are advised to select the conveyor.

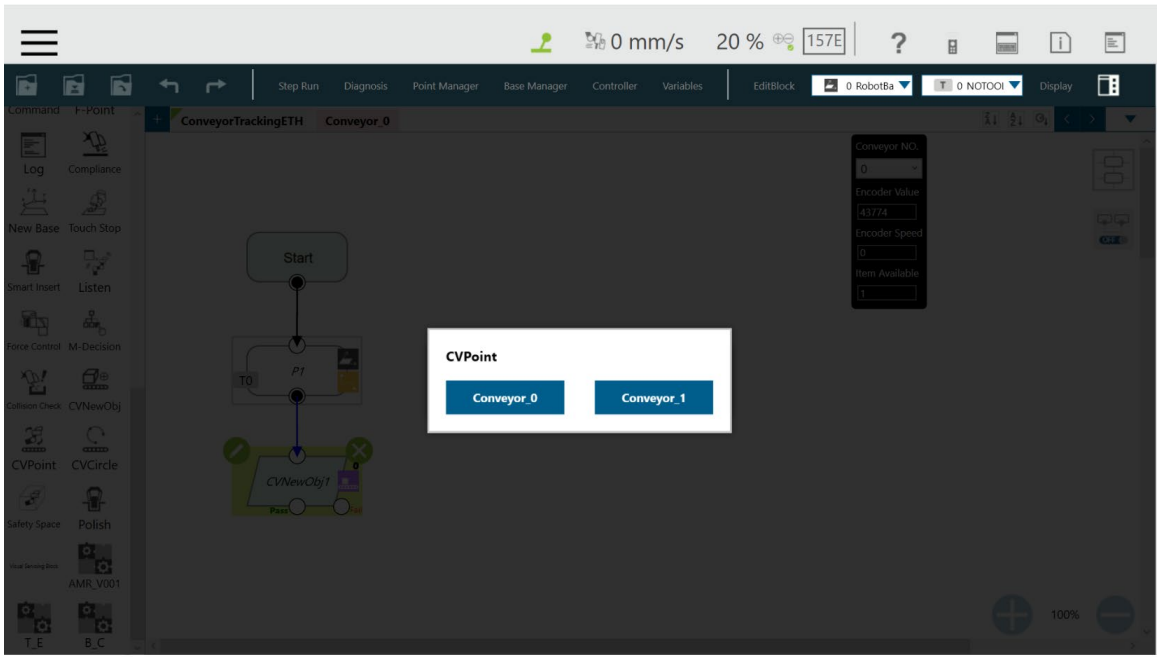



**Figure 51 Set conveyor for CVPoint**

Users are instructed to set Pass Path or Fail Path. Refer to **5.3.2** for details.

