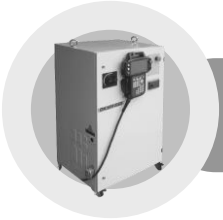
HYUNDAI
HEAVY INDUSTRIES CO.,LTD.

WARNING

INSTALLATION SHOULD ONLY BE PERFORMED BY QUALIFIED INSTALLATION PERSONNEL AND MUST CONFORM TO ALL NATIONAL AND LOCAL CODES

Hyundai Robot

Hi5CS120701FMEN2



Hi5 Controller Function Manual

Conveyor Synchronization

HYUNDAI
HEAVY INDUSTRIES CO.,LTD.

HYUNDAI
HEAVY INDUSTRIES CO.,LTD.

Printed in Korea – July. 2012. 2nd Edition

HYUNDAI
HEAVY INDUSTRIES CO.,LTD.

Contents

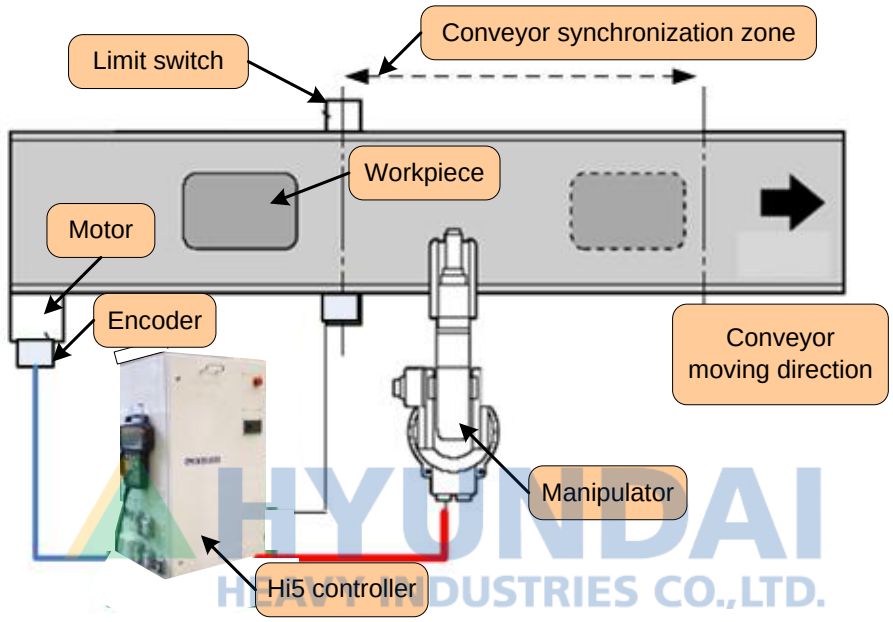
HYUNDAI
HEAVY INDUSTRIES CO.,LTD.

1 Introduction

Conveyor synchronization function refers to the operation of robot tracking the conveyor for the moving workpiece installed on the conveyor.

1.1. System configuration

Generally the conveyor synchronization system is configured as follows.

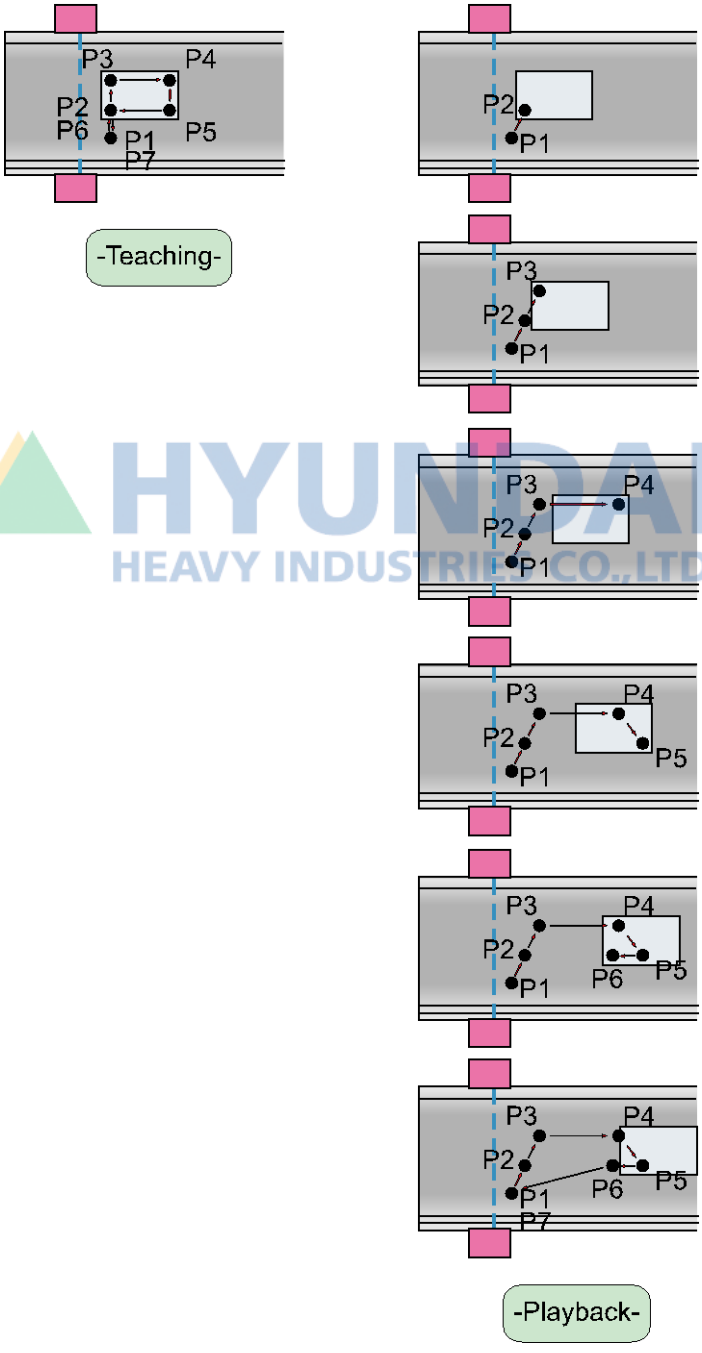


- **Limit switch**
  This is the device that notifies the controller that the workpiece has entered a specific location on the conveyor. Location of the limit switch becomes the reference point to judge the location of the workpiece on the conveyor.

- **Encoder**
  The conveyor driver is connected to the encoder that generates the applicable pulse for the rotation of the motor. And this encoder is connected to the robot controller for the robot controller to read the pulse from the conveyor.

1.2. Logic of conveyor synchronization

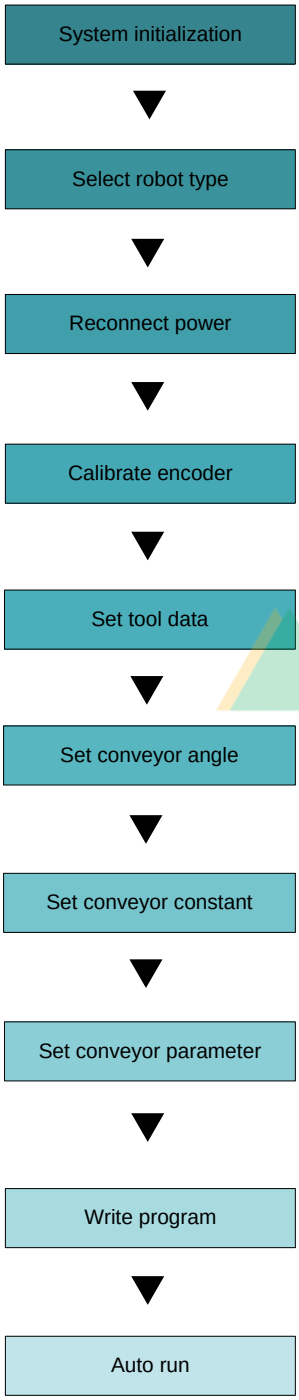
When playback the trace P1~P7 (P2~P6 is for conveyor synchronization) taught when the conveyor is in stopped condition as shown in the following picture, the movement of the workpiece is calculated from the limit switch for the workpiece installed on the conveyor and then added to the reference location for playback. For this, the robot must be synchronized to the changing conveyor speed to maintain the relative location and position between the workpiece and the tool.



