Conveyor Tracking Process

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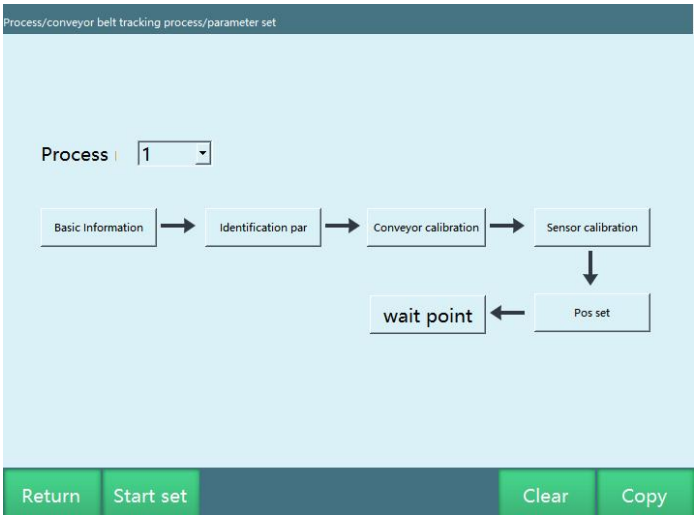
Catalogue

Conveyor Tracking Process

Click [Process], select [Conveyor tracking process], and click [Parameter settings] to enter the conveyor tracking process parameter setting interface.

Conveyor tracking means that the robot uses the material point position entered by the user and the corresponding encoder value when the material is in this position, to calculate the material point position in real time and track the material through movement.

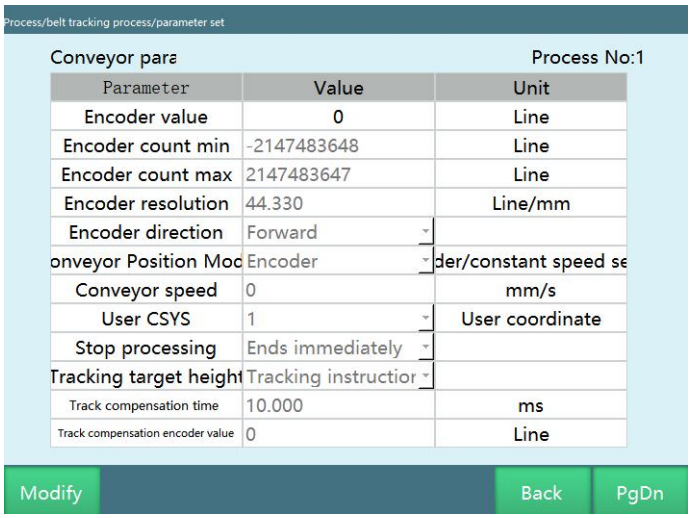


Clear parameters: Clear all parameters of this process number

Copy parameters: Copy all parameters of this process number to another process number

> Basic information

Before setting all parameters, please select a process number in the "Parameter settings" interface, each process number holds all parameters. The basic information is the basic setting for the parameters of the conveyor belt.



The "Basic information" interface contains the following parameters:

Encoder value

After the encoder is successfully connected, the robot will automatically identify the readings of the currently connected encoder, which are read-only;

If the encoder is not connected successfully, there will be no encoder value. Generally, there are two cases: 1: The wiring of the encoder port is incorrect; 2: The encoder is connected to the wrong port on the IO board.

1: The position of the connection port on the IO board can refer to the definition diagram of the corresponding IO board

2: The wiring method of the encoder port can refer to the definition diagram of the corresponding encoder

Encoder count max/Encoder count min

The maximum value that can be counted by the encoder data processing module is based on the IO board used as the encoder data processing module, there are currently two value ranges: (0,6000) or (-2^31, 2^31-1)

Encoder resolution

The unit pulse emitted by the encoder when the conveyor belt moves 1mm; this value is the calibration result of the encoder resolution

Encoder direction

Start the conveyor belt and observe whether the offset and speed increase as the belt moves. If there is no change, then the encoder type or resolution setting does not match the actual situation. If the offset and speed decrease with the movement of the conveyor belt, then check [Reverse] here

Conveyor position mode

Select "Encoder": normal sensor calibration

Select "Constant speed setting": when "Constant speed setting" is selected, there is nothing to do with the encoder, and the conveyor speed can be set manually. (Note: After manually modifying the speed, you need to re-calibrate the sensor)

Note: When setting constant speed, there is error in sensor position calibration calculation. Error factor: The movement time interval of the conveyor belt calculated at the time of calibration is too large.

[Solution]: Stop the robot tool hand on the follow-up path of the workpiece, and calibrate the workpiece directly when it passes the tool hand, which can reduce the error.