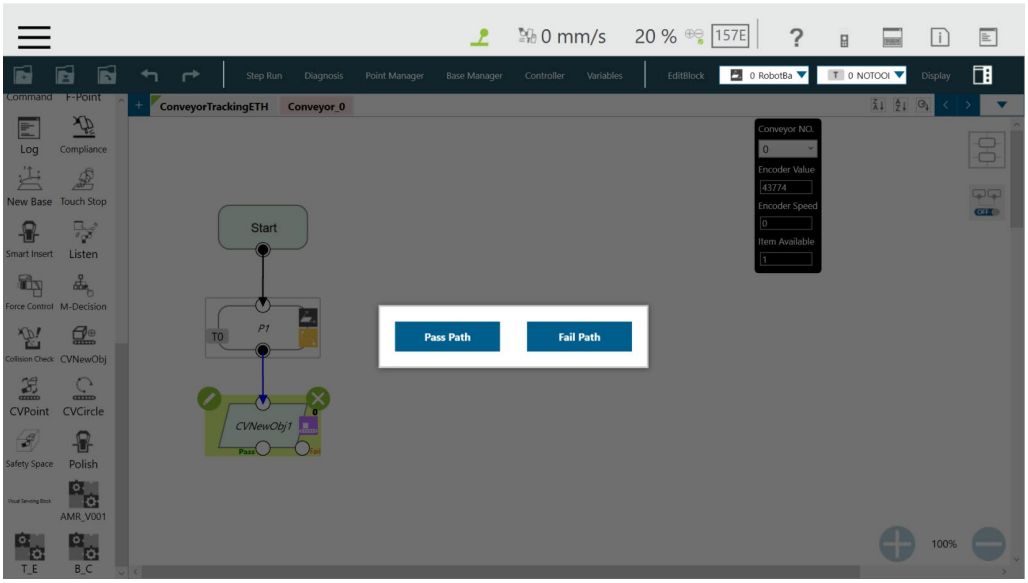



**Figure 52 Set path**

18. Enter CVPoint Node

- Click of the CVPoint Node. Meanwhile, use the conveyor to move the object to the robot's working area.
- Hand-guide the robot to the top of the object.
- Click "Get Point".

  Upon entering "Get Point", click "Get" and "OK" to complete CVPoint setting in ETH Mode.

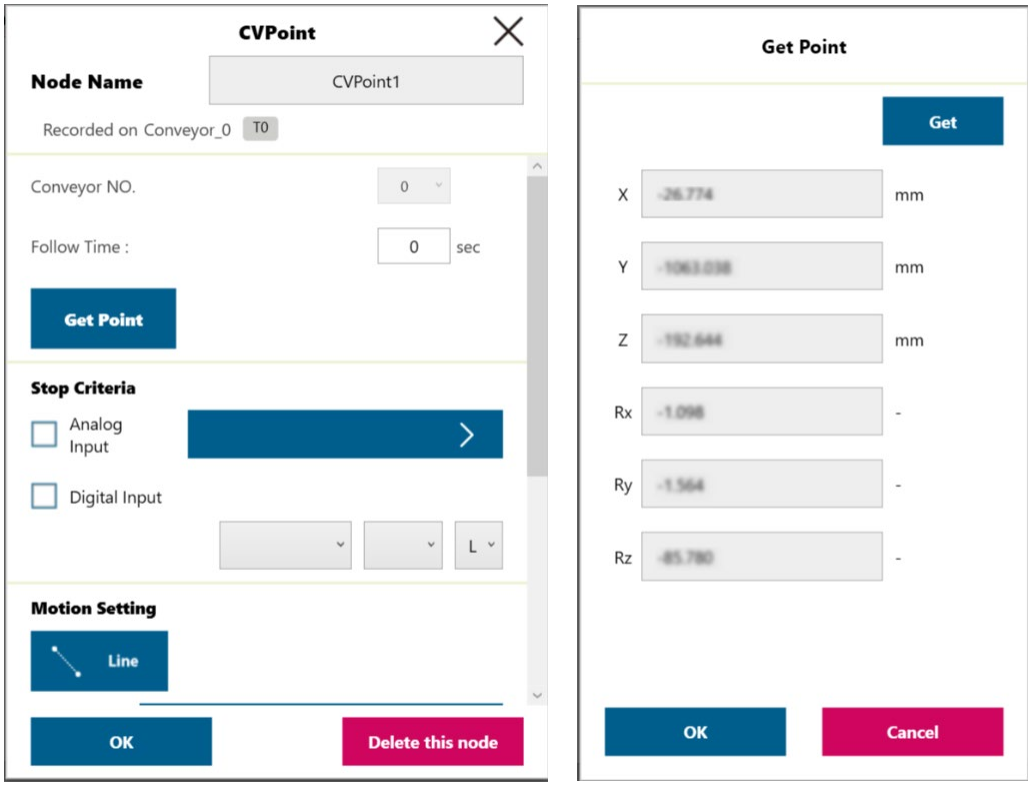



**Figure 53 Get Point**

19. Form a repeated loop

- Drag a line back to the P1 Node starting point to form a repeated loop to complete the tracking procedure.