1.3. Key specification

Item	Specification
Conveyor parameter setting file	ROBOT.CON
Number of conveyors that can be synchronized	2 conveyors
Conveyor type	Linear, arc
Conveyor angle setting	Support auto setting method
Pulse input type	Open collector, line drive
Pulse counting type	Up, Up/Down
Conveyor constant setting	Support auto setting method
Permitted number of multiple workpieces	100 units (Per conveyor)
Conveyor length that can be synchronized	21m
Interpolation type supported within synchronized zone	Linear (L), Arc (C)

1.4. Operating order



Run system initialization
(『[F2]: System』 → 『5: Initialize』 → 『1: System format』)
* Refer to Hi5 controller operating manual

Register robot type and number of additional axes
(『[F2]: System』 → 『5: Initializee』 → 『2: Robot type Selection』)
* Refer to Hi5 controller operating manual

Register encoder zero point
(『[F2]: System』 → 『3: Robot parameter』 → 『4: Encoder offset』)
* Refer to Hi5 controller operating manual

Load calculation function, axis constant and tool length optimization
(『[F2]: System』→ 『6: Automatic constant setting』 → 『4: Load estimation function』)
(『[F2]: System』→ 『6: Automatic constant setting』 → 『1: Optimize axis constant and tool length』)
* Refer to Hi5 controller operating manual

Automatically set the conveyor angle
(『[F2]: System』 → 『4: Application parameter』 → 『4: Conveyor synchronization』
→ 『2: 1st conveyor parameter』 → 『[F1]: Angle set』)

Automatically set the conveyor constant
(『[F2]: System』 → 『4: Application parameter』 → 『4: Conveyor synchronization』
→ 『2: 1st conveyor parameter』 → 『[F2]: Cnst set』)

Set various parameters for conveyor synchronization function
(『[F2]: System』 → 『4: Application parameter』 → 『4: Conveyor synchronization』)
1: Environment setting
2: 1st conveyor parameter
3: 2nd conveyor parameter
4: Input signal assign
5: Output signal assign

Write work program
* Conveyor synchronization using CNVYSYNC
* Workpiece standby using WAITCNVY

HYUNDAI
HEAVY INDUSTRIES CO.,LTD.

2

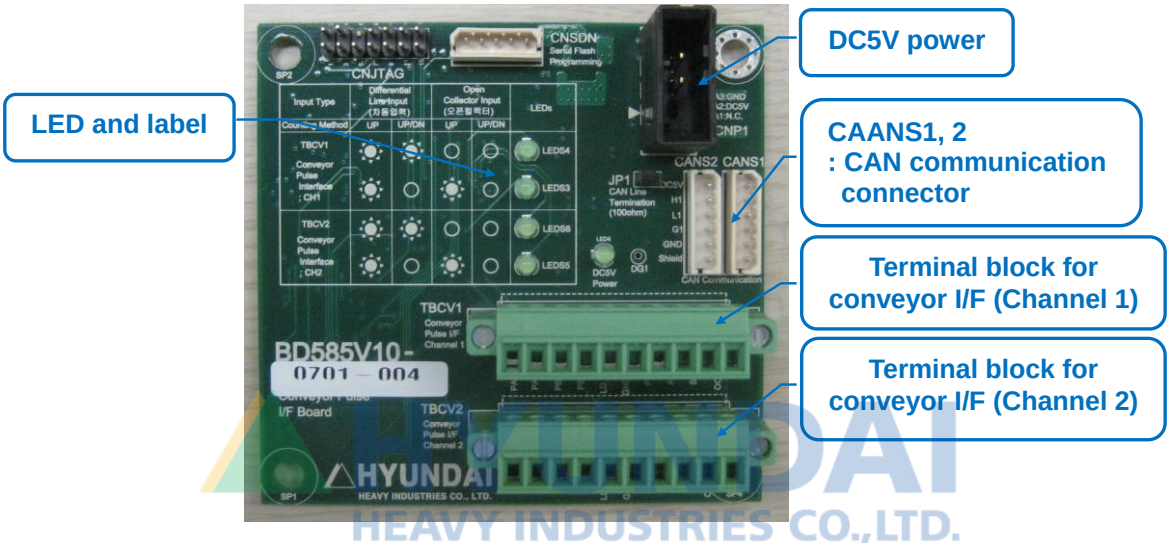
System Configuration and Connection

2.1. Conveyor I/F board

For details, refer to 『Hi5 Controller Maintenance Manual』.

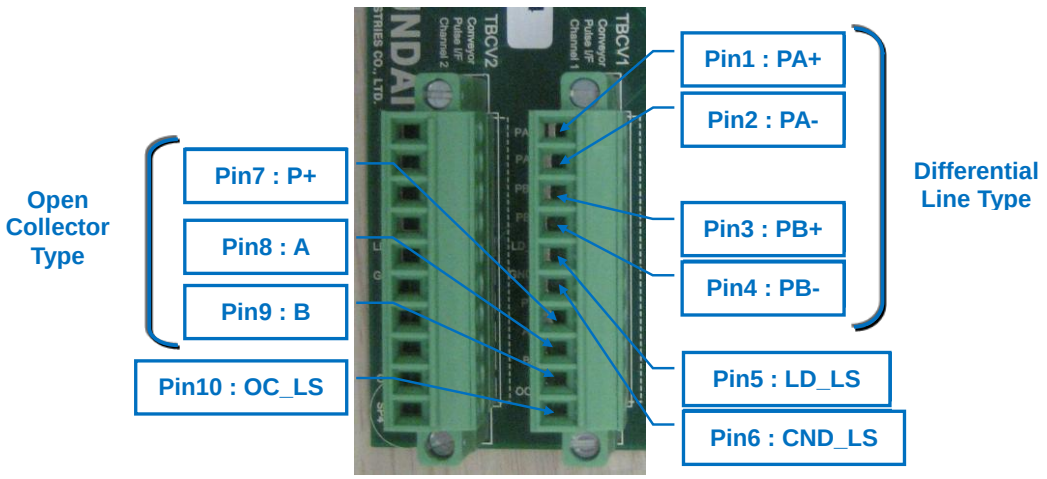
2.1.1. Introduction

The following shows how the conveyor I/F board (BD585) is structured.



2.1.2. Terminal block (TBCV1, TBCV2)

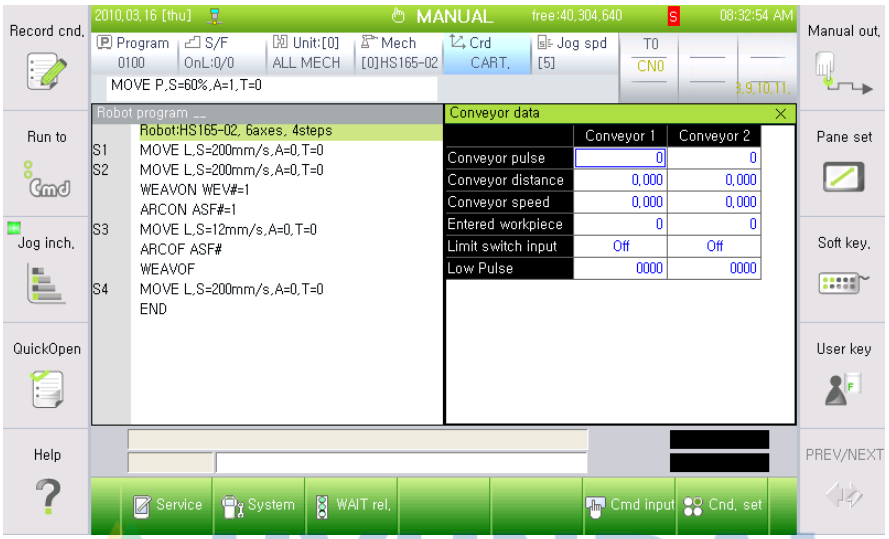
Connection specification of the terminal block connected to the conveyor I/F board and external device is as follows.



Terminal name	PIN number	Description	Input specification
PA+,PA-	1, 2	Line drive type Conveyor A phase pulse input	0 ~ 5V,100kHz or below
PB+,PB-	3, 4	Line drive type Conveyor B phase pulse input	0 ~ 5V,100kHz or below
LD_LS	5	Line drive type Limit switch input for workpiece detection	0 ~ -30V
GND_LS	6	Line drive type Power GND input	0V
P+	7	Open collector type Power input	20 ~ 30V
A	8	Open collector type Conveyor A phase pulse input	0 ~ -30V,100kHz or below
B	9	Open collector type Conveyor B phase pulse input	0 ~ -30V,100kHz or below
OC_LS	10	Open collector type Limit switch input for workpiece detection	0 ~ -30V

2.2. Hardware check

When you select 『[F1]: Service』 → 『1: Monitoring』 → 『5: Conveyor data』, you can check the data related to conveyor synchronization.



- **Limit switch**
  “Limit switch input” item is normal if it is ON when the limit switch is operating and OFF when not. If it is not operating normally, check the hardware.

- **Encoder**
  “Low Pulse” item continuously increases or decreases in the range of 0 ~ FFFF” when the encoder pulse is entered normally. If it is not operating normally, check the hardware.

3 User Interface

3.1. Conveyor angle auto setting

For the robot to synchronize the moving conveyor, the robot must understand which direction the conveyor is moving within which robot coordinate.

When the direction of the conveyor is set arbitrarily, it requires time to measure the location the conveyor is moving accurately, and in this case, the auto calculation function of the conveyor angle can be used.

3.1.1. Program teaching

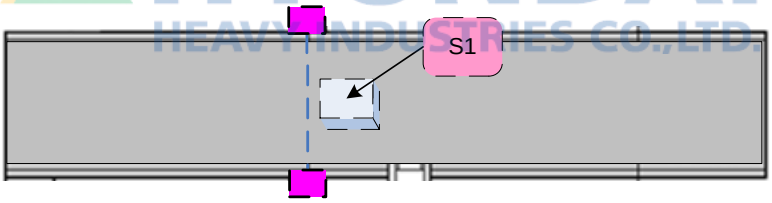
To automatically calculate the conveyor angle, first the program for auto calculation must be prepared as follows.