Conveyor speed

Current conveyor belt speed, read-only

User coordinate system

The user coordinate system can be calibrated according to the actual movement direction of the conveyor belt, and the motion tracking and calculation are carried out under this user coordinate system

Conveyor stop processing

Robot stops immediately: When the conveyor belt stops unexpectedly during the tracking process, the robot will stop this tracking and return to the safety point to wait for the next tracking signal, with a waiting timeout of 2min. Robot continues running: When the conveyor belt stops unexpectedly during the tracking process, the robot will not stop running but will continue to complete the previously planned trajectory.

Tracking target height

Sensor sensing: Determine the maximum height of the target workpiece according to the height captured by the vision and the height triggered by the sensor

Tracking instruction teach: the start height when teaching the trajectory is the tracking height

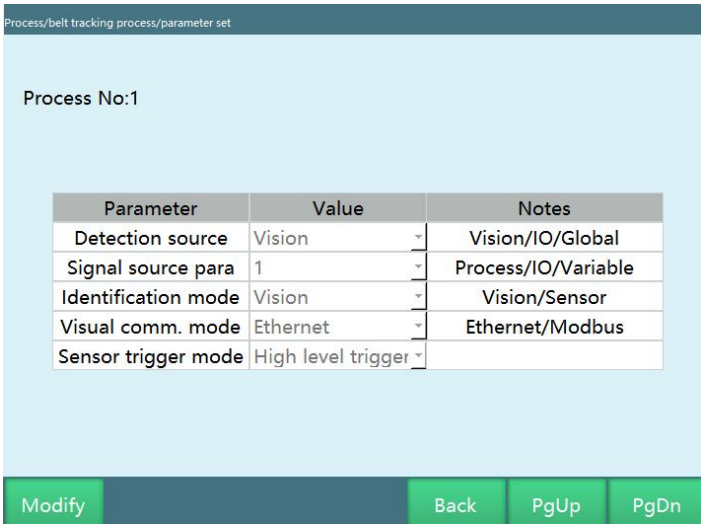
Tracking compensation time

Used to solve the tracking lag problem; calculated from time and conveyor belt speed. The tracking lag is mainly caused by the filtering of the encoder data and the execution of the planned motion of the robot.

Tracking compensation encoder value

Used to solve the tracking lag problem; calculated from encoder value and resolution

> Parameter identification



Workpiece detection signal source

Workpieces on conveyor can be detected by three methods: vision, IO, and global variables

Signal source parameters

If the workpieces on conveyor are detected by IO, the signal source parameter can select the IO port number;

If the workpieces on conveyor are detected by vision, the signal source parameter can select the corresponding visual process number;

If the workpieces on conveyor are detected through the global variables, the signal source parameter can select the global Boolean variable.

Workpiece identification method

The workpieces on conveyor can be identified through vision and sensors; when selecting sensors, the visual communication method is not required

Visual communication method

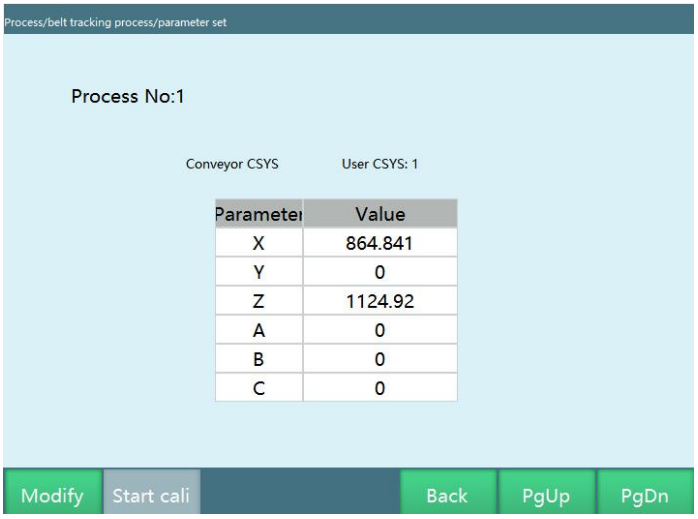
If the workpieces on conveyor are identified by vision, two communication methods can be selected: Ethernet and Modbus

