CONTROLLERS

An optimal controller can be selected from various command input formats.
As servo parameters and deceleration patterns suitable for robots are pre-registered, robots can be operated quickly without complex settings.

LCMR200 | Linear conveyor modules
GX | Single-axis robots
YHX | Controller
LCM100 | Linear conveyor modules
YK-X | SCARA robots
RCX iVY2+ | Robot Vision
Robonity | Single-axis robots
PHASER | Linear motor single-axis robots
FLIP-X | Single-axis robots
TRANSERVO | Compact single-axis robots
XY-X | Cartesian robots
YP-X | Pick & place robots
CLEAN
CONTROLLER
YRG | Electric Gripper
APPLICATION
SERVICE PERIOD

High performance controllers supporting YAMAHA robots

		TRANSERVO	Robonity	FLIP-X		PHASER
		Stepping motor	**[ABAS/ABAR/AGXS] General-purpose servomotor**	**[T4L/T5L] Small type servomotor (24 V・30 W)**	**General-purpose servomotor (30 to 600W)**	**Linear motor**
1 axis	● I/O point trace ● Remote command ● Online command	**P** TS-S2 P.115 **P** TS-SH P.115	**P** EP-01 P.113		**P** TS-X P.115	**P** TS-P P.115
	● Pulse train	**D** TS-SD P.114			**D** RDV-X P.112	**D** RDV-P P.112
	● Program (YAMAHA SRC language) ● I/O point trace ● Remote command ● Online command			**C** ERCD P.119	**C** SR1-X P.119	**C** SR1-P P.119
2 axis	● Program (YAMAHA BASIC 2 language) ● I/O command ● Remote command ● Online command				**C** RCX320 P.121	
3, 4 axes	● Program (YAMAHA BASIC 2 language) ● Remote command ● Online command				**C** RCX340 P.121	

Five or more axes can also be supported

RCX320 **RCX340**

YC-Link/E

Up to four RCX320, RCX340 controllers (up to 16 controllable axes) can be connected.

The RCX340 controller and RCX320 controller can be connected.

up to 16 axes

All programs and settings are managed using the master.

Connectable using LAN cable. YC-Link/E

Controllers without program settings

PLC

Master — Slave — Slave — Slave

Master — YC-Link/E — Slave

P : Robot positioner   **D** : Robot driver   **C** : Robot controller

POINT 1

Selectable from various control methods

Program input

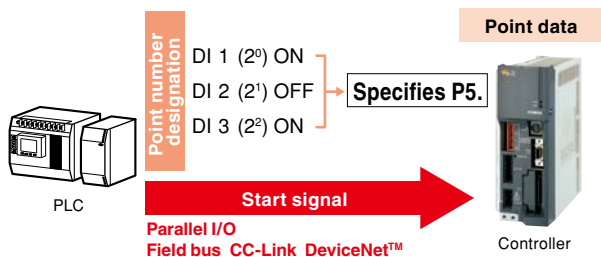#### ▐ A variety of operation settings, calculations, and conditional branching is possible

The single-axis robot controllers use the YAMAHA SRC language [Note] which is simple yet contains all required functions, such as I/O outputs and conditional branching, etc. The multi-axis controller RCX series uses the YAMAHA BASIC 2 language capable of more sophisticated programming and includes all types of arithmetic operations, flexible variable settings, and various conditional branching, etc. Both are easy to use robot language conforming to the BASIC. These languages support various needs from simple operations to expert user's sophisticated work.

Single-axis robot controller	YAMAHA SRC language <Example>	MOVA 1 , 100	Moves to point number 1 at 100 %-speed.
		DO 1 , 1	Turns on general-purpose output number 1.
		WAIT 2 , 1	Waits until general-purpose input number 2 turns on.

Multi-axis robot controller	YAMAHA BASIC 2 language <Example>	IF DO(10)=1 THEN * END	Jumps to *END if general-purpose input number 10 turns on. Otherwise, moves to the next line.
		MOVE P, P2, STOPON DI(1) =1	Moves to point number 2. Stops when general-purpose input number 1 turns on during movement.
		WAIT ARM	Waits until the robot arm operation ends.
		P3=WHERE	Writes the current position into point number 3.
		* END:	Defines the label named "END".
		HOLD	Pauses the program.

I/O point trace

▐ Program-less means easy

The host unit specifies a point number in binary format and the robot moves to the specified point when the start signal is input. The controller can operate only by teaching the point data without programs.
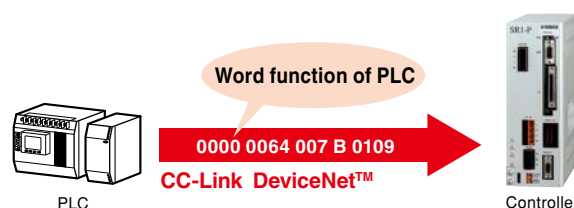

Point number designation

DI 1 (2^0) ON
DI 2 (2^1) OFF → **Specifies P5.**
DI 3 (2^2) ON

Point data

Start signal

Parallel I/O
Field bus CC-Link DeviceNet™

PLC

Controller

Pulse train

▐ Acceleration/deceleration curves can be created freely

The robot is controlled using pulse trains sent from the positioning unit. The controller does not need to have programs or point data. This pulse train is convenient when the control is centralized to the host unit.