If the shape of the conveyor is circular, locations of 3 points are required to calculate the angle. Repeat step (3) one more time below.

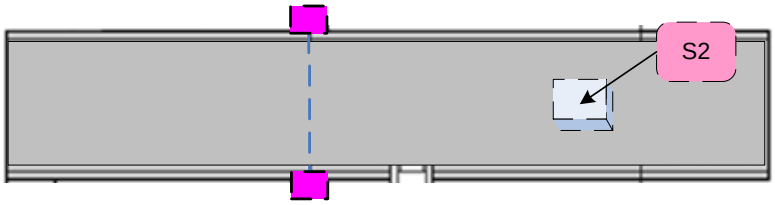
To set the angle accurately, select locations that are far apart as much as possible. (Linear distance: 1m or above)

(1) Select a new program to automatically calculate the conveyor angle.

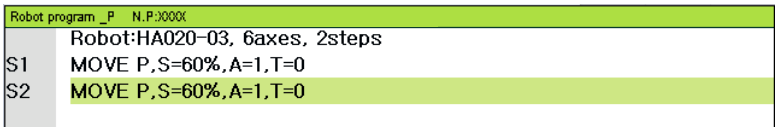
(2) After moving the tool end of the robot to a specific location of the workpiece on the conveyor, record S1.



(3) Operate the conveyor to move the workpiece and move the tool end of the robot to the specific location of (2), and then record S2.



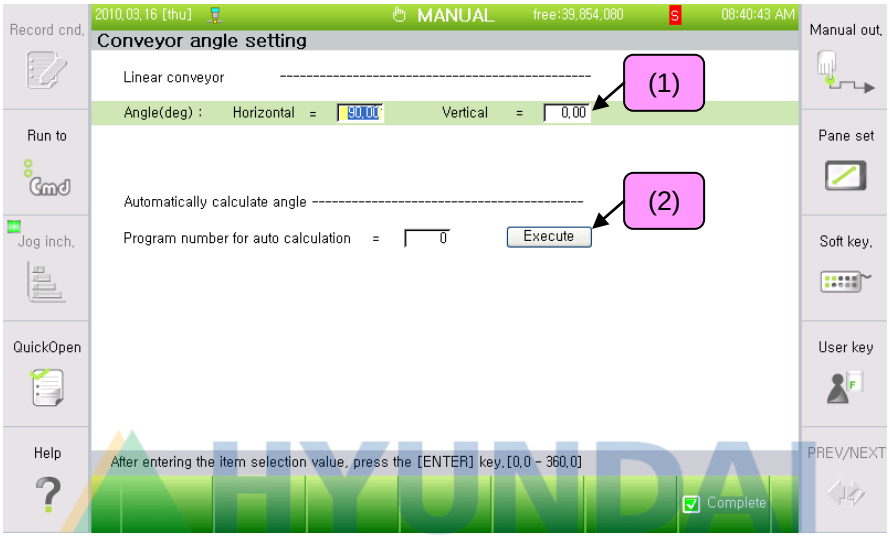
(4) The following program will be prepared.



3.1.2. PC side setting

When you click on 『[F2]: System』 → 『4: Application parameter』 → 『4: Conveyor synchronization』 → 『2: 1st conveyor parameter』 and select 『[F1]: Angle set』, the following screen will be displayed.

If the conveyor type is set to <Circle>, the following detail of (1) will be changed to set the angle and center of the circular conveyor.



(1) You can check and manually set the angle of the currently set conveyor.

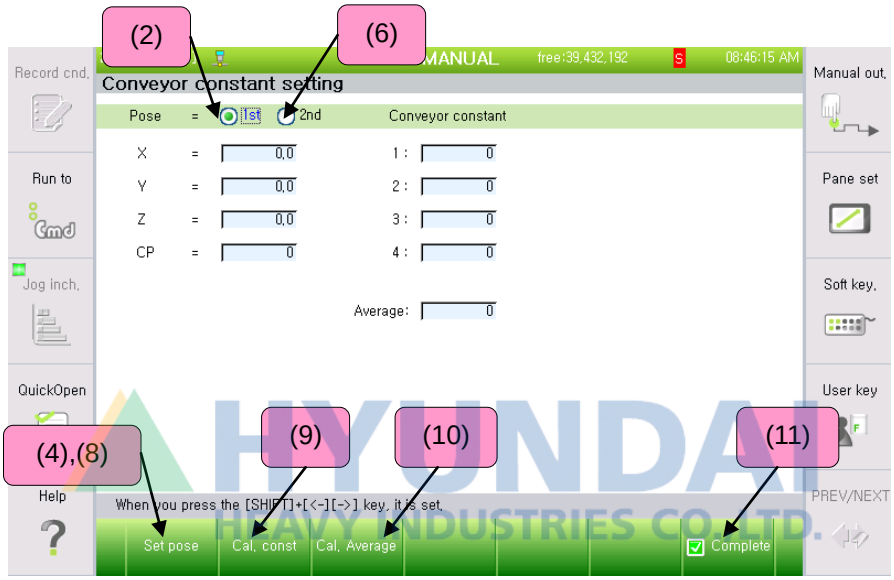
(2) To automatically calculate the conveyor angle, enter the taught program number and press the [Execute] button. The calculate result will be displayed in (1).

(3) Press the 『[F7]: Complete』 key to save the setting.

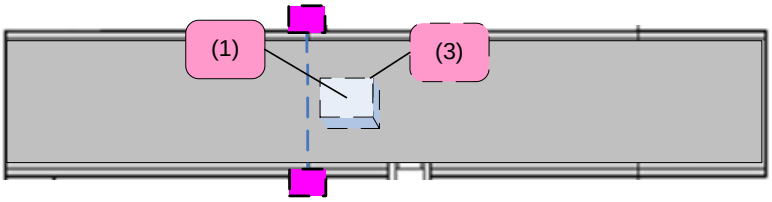
3.2. Conveyor constant auto setting

Conveyor constant refers to the number of pulses generated when the conveyor moves 1m for the linear type and 1deg for the circular type.

To automatically calculate the conveyor constant, click on 『[F2]: System』 → 『4: Application parameter』 → 『4: Conveyor synchronization』 → 『2: 1st Conveyor parameter』 and then 『[F2]: Cnst set』.



(1) After the workpiece passes the limit switch as shown below, the conveyor stops.

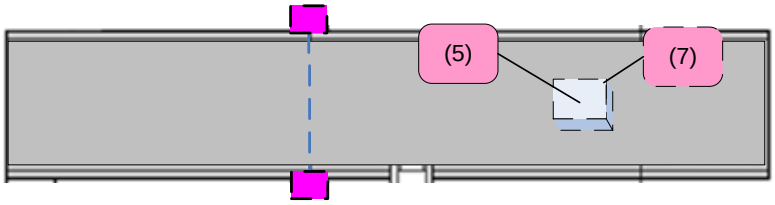


(2) Select <1st> as location.

(3) Move the tool end of the robot to the specific location of the workpiece on the conveyor.

(4) When you press 『[F1]: Set pose』, the conveyor pulse value will be recorded with the current location of the robot.

(5) Operate the conveyor to move the workpiece as shown below. (1m or above)



(6) Select <2nd> as location.

(7) Move the tool end of the robot to the specific location designated in (3).

(8) When you press 『[F1]: Set pose』, the conveyor pulse value will be recorded with the current location of the robot.

(9) When you press 『[F2]: Cal. const』, the conveyor constant will be calculated and recorded in the conveyor constant item.
When you repeat the process of (1) ~ (9), you can calculate total of 4 conveyor constants.

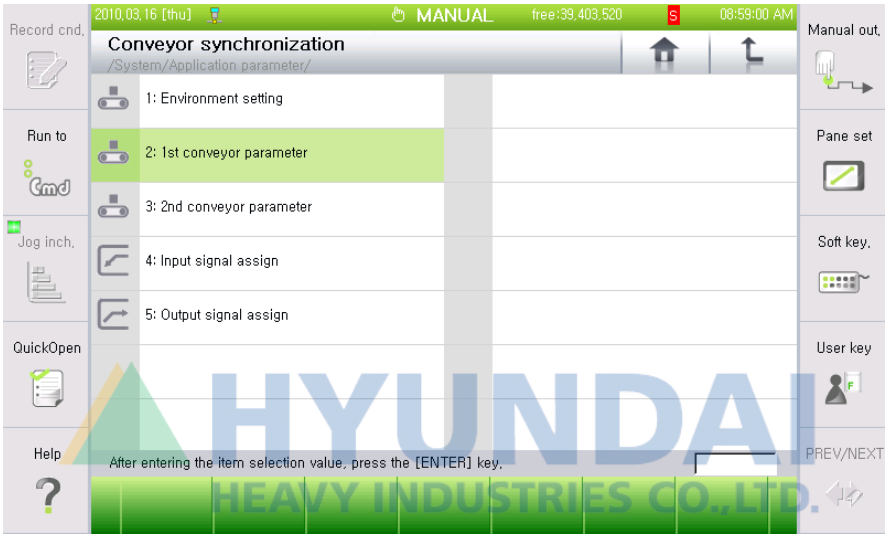
(10) When you press 『[F3]: Cal. Average』, the average of the recorded conveyor constants will be calculated.