Sensor trigger method

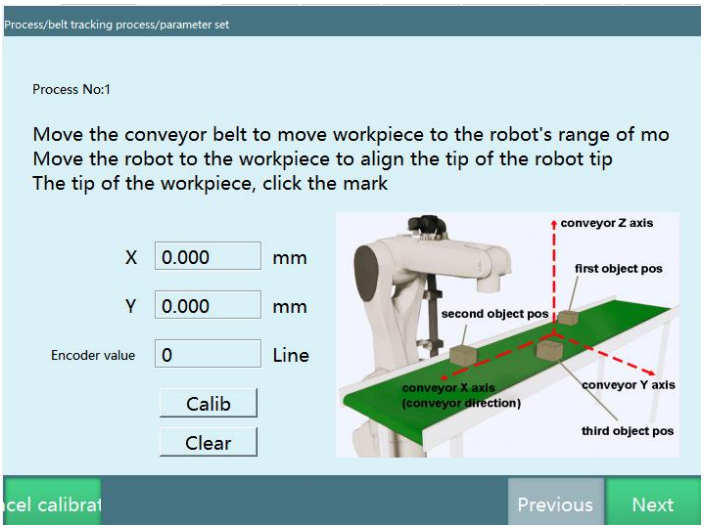
Only when the workpiece detection signal source is set to digital IO, the signal source parameters select the corresponding IO port, and the workpiece identification method is sensor, then the sensor trigger method can take effect. The trigger method is divided into two types: high level trigger (triggering when io signal is 1), low level trigger (triggering when io signal is 0)

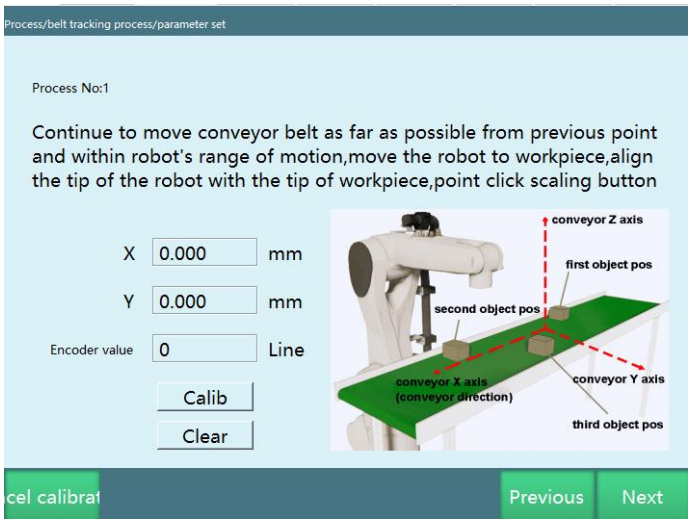
> Conveyor calibration

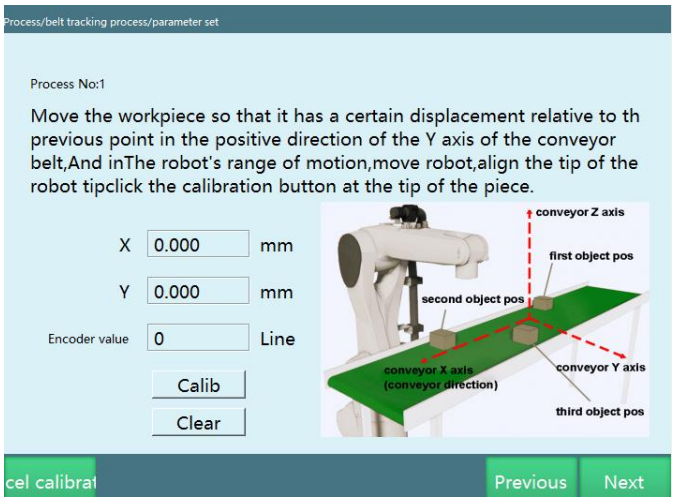
The user coordinate system is selected in the "Basic information", and it needs to be calibrated by the user in advance



Conveyor belt coordinate system calibration: calibrate 3 points, calculate the user coordinate system of the conveyor belt; click [Modify], and then click [Start calibration] button to enter the calibration interface



