![YASKAWA PARTNER SUPPORT - Shared Integration Experience]

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# Conveyor Tracking Setup

Conveyor Tracking Setup Procedure

1. If hardware was ordered during purchasing skip to step 9. If you need to install hardware please do so per your controller generations manual. (DX100, DX200, FS100, YRC1000 etc.) If not skip to step 9.

2. Wire your encoder to the tracking board (ACP02) per the manual. Also wire the home limit switch per the manual.

3. Boot into Maintenance Mode and select SYSTEM > SETUP > OPTION BOARD. In the option board menu select on ACP02 to show detailed settings.

4. Select USED and CONVEYOR TRACKING for the Sensor Function setting.
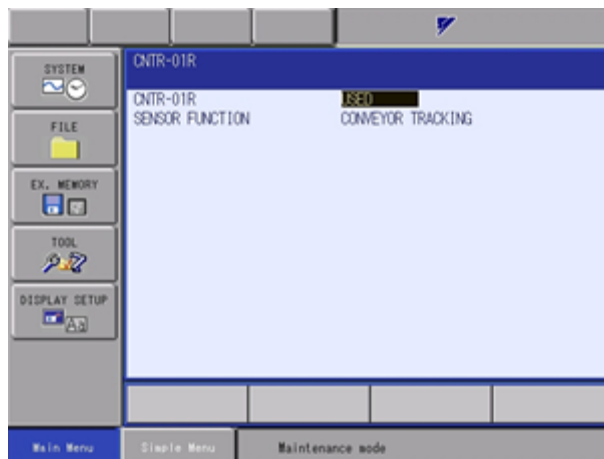
5. Select DETAIL set O (use) for R1. Press ENTER.

6. Press Enter again to return to the SETUP screen.
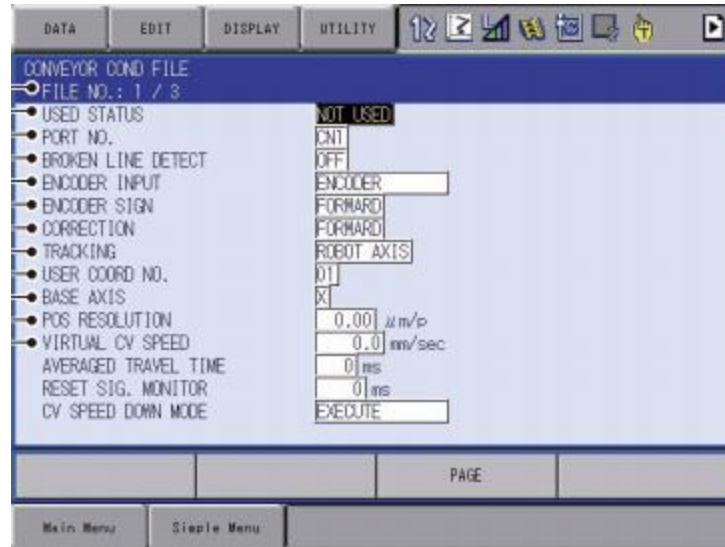
7. Cycle power on the system

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8. If the option was ordered after the robot shipment, please contact Partner Support for help with setting parameters.

9. Setup a proper TCP for the robot, and a pointer with a defined TCP. I generally set the last TCP in the list as my pointer, so it is not accidently selected during programming. If you have a 6 or 7 axis robot you can use the calibration menu in the TOOL menu to perform the 5-point calibration. If you have a 4-axis robot you can still use this function, but it is not as accurate with only 4 axes. If you have a delta robot (MPP3) the calibration function is not available and will require you to use CAD data or measure. This step is ***CRUCIAL***!! The pointer is used to accurately program user frames. The weight, center of gravity, and moment of inertia are extremely important to setup correctly on the work tool. These are used to calculate motion speed as well as acceleration and deceleration data for the motion path. Failure to properly calculate ***ALL*** tool data will result in increased chances of seeing excessive segment alarms during tracking, and over acceleration alarms with MPP3 manipulators. It can also cause excessive wear and premature failure of robot axis.