(11) When you press 『[F7]: Complete』, the average value will be registered as the conveyor constant.

3.3. Conveyor parameter

To playback the robot by applying the conveyor synchronization function, various types of information of the conveyor must be known. Entering this information to the controller is called the conveyor parameter setting.

Therefore conveyor parameter setting must be done prior to preparing the work program and can be done in 『[F2]: System』 → 『4: Application parameter』 → 『4: Conveyor synchronization』 → 『2: 1st conveyor parameter』.



3.3.1. Environment setting

■ **Conveyor operation**

- **Normal**
  Robot operates while synchronized to the workpiece on the operating conveyor.

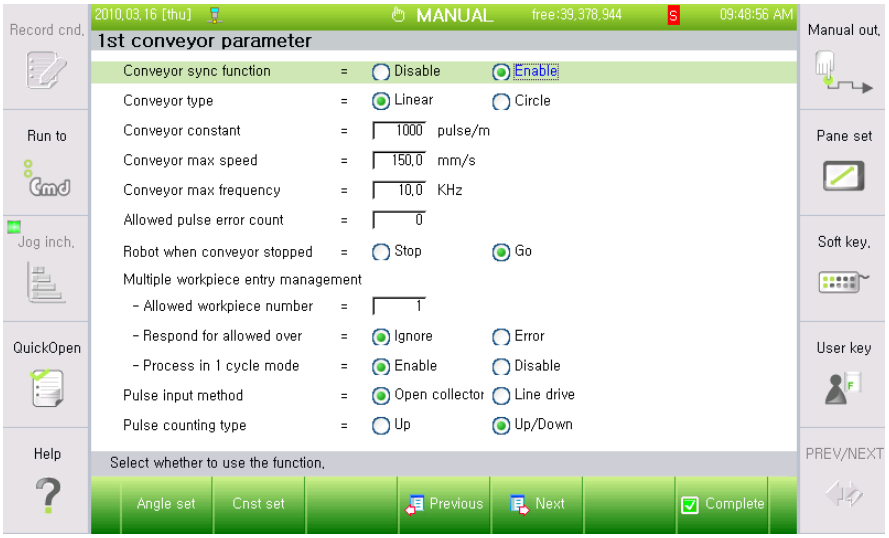
- **Simulation**
  Conveyor does not operate but the robot operates at the conveyor simulation speed set by the user. You can check the soft limit and cycle time of the robot.

- **Test**
  Conveyor does not operate and you can check the robot operation by the entered conveyor data. Test is used for checking the work location after the teaching is completed. Because the conveyor pulse counter is not cleared after executing the program END command, you can check the operation of the robot with the workpiece on the conveyor in stopped condition.

Signal processing during conveyor operation by operation type

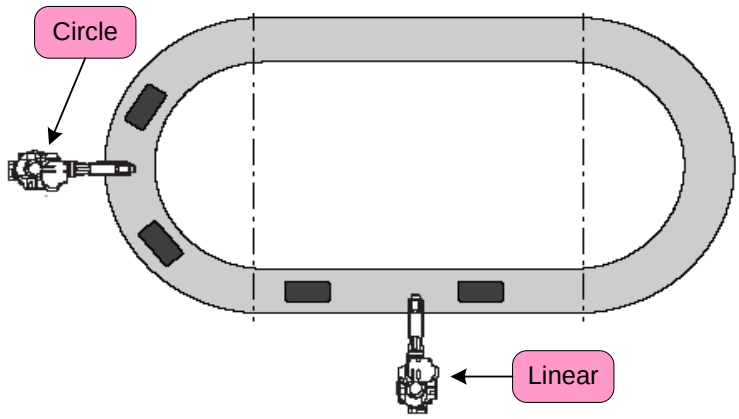
	Signal during conveyor operation	
	On	**Off**
Normal	Normal	Stop or Execution (Setting by user)
Simulation/Test	Error	Normal

3.3.2. Conveyor parameter



■ **Conveyor synchronization function**
Select whether to use the conveyor synchronization function.

■ **Conveyor type**
Refer to the following picture to select the conveyor type.



■ **Conveyor constant**
Conveyor constant is defined as the number of pulses generated when the conveyor moves 1m for the linear type and 1deg for the circular type.

To automatically calculate the conveyor constant, refer to 『3.2. Conveyor constant auto setting』.

■ **Conveyor max speed**
This is the item to generate the error if the conveyor speed is abnormally high. Considering the general speed of the conveyor to use, the speed of the conveyor is calculated internally. And if this speed is higher than the conveyor permitted speed, error is generated.

Generally conveyor pulse has some ripple based on the average value, and the conveyor speed also has some ripple based on the average value. Therefore, considering this, set the speed slightly higher than the conveyor speed.

■ **Conveyor max frequency**
Set the maximum number of normal pulses generated from the pulse generate in 1 second. The robot controller calculates the number of input pulses for 1 second and generates an error when this exceeds the conveyor permitted frequency assuming that it is incorrect data from noise etc.

- **Allowed pulse error count**
  When the conveyor pulse is inputted abnormally, the robot controller generates an error message of “E0019 Conveyor pulse count changed a lot”. At this time, you can use this setting to set the robot to continue to work even when the pulse error is generated to protect the workpiece in synchronized work.

  For example, if you set the number of times to ignore pulse detection error to 3, the robot controller does not generate the error up to 3 times for the pulse error of one workpiece during the conveyor synchronization work, and internally generates an appropriate pulse value. And then when the 4th pulse error is detected, the error will be generated. The information of how many pulse errors occurred is reset when the playback is completed for the applicable workpiece.

- **Robot when conveyor stopped**
  When the signal has no input during conveyor operation in normal mode, that is, when the conveyor stops, this sets the condition to decide the operation of the robot.

- **Multiple workpiece entry management**
  This sets how to process the robot when another workpiece enters the work zone by passing the limit switch while one workpiece is in synchronized process.

- **Allowed workpiece number**
  This sets the maximum number of permitted workpiece.

- **Response for allowed over**
  Select whether to ignore or stop as error when the number of workpiece exceeds the maximum permitted number of workpiece.

- **Process in 1 cycle mode**
  Select whether to process the workpiece when the condition setting/operating mode is set to <1 cycle>.

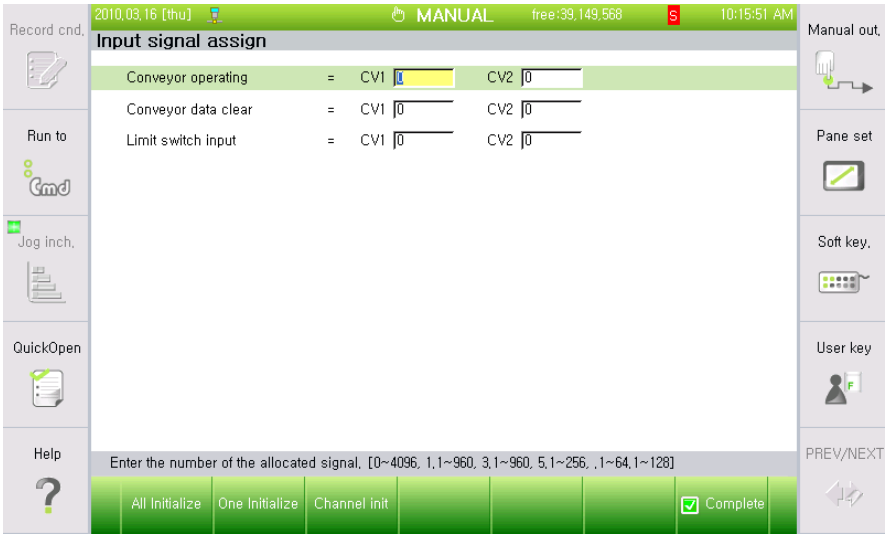
- **Pulse input method**
  Select the input type for the conveyor pulse entered to the conveyor interface board.

- **Pulse counting type**
  Select <Up> if you want to count in forward direction even when the direction of the conveyor has been reversed.

■ **Detect conveyor related error**
This sets not to generate the system error related to conveyor synchronization to operate the process irrelevant from the synchronization work when the system error related to conveyor synchronization is generated due to incomplete system installation or board damage etc., and the robot cannot be set to operation standby ON condition.