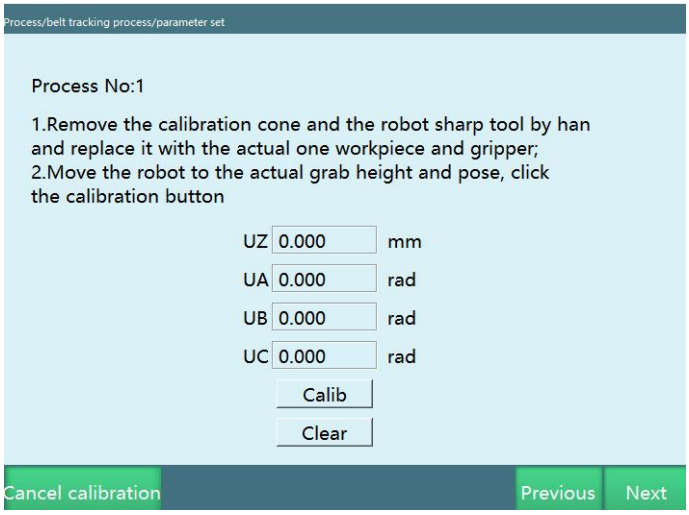




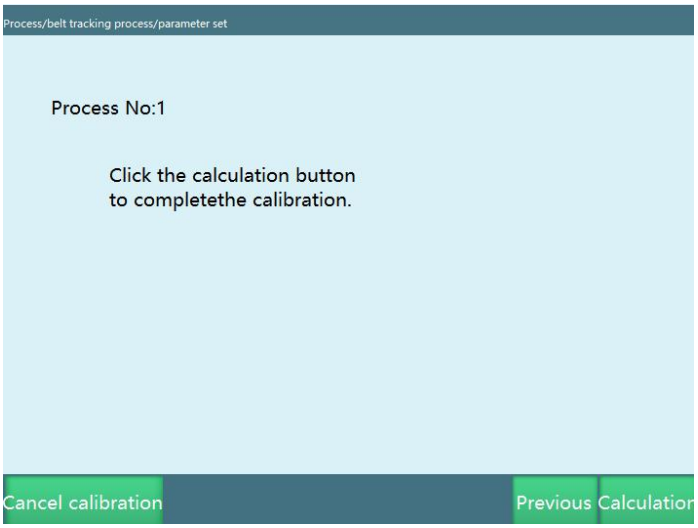
Step 1: Place a pointed calibration cone on the conveyor belt, move the conveyor belt so that the calibration cone on the conveyor belt moves within the motion range of the robot, move the robot to the workpiece so that the robot tool end tip is aligned with the tip of the calibration cone, click [Calibrate].

Step 2: Teach the robot to raise slightly , continue to move the conveyor belt so that the calibration cone on the conveyor belt is as far away as possible from the previous point and within the robot's motion range, move the robot to the calibration cone so that the robot tool end tip is aligned with the tip of the calibration cone, click the [Calibrate] button.

Step 3: Move the calibration cone so that it has a certain displacement in the positive direction of the Y-axis of the conveyor belt relative to the previous point, and within the motion range of the robot, move the robot so that the robot tool end tip is aligned with the tip of the calibration cone, click the [Calibrate] button.

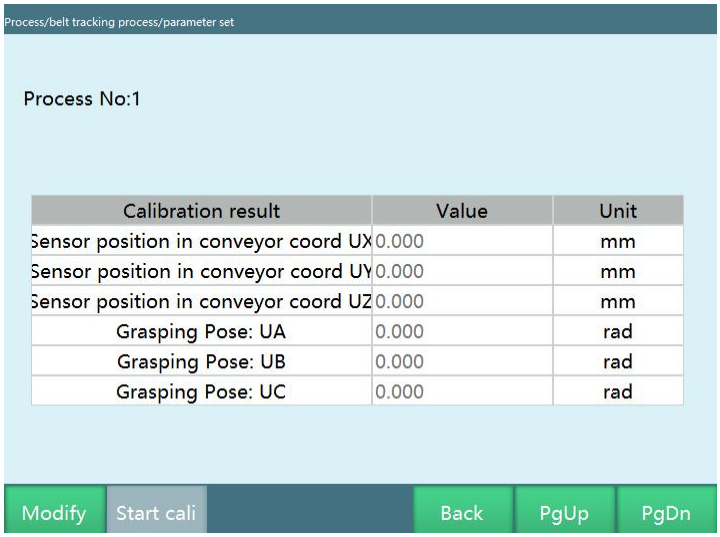


Step 4: Raise the robot for a certain distance, and click the [Calculate] button to complete the calibration.



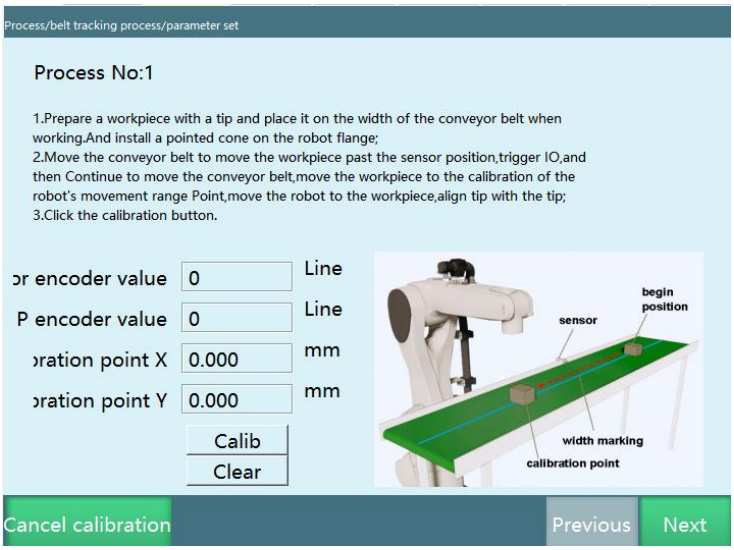
Note: The direction of the selected user coordinate system should be consistent with the calibration direction of the conveyor belt