10. You will need to define a user frame on the conveyor to let the robot know the conveyors direction of travel when tracking. The XX of the UF will be used to define conveyor travel. Please make this as accurate as possible as this can cause the tracking to drift if not in line with the conveyor. This is where you will use your pointer.
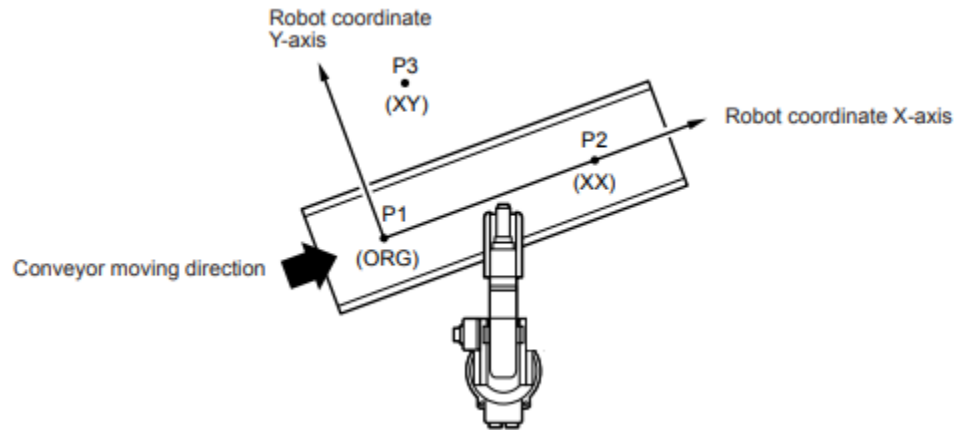
11. You will then need to setup your CONVEYOR CONDITION FILE. You will need to enter the port number you have wired your conveyor into. Your encoder input, encoder and correction sign, and your tracking axis. Robot or Base if you are on a base track. Please also input the conveyor UF that was taught. Once this is completed you can set to USED.

Note: A detailed explanation of each setting can be found in the manual provided.

12. We need to calculate the conveyor resolution of the encoder for accurate tracking. Before doing this create a simple program with SYEND in the job. Run this as the SYEND command will need to be seen by the robot to allow the LS to be looked at. Place a part right at the edge to where the home LS is just turned on. This will set your encoder count to 0. If not, please note the current pulse count as this will be referenced as C1. This can be found under ROBOT > CV MONITOR.   I find it easier to put a part down and manually move the conveyor until the part reaches the home limit switch. This allows for ease of control, and finer precision than just trying to turn the conveyor off.

13. Move the conveyor as far as you can but can still reach the part with the robot. The manual states 1m, but if you can move further that will help get a better resolution. This distance will need to be recorded (in millimeters) and will be referenced to as L. Please also take note of the conveyor pulse count, as this will be referenced to as C2.

14. The conveyor resolution can now be calculated with the data that has been recorded.

$$\text{Resolution} = \frac{L \times 1000000}{C2-C1} \quad (\mu/pulse)$$

You will then need to enter this number into the conveyor condition file and set to USED.

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15. You will need to write a simple tracking job to check and confirm the resolution. Create a simple job and have a SYMOVL with a timer after it. Program that position on a corner or somewhere easily identifiable on the part.

```
0000  NOP
0001  MOVJ  VJ=25.00
0002  MOVL  V=300.0
0003  SYSTART  CV#(1)  ST=10.000
0004  SYMOVL  V=200.0  CV#(1)  CTP=100.000
0005  TIMER  T=10.00
0006  SYMOVL  V=200.0  CV#(1)  CTP=100.000
0007  SYEND  CV#(1)
0008  MOVJ  VJ=25.00
0009  END
```
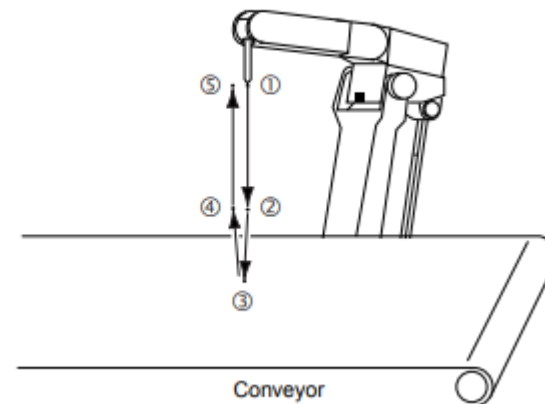
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16. You'll want to run this and watch the robot while tracking. If while tracking the robot drifts behind the point, you'll need to adjust the resolution higher. If while tracking the robot drifts in front of the part, you will need to adjust the resolution lower. Do this until the robot does not drift and holds its point while tracking.