Error number	Type of synchronization system error
E0017	Conveyor pulse line trouble
E0019	Conveyor pulse count changed a lot
E0020	Conveyor I/F board connection error
E0021	Conveyor speed is too high

3.3.3. Input signal assign

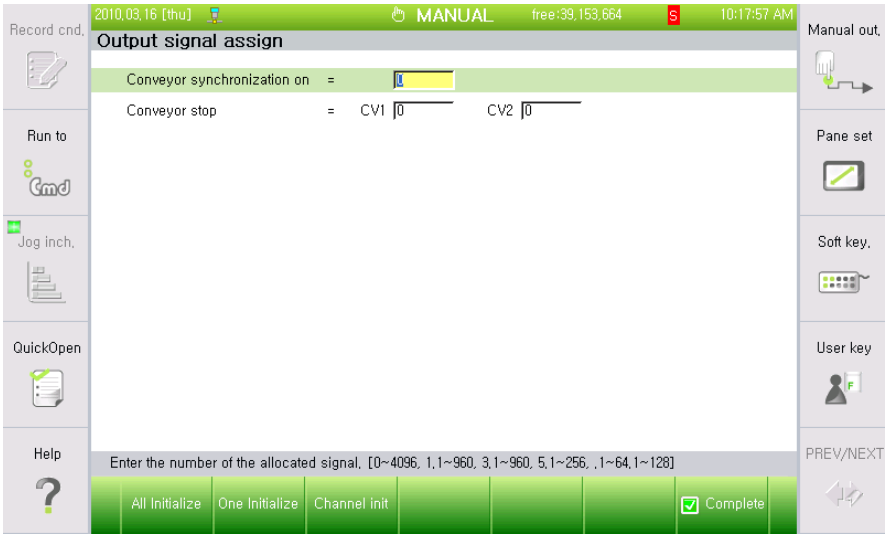


- **Conveyor operating**
  This signal must be inputted in normal mode in conveyor synchronization playback zone, but this signal must not be inputted in test or simulation mode.

- **Conveyor data clear**
  This can clear the conveyor data by external input signal. When this signal is entered while the robot is in stopped condition, the conveyor data (CP, CD, CS) will be cleared.

- **Limit switch input**
  This can receive the conveyor limit switch condition by the external input signal. If the input signal is not registered, the limit switch condition entered through the conveyor I/F board will be used.

3.3.4. Output signal assign



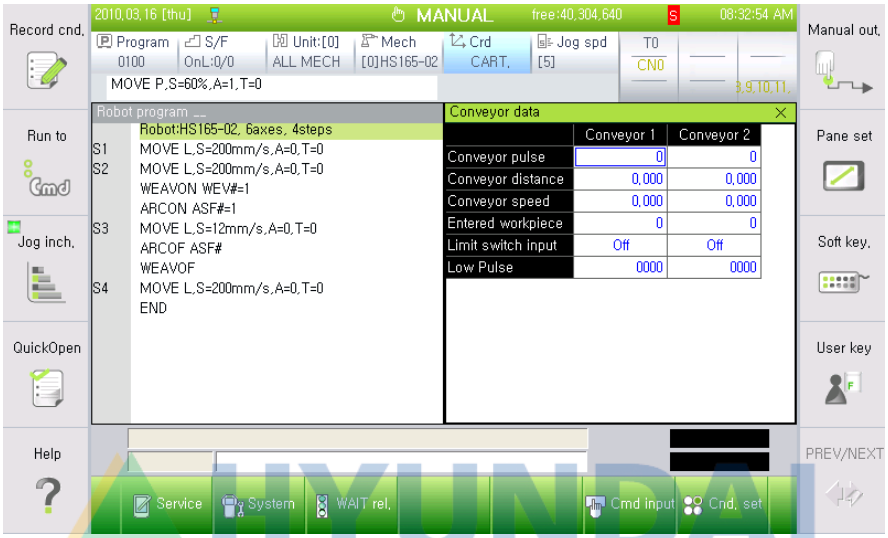
- **Conveyor synchronization ON**
  This outputs conveyor synchronization playback ON/OFF condition. When conveyor synchronization playback ON command is executed, the signal output will be ON and when conveyor synchronization playback OFF or RESET command is executed, the signal output will be OFF.

- **Conveyor stop**
  If the signal during the conveyor operation by input is in OFF condition, the detection is notified externally.

3.4. Monitoring

3.4.1. Conveyor data

When you select 『[F1]: Service』 → 『1: Monitoring』 → 『5: Conveyor data』, you can check the data related to conveyor synchronization.



- **Conveyor pulse (CP)**
  This parameter manages the number of pulse received from the pulse generator.

- **Conveyor distance (CD)**
  This parameter shows the distance of workpiece from the limit switch.

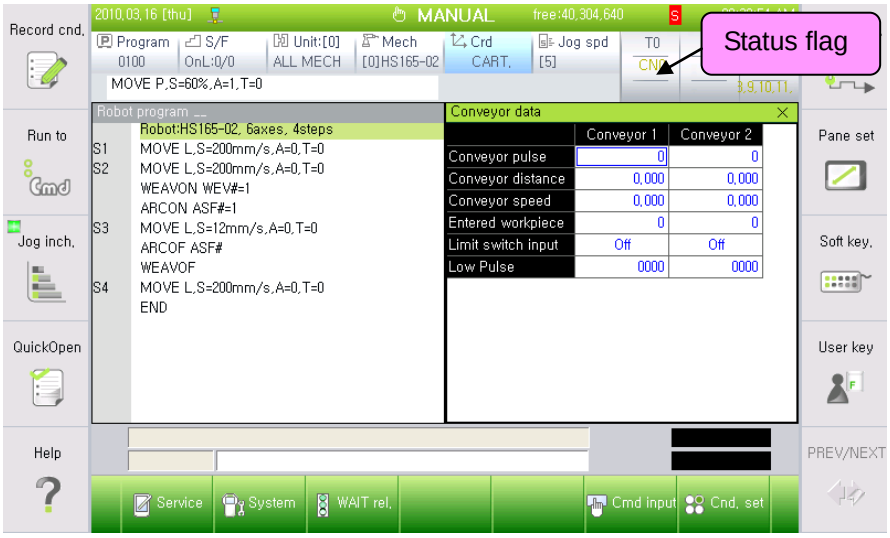
- **Conveyor speed (CS)**
  This parameter manages the conveyor speed.

- **Entered workpiece**
  This shows the number of workpiece entering through the limit switch.

- **Limit switch input**
  This displays whether the limit switch is operating.

- **Low pulse**
  This displays the processed value of conveyor pulse entered from conveyor I/F board and is repeated in the range of “0 ~ FFFF” if normal.

3.4.2. Status flag



- **Conveyor operation mode**
  String of 『CN1』 / 『CS1』 / 『CT1』 is displayed respectively depending on Normal/simulation/test mode.

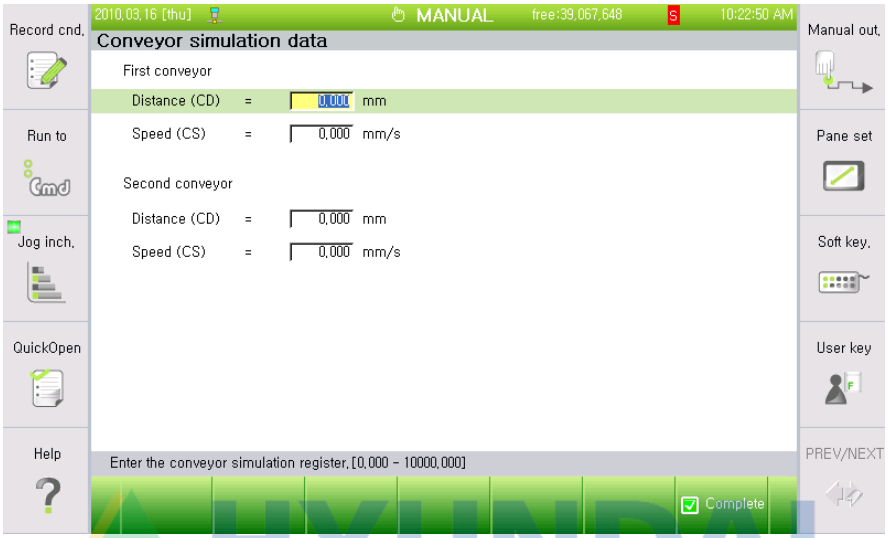
- **Signal input condition during conveyor operation**
  If the signal is ON during the conveyor operation, the string showing the operating mode of the conveyor is displayed in order by adding one letter.

  Ex) when conveyor is operating in normal mode
  Conveyor is operating : 『 』 → 『C』 → 『CN』 → 『CN1』
  Conveyor is stopping : 『CN1』 fixed

- **Conveyor synchronization playback ON/OFF condition**
  The color of the string changes to show the conveyor operating mode depending on whether conveyor synchronization playback is ON or OFF.

3.5. Conveyor simulation data

When you select 『[F1]: Service』 → 『2: Register』 → 『6: Conveyor simulation data』, the robot will playback the simulation based on the speed and distance set by the user if the conveyor operating mode is set to simulation.



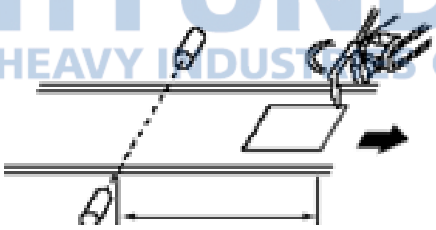
3.6. Command

■ **CNVYSYNC (Conveyor synchronization playback)**
This designates the zone to execute for conveyor synchronization during program playback.

CNVYSYNC <Synchronization>

	Content	
Synchronization	0	Conveyor synchronization Off
	1	Conveyor synchronization On
	2	Conveyor synchronization Off + Conveyor data clear

■ **WAITCNVY (Conveyor interlock standby)**
As shown in the following picture, this is used for keeping the robot in standby mode until the workpiece reaches the designated location from the limit switch.