> Sensor calibration

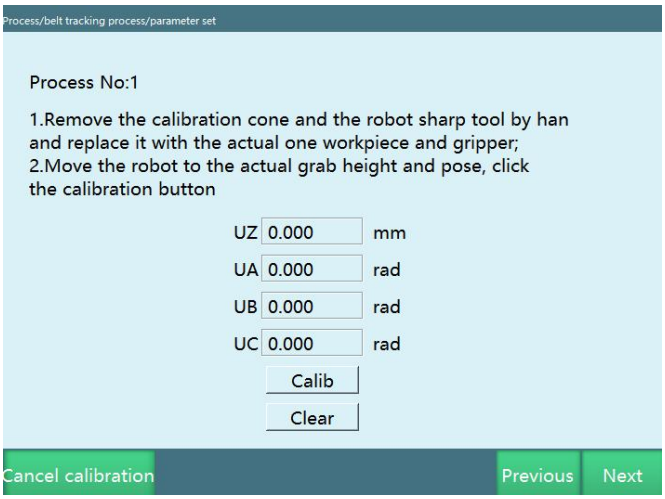


If you use the sensor to identify the workpiece, you need to calibrate the sensor on this interface; click [Modify], and then click [Start Calibration] button to enter the calibration interface.

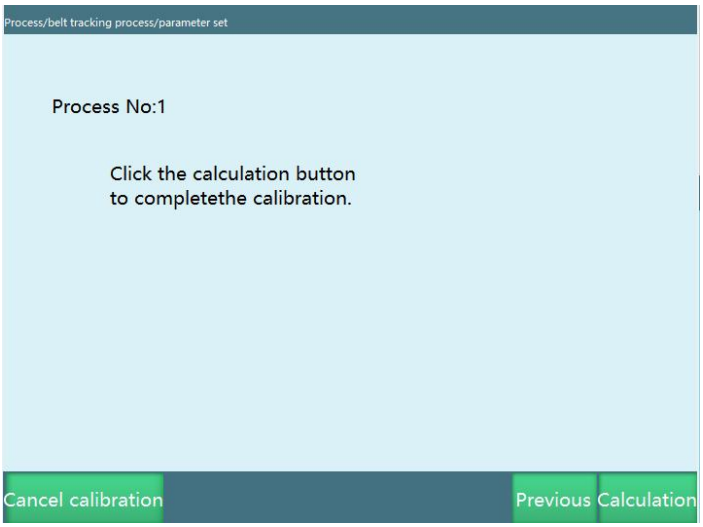
Note: If you use vision to identify the workpiece, then calibration is not required, just skip it.



Step 1: Prepare a workpiece with a tip, place it at the width of the conveyor belt at work, and install a pointed cone on the robot flange; move the conveyor belt so that the workpiece moves past the sensor position, trigger IO, then continue to move the conveyor belt to move the workpiece to the calibration point within the robot's range of motion, stop the conveyor belt, move the robot to the workpiece so that the tip aligns with the tip; click the [Calibrate] button.

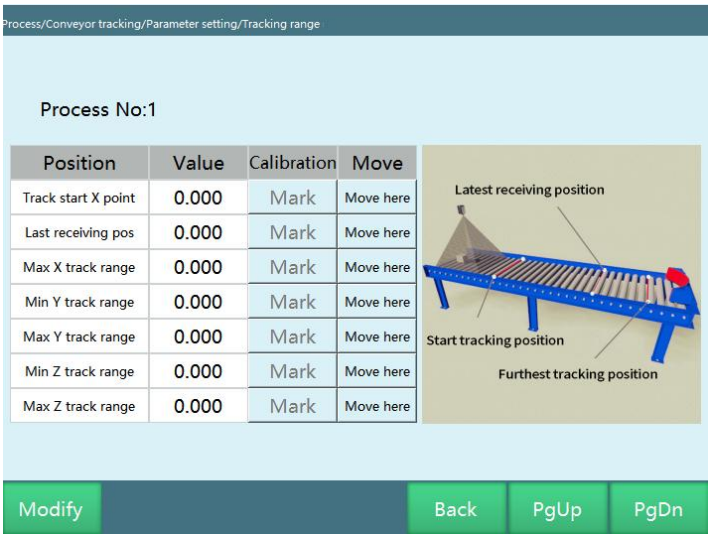


Step 2: Remove the calibration cone and the robot pointed tool hand and replace it with the actual workpiece and gripper; run the robot to the actual grasping height and attitude, and click the [Calibrate] button.



Step 3: Click the [Calculate] button, the calibration parameters are stored.

> Tracking range setting



This interface is used to set some key positions and tracking range of the robot during the tracking process

Tracking start X point

This parameter only records the value of the X-axis of the conveyor belt coordinate (the running direction of the conveyor belt), and the robot will track only when the workpiece exceeds this position during each tracking.