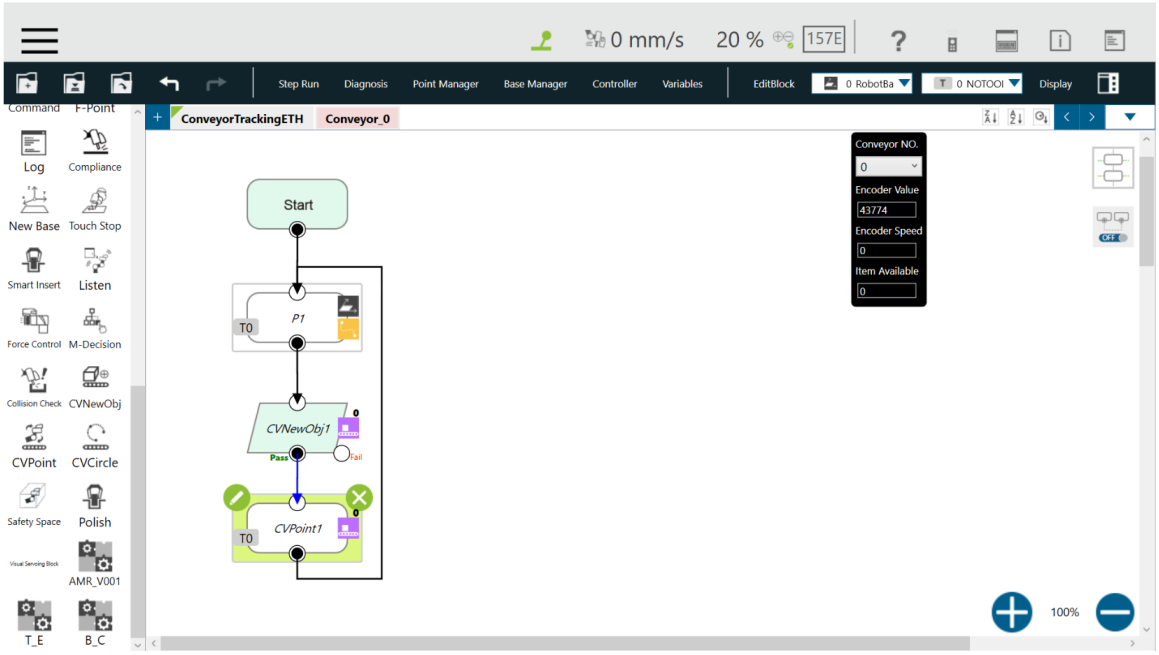



**Figure 54 Form a loop**

Note

**NOTE :**

User can set end effector I/O status in CVPoint to control the component to complete grip, release grip or other procedure.

**OMRON Corporation** **Industrial Automation Company**
**Kyoto, JAPAN**
**Contact: www.ia.omron.com**

***Regional Headquarters***

**OMRON EUROPE B.V.**
Wegalaan 67-69, 2132 JD Hoofddorp
The Netherlands
Tel: (31)2356-81-300/Fax: (31)2356-81-388

**OMRON ASIA PACIFIC PTE. LTD.**
No. 438A Alexandra Road # 05-05/08 (Lobby 2),
Alexandra Technopark,
Singapore 119967
Tel: (65) 6835-3011/Fax: (65) 6835-2711

**OMRON ELECTRONICS LLC**
2895 Greenspoint Parkway, Suite 200 Hoffman Estates,
IL 60169 U.S.A.
Tel: (1) 847-843-7900/Fax: (1) 847-843-7787

**OMRON ROBOTICS AND SAFETY TECHNOLOGIES, INC.**
4225 Hacienda Drive, Pleasanton CA 94588 U.S.A.
Tel: (1) 925-245-3400/Fax: (1) 925-960-0590

**OMRON (CHINA) CO., LTD.**
Room 2211, Bank of China Tower, 200 Yin Cheng Zhong Road,
PuDong New Area, Shanghai, 200120, China
Tel: (86) 21-5037-2222/Fax: (86) 21-5037-2200

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