DIST

WAITCNVY SYNC=<Synchronization>,DIST=<Standby distance>

	Content
Synchronization	Conveyor synchronization during standby (0=Async, 1=Sync)
Standby distance	Distance from limit switch to workpiece

3.7. R code

- **R44 (Conveyor data clear)**
  This can be used when the robot is stopped and the operating mode is not in simulation. This manually clears various types of data related to conveyor (CP, CD, CS, number of workpieces to enter, synchronization playback condition etc.)

- **R45 (Conveyor distance manual input)**
  This can only be used in the manual mode and the CD value (Linear conveyor mm, circular conveyor deg) can be entered manually. When the CD value changes the CP value is also updated by the conveyor constant.

- **R46 (Conveyor limit switch manual input)**
  This can only be used in the manual mode and this is used for entering the limit switch manually.

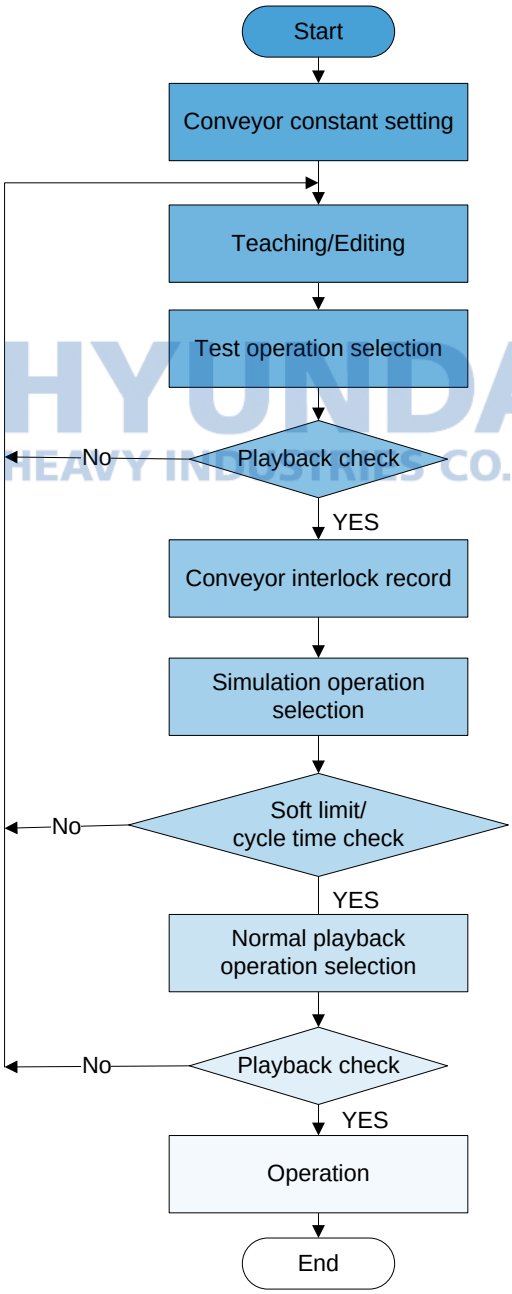
4

Teaching

Preparing the program for conveyor synchronization is the same as general teaching. But to check teaching and playback the conveyor synchronization, you must use the 『CNVYSYNC (Conveyor synchronization playback)』 and 『WAITCNVY (Conveyor interlock standby)』 command. These commands must be recorded before executing the playback to check the taught program.

4.1. Conveyor synchronization operation procedure

Conveyor synchronization operation is done in the order of conveyor parameter setting, teaching and editing, check playback and normal playback according to the following flowchart.



- **Conveyor parameter setting**
  As the initially required stage after installing the conveyor system, this decides the location error level of all synchronized playback work and must be set carefully.

- **Teaching and editing**
  After the conveyor parameter setting is completed, operate the conveyor so that the workpiece can pass through the limit switch to enter the work zone. When the workpiece reaches the desired location, stop the conveyor and teach and edit the process.

- **Playback check**
  When the teaching and editing is completed, playback the process according to the conveyor operation type in the order of test, simulation and normal mode. Here, the test and simulation operating mode are not mandatory processes and they can be appropriately judged by the user depending on the user environment.

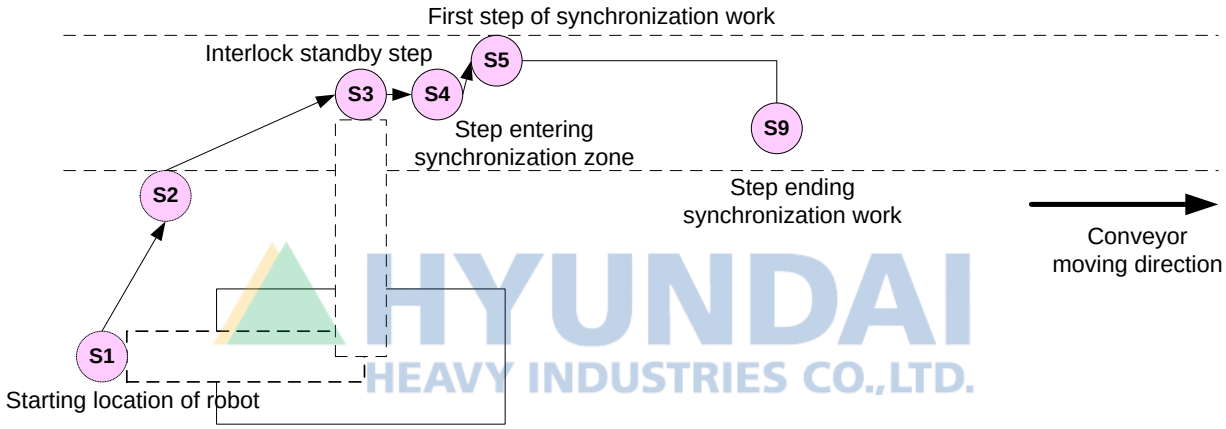
- **Normal playback**
  When the playback check is completed, and the issues are all cleared, select the normal mode to operate the conveyor to playback the conveyor for actual flow.

4.2. Synchronization work program configuration

- **Start location standby**
  Robot stands by in the start location until the operation command is given.

- **Interlock standby**
  Robot moves near the synchronization work zone and waits until the workpiece reaches the distance recorded on the WAITCNVY command.

  The following picture shows the painting program for the workpiece on the conveyor. Robot starts the conveyor synchronization as it progresses to step 4 and sprays the paint on the workpiece in synchronized condition when moving to step 5. Here, the interlock standby step (Step 3) is recorded near step of entering the synchronization work zone (Step 4).



The above work can be prepared in the program as follows.

```
Step 1                              → Robot start location
Step 2
Step 3                              → Interlock standby step
        CNVYSYNC 1                  → Conveyor synchronization playback ON
        WAITCNVY SYNC=0,D=500       → Conveyor interlock standby
Step 4                              → Step entering synchronization zone
        DO1 = 1                     → Paint spray ON signal
Step 5                              → 1st synchronization step
 :
Step 9                              → Last synchronization step
        DO1 = 0                     → Paint spray OFF signal
        CNVYSYNC 0                  → Conveyor synchronization playback OFF
Step 10
 :
Step 13                             → Robot start location
        END
```

- **Synchronized playback**
  In the picture, conveyor synchronization playback zone is from step 4 to 9, and all the commands in this zone are synchronized to the conveyor and executed.

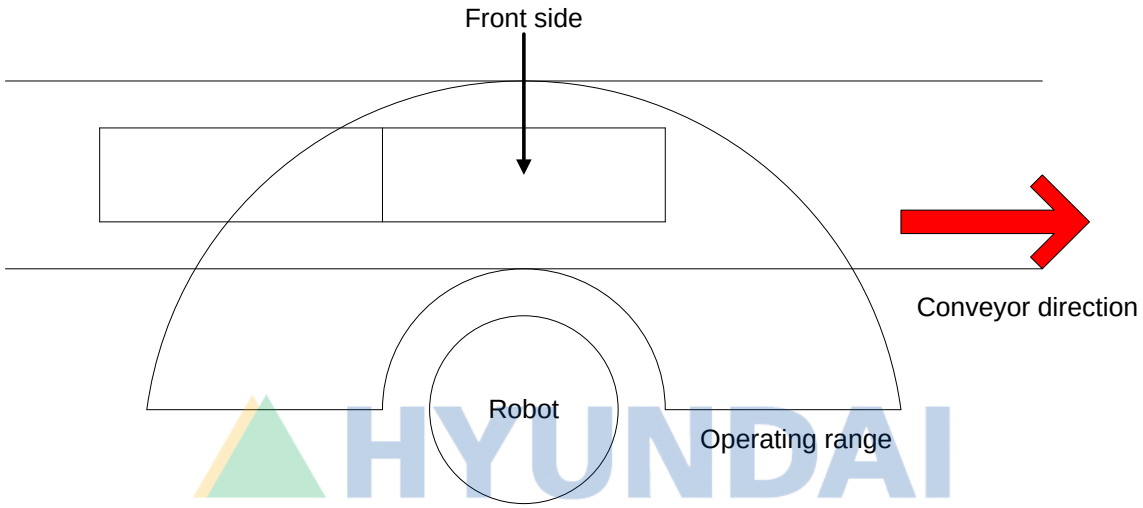
- **Return to start location**
  When the work is completed, the robot returns to the starting location for next operation command.