When the robot is in the previous tracking process, and the next workpiece has exceeded the tracking start X point, the robot will directly perform the tracking process for the workpiece after completing the previous tracking process.

If the robot does not perform the tracking process at this time, and the workpiece has not reached the position of the tracking start X point, the robot will wait at this position.

Tracking range X max

The maximum position of the tracking range on the X-axis of the conveyor belt (the running direction of the conveyor belt); the robot abandons tracking as soon as the position is exceeded, regardless of whether the workpiece is being tracked or not.

Tracking range Y min

The minimum position of the tracking range on the Y-axis of the conveyor belt (perpendicular to the running direction of the conveyor belt); if the workpiece does not reach this position, the robot does not track.

Tracking range Y max

The maximum position of the tracking range on the Y-axis of the conveyor belt (perpendicular to the running direction of the conveyor belt); if the workpiece exceeds this position, the robot does not track.

Tracking range Z min

The minimum height of the robot during tracking.

Tracking range Z max

The maximum height of the robot during tracking.

Latest receiving position

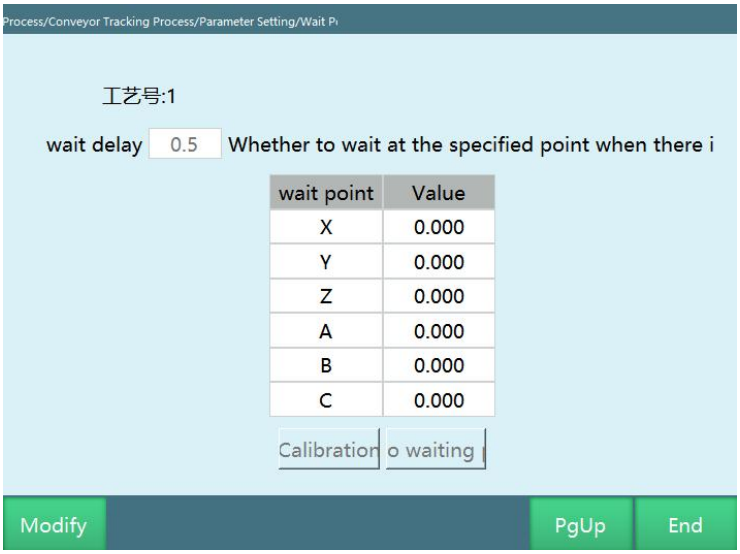
The latest receiving position of the workpiece on the conveyor X-axis (the running direction of the conveyor belt).

If the workpiece exceeds this position before being tracked, the robot will not track the workpiece.

Note: If you find that the calibration range is not reasonable, please reconfirm the calibration of the user coordinate system and check whether the direction of the selected user coordinate system is reasonable.

> Waiting point

During the tracking process, the robot will stay at the waiting point when there is no workpiece, and wait until the signal of workpiece is detected, then continue to track. If there is a workpiece, the robot will continue to track without going to the waiting point



Waiting delay: determine whether there is a workpiece within 0.5s, and continue to track if there is a workpiece. If there is no workpiece, the robot will go to the waiting point

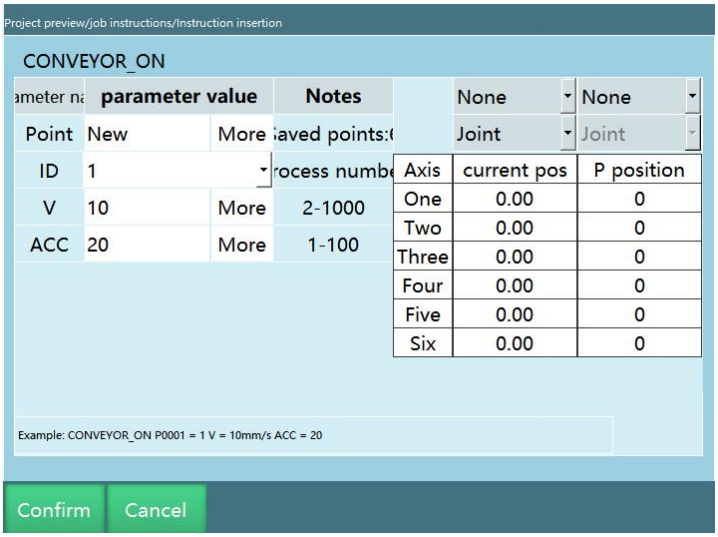
Calibrate this point: no matter what coordinate system the points are marked in, the saved points are still the points in the user coordinate system