17. The main setup of conveyor tracking is now complete. You can now set any additional settings that need to be set to complete your application. For example, if you are going to que parts, you will need to go to the START SHFIT menu and set how many parts you want to be queued. This is set as MAX WORK CNT. Make sure START SHIFT DISTANCE is set to 0(we will be setting the STP instead), and the status is set to USED.

When programming with Conveyor Tracking there are a few general rules to follow.

When programming a part, please let the part pass the limit switch. This will set the encoder count to 0 for that tracking instance and then will continue to track the pulse counts of the encoder. Let the part move to the working area and stop the conveyor. The tracked portion of the job needs to be under the SYSTART and above the SYSEND. The robot motion that is tracked needs to be SYMOV as well. To change a MOVL to a SYMOVL press SHIFT + MOTION TYPE.

When you program a part, you'll get a few new tags on your motion. CV# is which condition file you will be referencing, and CTP is the Conveyor Taught Position. This is extremely important to tracking. DO NOT MODIFY these unless you completely understand the impact it will have. All the CTP numbers should be the same in the tracking section. Anytime you modify a tracking move the CTP will update with the current conveyor position. I generally have people modify all the positions that way the CTP matches and you don't have issues while tracking. We want to minimize the amount of time we speed tracking, so there should be few moves here.

On the SYSTART command you'll also have ST or STP. This is the point in which the robot will start tracking. Generally, the limit switch is placed up stream of the robot. The distance from the switch to the robot's work area is the STP. The robot will sit at the SYSTART and wait until the conveyor reaches your desired starting position.

If you have an FS100 controller, you MUST run the commands after a powerup to let the controller start looking for the home limit switch signal. It should look like this. If you have queuing enabled, if so, you will have the CVQUE command, you should always have an SYEND before and after it like below.

```
0000 NOP
0001 SYEND CV#(1)
0002 CVQUE CV#(1)
0003 SYEND CV#(1)
```

If you set EXCESSIVE SEGMENT alarms as soon as your start tracking, try to bump your AVERAGED TRAVEL TIME up to about 200ms, this should help with the alarm. If it persists, make sure the que is clear from the last instance. You can also try to change the pounce position slightly to help keep from getting this alarm.

Here is the layout for a basic tracking job.

Instruction	Explanation
NOP	
SYEND CV#(1)	Resets the conveyor home-position registered status. After then, a conveyor home-position limit switch signal is accepted.
MOVJ	After the job is started, the manipulator moves to its stand-by position.
SYSTART CV#(1) STP=100.000	Conveyor synchronization start instruction If the conveyor reaches the specified position (ex.: 100 mm), the conveyor synchronization starts.
GETS B000 $B008	Convents system variable $B008, which indicated whether the synchronized operation starts normally or not, to B000. Normal if B000 = 1, abnormal if B000 = 0.
JUMP *END IF B000=0	If B000 is 0 (synchronized operation could not start due to an error), jump to the label "*END".
SYMOVL CV#(1) CTP=50.000 | | | SYMOVL CV#(1) CTP=50.000	Conveyor synchronized move instruction Moves in conveyor synchronized status.
*END	Jump destination in case of failure in normal starting of conveyor synchronized operation
SYEND CV#(1)	Ends the conveyor synchronized operation.
MOVJ END	The manipulator returns to the stand-by position. End.