4.3. Teaching by block division

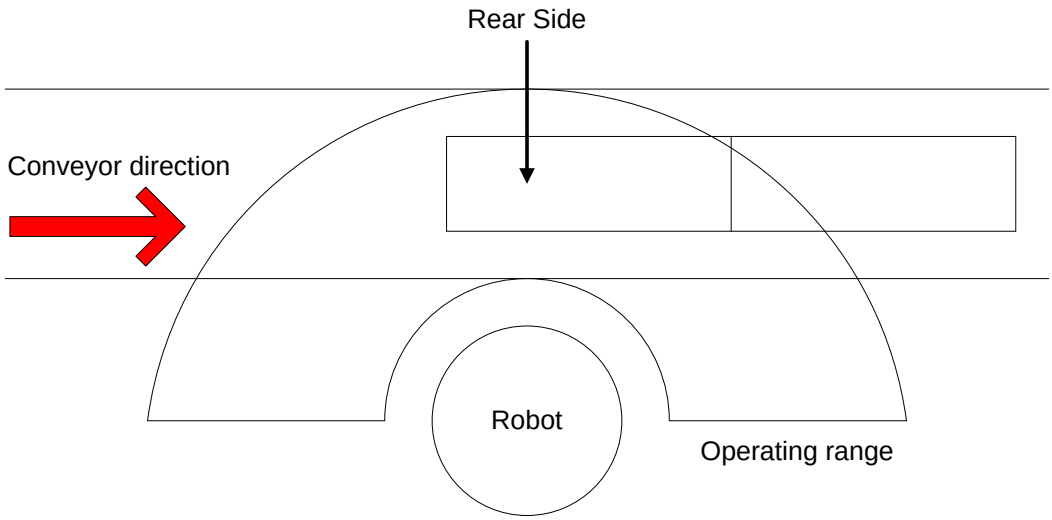
When teaching a workpiece larger than the operating range of the robot, it is impossible to teach the workpiece at once while the conveyor is moving. Therefore the teaching is divided into blocks.

4.3.1. Teaching procedure by block division

(1) Stop the workpiece in the location in the picture.



(2) After teaching the front part of the workpiece in program 1, operate the conveyor to teach the workpiece at the location of the following picture.

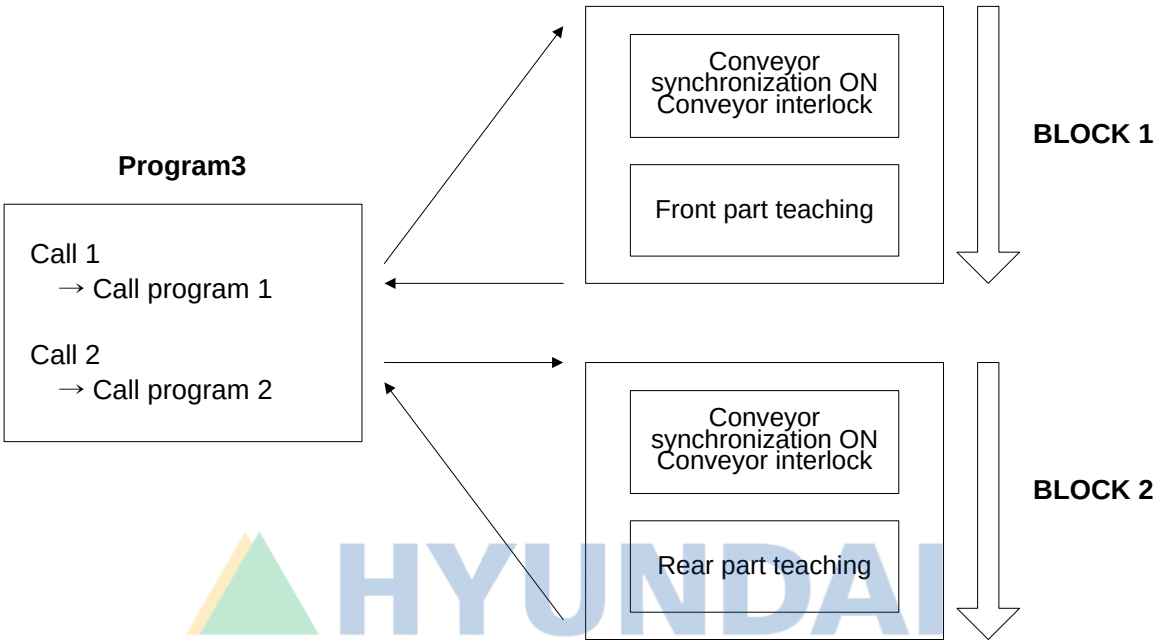


(3) After teaching the rear part of the workpiece in program 2, prepare program 3 to call both program 1 and program 2.

(4) By playback program 3, the work can be done for all areas of the workpiece.

4.3.2. Program preparation by block division

Program preparation by block division is done according to the following procedure.



■ **Block 1 teaching**

(1) Check whether the conveyor data is cleared.

(2) Move the conveyor to operate the limit switch by the workpiece. When the teaching part of the workpiece reaches the front side of the robot, the conveyor stops. Conveyor pulse counter and register value are calculated to respond to the current location of the workpiece.

(3) Workpiece teaching is done for the current location and use the previous/next step to check the teaching results.

(4) Select conveyor operation from 『[F2]: System』 → 『4: Application parameter』 → 『4: Conveyor synchronization』 → 『1: Environment setting』 to <Test>. When END command is executed for the program in normal mode, the conveyor data is cleared. And because the signal input is required during conveyor operation, select the test mode to avoid this situation.

(5) While keeping the workpiece in the current location, press the run button to check the playback.

(6) CNVYSYNC and WAITCNVY commands are recorded in step 0.

■ **Block 2 teaching**

(1) Select and playback the final step of program 1.

(2) Move the conveyor until the teaching part of the 2nd block reaches the front side of the robot, and stop the conveyor.

(3) After selecting the manual mode, select program 2.

(4) Execute the teaching as block 1.

4.4. Teach with conveyor synchronization canceled

The operating program by conveyor synchronization up to the final step shows different robot location at the final step depending on the conveyor speed. Especially if the conveyor is fast, it takes longer to operate from final step to the 1st step of the next cycle, and the location at the final step of the next cycle moves further downstream. As this phenomenon is repeated and accumulated for each cycle, the robot finally generates a soft limit error to stop the operation.
To avoid this, the conveyor synchronization is canceled in front of the final step so that the robot can always execute the next cycle from the same location.

- **Teaching example 1**

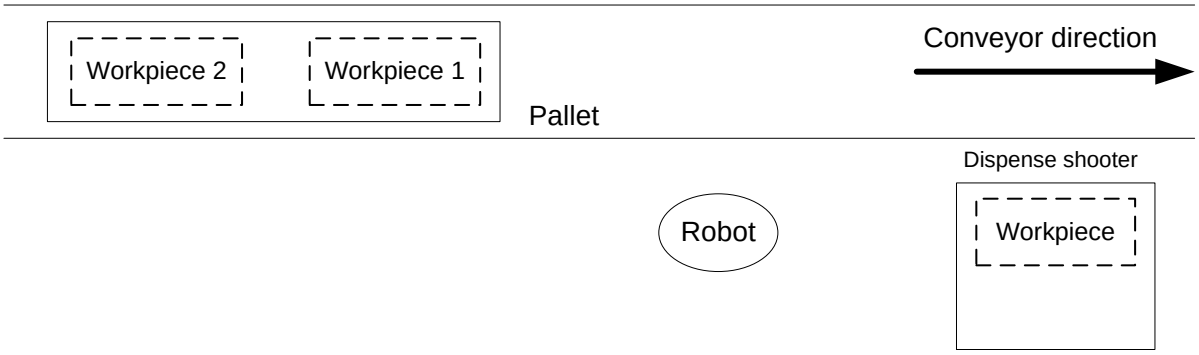
  The following shows an example of a program using the conveyor synchronization cancel function.

```
Step 1
        CNVYSYNC 1                  → Conveyor synchronization playback ON
        WAITCNVY SYNC=0,D=500       → Conveyor interlock standby
Step 2
Step 3
Step 4
        CNVYSYNC 0                  → Conveyor synchronization playback OFF
Step 5
        END
```


In step 4, the conveyor synchronization playback OFF command is recorded and in step 5, the robot does not synchronize with the conveyor and just moves to the location recorded on step 5. That is, the robot will always stop at a certain location (Location where step 5 is initially recorded) irrelevant from the conveyor and the moving time to the 1st step of the next cycle is always consistent.

■ **Teaching example 2**

As shown below, let's learn about the teaching method for the system where 2 workpieces move on the pallet on top of the conveyor and the robot moves one workpiece to the dispense shooter respectively.



(1) Synchronize the robot to the conveyer to hold workpiece 1 on the pallet.

(2) Place workpiece 1 on the dispense shooter. At this time, the dispense shooter is not on the conveyor and the conveyor synchronization is canceled.