Run to waiting point: run to the marked waiting point

Conveyor instructions

> CONVEYOR_ON instruction

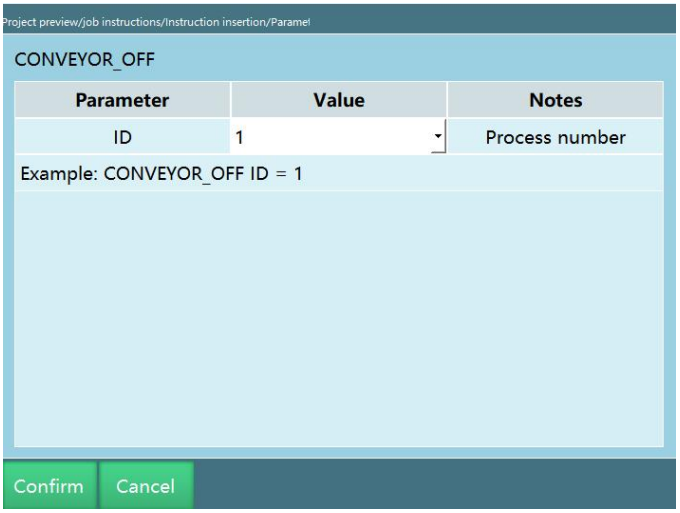
Conveyor tracking start instruction, which is used in combination with the CONVEYOR_OFF instruction



- Reference point position data
- You can select an existing position variable or create a new one.This point is the reference point in the conveyor tracking process and also determines the tracking height. It is recommended to set this point to the middle point of the workpiece to be tracked, or the first point of the trajectory if a trajectory needs to be taken on the workpiece.
- P point, GP point, workpiece point can be selected
- ID
- The process number of the conveyor tracking process.
- V
- Maximum speed during conveyor tracking, range 1-9999.
- ACC
- Acceleration during conveyor tracking, range 1-100.

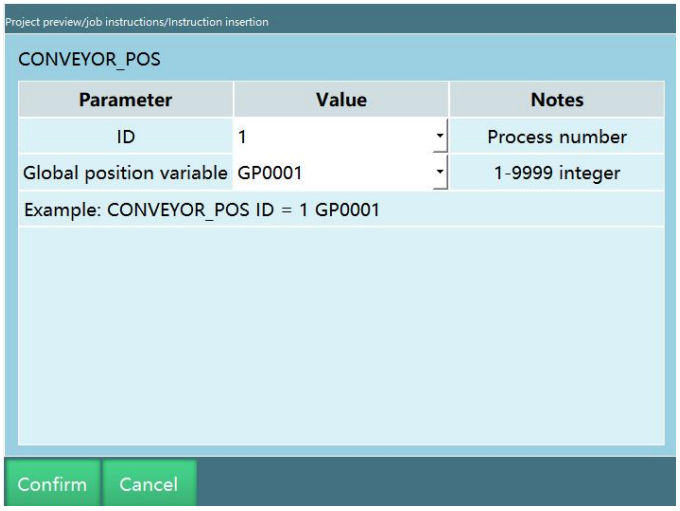
> CONVEYOR_OFF instruction

Conveyor tracking end instruction



> CONVEYOR_POS instruction

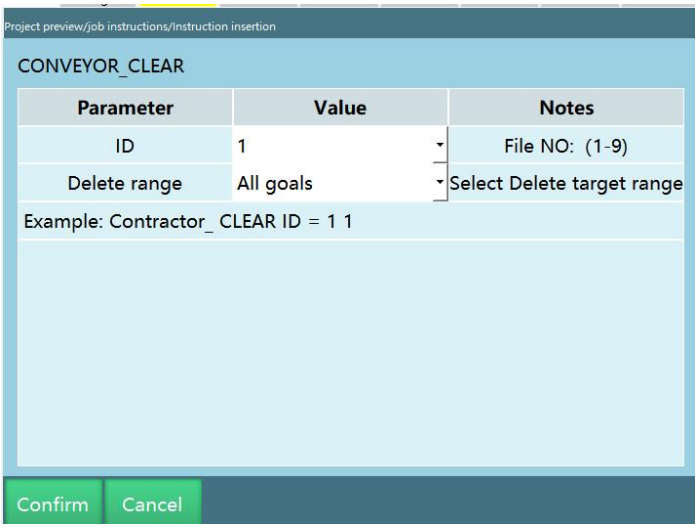
Instruction to get conveyor tracking position



When this instruction is executed, the sensor calibration result of the conveyor belt process number 1 is stored in the global point GP001.