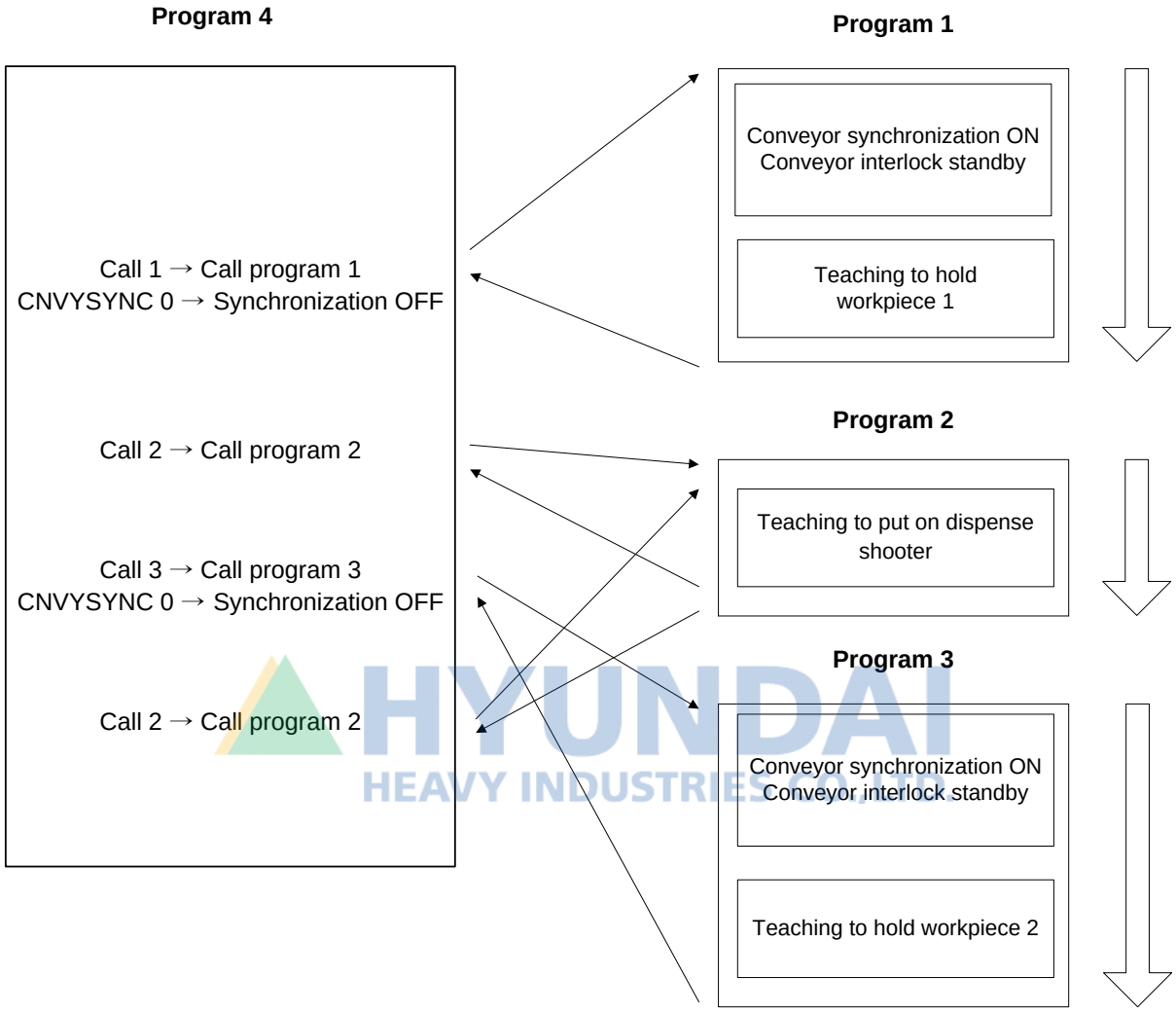
(3) Synchronize the robot to the conveyor to hold workpiece 2 on the pallet.

(4) Place the workpiece 2 on the dispense shooter. At this time, the dispense shooter is not on the conveyor and the conveyor synchronization is canceled.

(5) When executing this operation, it is convenient to use the block division described above and the teaching example is as follows.

(6) In this system, 4 programs have to be prepared.

(7) Program 1 is taught to hold workpiece 1. Program 2 is taught to move the workpiece to the dispense shooter. Program 3 is taught to hold workpiece 2. And then program 4 is taught to call programs 1, 2 and 3. But before calling program 2, the conveyor synchronization playback must be turned OFF.



HYUNDAI
HEAVY INDUSTRIES CO.,LTD.

5
FAQ

- When the axis specification of the additional axis is the base and axis configuration is direct operation, how is the conveyor synchronization done?
  If an additional axis exists during conveyor synchronization, the conveyor tracks the additional axis first. If the robot cannot track the additional axis due to soft limit, arm interference etc., the robot uses the 6 axes to track the conveyor.

- How is the conveyor synchronization done around 0 degrees of B axis?
  When the robot passes the 0 degrees of B axis during conveyor synchronization, the robot cannot maintain the tool position consistently. Therefore select the tool direction not using the 0 degrees of B axis ahead when assembling the tool.

- What is the increase timing of the conveyor data?
  The increase timing of the conveyor data according to the conveyor operating mode is summarized as follows

	Normal	Simulation test	Test
CP	LS input	Always consistent	Always consistent
CD	Same as above	(1) After setting the simulation speed, turn on conveyor synchronization to ON (2) Set the simulation register value as the initial value and increase the value	Always consistent
CS	Same as above	(1) Set simulation speed (2) When running step 0, read the simulation speed	Always 0

■ What is the clear timing of the conveyor data?
The clear timing of the conveyor data according to conveyor operating mode is summarized as follows.

	Normal	Simulation	Test
CP	① Execute program cycle END ② Execute conveyor synchronization reset command (CNVYSYNC 2) ③ Manually reset conveyor data (When robot is stopped) ④ Conveyor data clear input signal ON (When robot is stopped)	① Execute conveyor synchronization reset command (CNVYSYNC 2) ② Conveyor data clear input signal ON (When robot is stopped)	① Execute conveyor synchronization reset command (CNVYSYNC 2) ② Manually reset conveyor data (When robot is stopped) ③ Conveyor data clear input signal ON (When robot is stopped)
CR	Same as above	① Execute program cycle END ② Execute conveyor synchronization reset command (CNVYSYNC 2) ③ Conveyor data clear input signal ON (When robot is stopped)	① Execute conveyor synchronization reset command (CNVYSYNC 2) ② Manually reset conveyor data (When robot is stopped) ③ Conveyor data clear input signal ON (When robot is stopped)
CS	Same as above	① Execute conveyor synchronization reset command (CNVYSYNC 2) ② Conveyor data clear input signal ON (When robot is stopped)	Always 0

■ How can I enter the limit switch manually?
R46 : Use the conveyor limit switch manual input function.

■ How can I reset the current conveyor data manually?
R44 : Use the conveyor data clear function.

HYUNDAI
HEAVY INDUSTRIES CO.,LTD.

HYUNDAI
HEAVY INDUSTRIES CO.,LTD.

- **Head Office**
  Tel. 82-52-202-7901 / Fax. 82-52-202-7900
  1, Jeonha-dong, Dong-gu, Ulsan, Korea

- **A/S Center**
  Tel. 82-52-202-5041 / Fax. 82-52-202-7960

- **Seoul Office**
  Tel.82-2-746-4711 / Fax. 82-2-746-4720
  140-2, Gye-dong, Jongno-gu, Seoul, Korea

- **Ansan Office**
  Tel.82-31-409-4945 / Fax.82-31-409-4946
  1431-2, Sa-dong, Sangnok-gu, Ansan-si, Gyeonggi-do, Korea

- **Cheonan Office**
  Tel.82-41-576-4294 / Fax.82-41-576-4296
  355-15, Daga-dong, Cheonan-si, Chungcheongnam-do, Korea

- **Daegu Office**
  Tel.82-53-746-6232 / Fax.82-53-746-6231
  223-5, Beomeo 2-dong, Suseong-gu, Daegu, Korea

- **Gwangju Office**
  Tel. 82-62-363-5272 / Fax. 82-62-363-5273
  415-2, Nongseong-dong, Seo-gu, Gwangju, Korea

- **본사**
  Tel. 052-202-7901 / Fax. 052-202-7900
  울산광역시 동구 전하동 1 번지

- **A/S 센터**
  Tel. 82-52-202-5041 / Fax. 82-52-202-7960

- **서울 사무소**
  Tel. 02-746-4711 / Fax. 02-746-4720
  서울특별시 종로구 계동 140-2 번지

- **안산 사무소**
  Tel. 031-409-4945 / Fax. 031-409-4946
  경기도 안산시 상록구 사동 1431-2 번지

- **천안 사무소**
  Tel. 041-576-4294 / Fax. 041-576-4296
  충남 천안시 다가동 355-15 번지

- **대구 사무소**
  Tel. 053-746-6232 / Fax. 053-746-6231
  대구광역시 수성구 범어 2 동 223-5 번지

- **광주 사무소**
  Tel. 062-363-5272 / Fax. 062-363-5273
  광주광역시 서구 농성동 415-2 번지