> CONVEYOR_REMOVE instruction

Delete conveyor tracking target



Deletion range: all targets

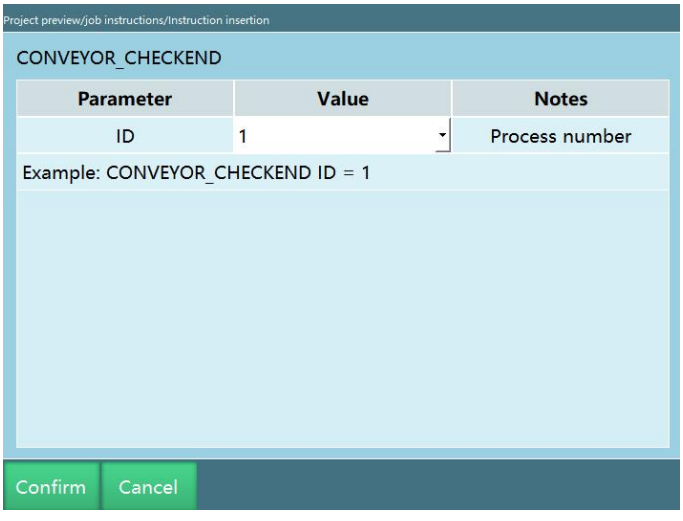
When the running program gives the conveyor tracking start signal multiple times, all but the first signal are deleted

Deletion range: this target

When the running program gives the conveyor tracking start signal multiple times, the first signal will be deleted during each loop

> CONVEYOR_CHECKEND instruction

Conveyor workpiece detection end instruction



> CONVEYOR_CHECKPOS instruction

Conveyor workpiece detection start instruction, which is used in combination with the CONVEYOR_CHECKEND instruction

Run the instruction and wait for the conveyor workpiece detection signal

Programming

Use the sensor, MOVJ to walk the track

NOP	
MOVJ P001 VJ = 20 % PL = 0 ACC = 20 DEC = 20	Move to starting safe position
CONVEYOR_CHECKPOS ID = 1	Start detecting external data
TIMER T = 1	Delay 1s
WHILE (GI001 == 1)	Inner loop, cycle tracking
CONVEYOR_ON G001 ID = 1 V = 100 mm/s ACC = 20	Start conveyor tracking
TIMER T = 1	Stay over the workpiece for 1s
MOVJ G002 VJ = 20 % PL = 0 ACC = 20 DEC = 20	Walk the track on workpiece
MOVJ G003 VJ = 20 % PL = 0 ACC = 20 DEC = 20	Walk the track on workpiece
MOVJ G004 VJ = 20 % PL = 0 ACC = 20 DEC = 20	Walk the track on workpiece
CONVEYOR_OFF ID = 1	End tracking
ENDWHILE	Cycle tracking
CONVEYOR_CHECKEND ID = 1	Stop detecting data
END	

Use the sensor, external point function to walk the track

When using this function, simply select "External point" at the position where P-point and G-point are selected when inserting the CONVEYOR_ON instruction, and insert the MOVCOMM instruction under CONVEYOR_ON.

NOP	
MOVJ P001 VJ = 20 % PL = 0 ACC = 20 DEC = 20	Move to starting safe position
CONVEYOR_CHECKPOS ID = 1	Start detecting external data
TIMER T = 1	Delay 1s
WHILE (GI001 == 1)	Inner loop, cycle tracking
CONVEYOR_ON OUTP ID = 1 V = 100 mm/s ACC = 20	Start conveyor tracking
TIMER T = 1	Stay over the workpiece for 1s
MOVCOMM	Use external point function to walk the track
CONVEYOR_OFF ID = 1	End tracking
ENDWHILE	Cycle tracking
CONVEYOR_CHECKEND ID = 1	Stop detecting data
END	

Vision conveyor tracking

When using this function, the workpiece is tracked by vision which is selected for workpiece detection signal source.

NOP	Start
INT I001 = 0	Define variable
MOVJ P008 VJ = 60 % PL = 0 ACC = 60 DEC = 60	Safety point
VISION_RUN ID = 1	Vision process 1 open
CONVEYOR_CHECKPOS ID = 1	Conveyor workpiece detection start
VISION_TRG ID = 1	Vision trigger
WHILE (I001 == 0)	Cycle grab
CONVEYOR_ON P005 ID = 1 V = 500 mm/s ACC = 50	Conveyor tracking start (trajectory point 1)
MOVL P003 V = 500 mm/s PL = 0 ACC = 50 DEC = 50	Trajectory point 2
MOVL P005 V = 500 mm/s PL = 0 ACC = 50 DEC = 50	Trajectory point 3
MOVL P004 V = 500 mm/s PL = 0 ACC = 50 DEC = 50	Trajectory point 4
MOVL P006 V = 500 mm/s PL = 0 ACC = 50 DEC = 50	Trajectory point 5
MOVL P007 V = 500 mm/s PL = 0 ACC = 50 DEC = 50	Trajectory point 6
MOVL P003 V = 500 mm/s PL = 0 ACC = 50 DEC = 50	Trajectory point 7
CONVEYOR_OFF ID = 1	Conveyor tracking end
ENDWHILE	Loop end
CONVEYOR_CHECKEND ID = 1	Conveyor workpiece detection end
VISION_END ID = 1	Vision end
END	Program end

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