Pulse train

Positioning unit

Controller

Remote command

▐ Ideal for unified data management

The word function of the CC-Link or DeviceNet™ is used to issue various commands or data to the robot. The expandability of the word function from simple operation instructions to point data writing is fully utilized to freely use the robot controller functions from the host unit.
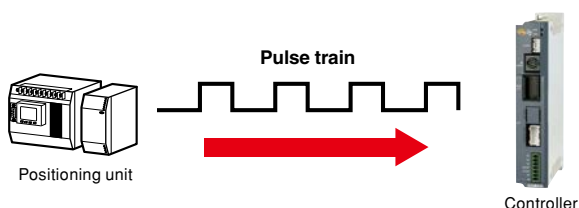
Note. This function is enabled when selecting an option network board.

Word function of PLC

0000 0064 007 B 0109
CC-Link DeviceNet™

PLC

Controller

Online command

▐ Execute everything from a PC

The PC can issue various commands or data to the controller or receive the data or status through the RS-232C or Ethernet [Note]. All executable operations from the teaching pendant can be executed from the PC.

Note. Ethernet is enabled when selecting an option network board.
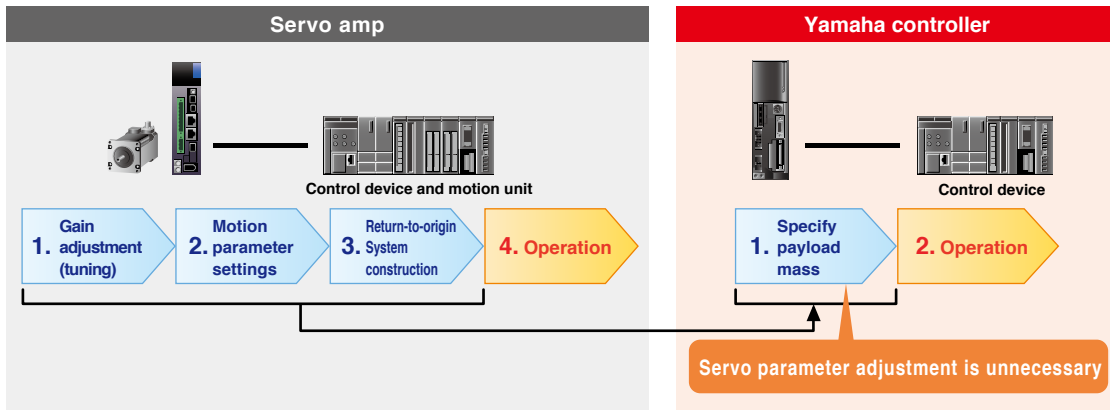(For the RCX320 and RCX340, Ethernet is provided as standard function.)

@MOVA1,100 c/r I/f

PC

Controller

Linear conveyor modules LCMR200
Single-axis robots GX
Controller YHX
Linear conveyor modules LCM100
SCARA robots YK-X
Robot Vision RCX iVY2+
Single-axis robots Robonity
Linear motor single-axis robots PHASER
Single-axis robots FLIP-X
Compact single-axis robots TRANSERVO
Cartesian robots XY-X
Pick & place robots YP-X
CLEAN
CONTROLLER
Electric Gripper YRG
APPLICATION
SERVICE PERIOD

POINT 2

Easy optimal setup
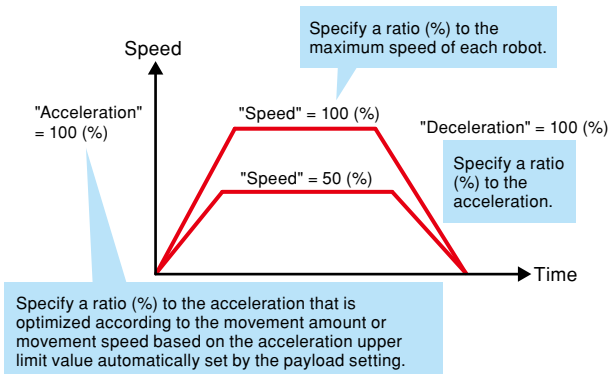
Complicated parameter settings are unnecessary

Robot controllers are specially designed for YAMAHA robots. Optimal values for servo parameters required for robot operation, such as gain are already registered beforehand. Start operating immediately without any need for complicated settings or tuning, even if you don't have knowledge or experience about control.

Servo amp	Yamaha controller
Control device and motion unit	Control device

1. Gain adjustment (tuning)
2. Motion parameter settings
3. Return-to-origin System construction
4. Operation

1. Specify payload mass
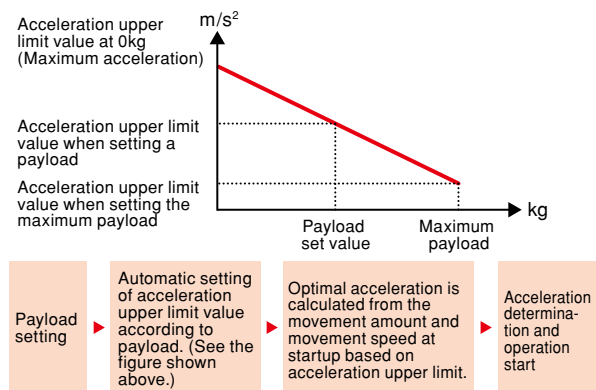2. Operation

Servo parameter adjustment is unnecessary

Easy acceleration/deceleration settings

The acceleration/deceleration is an important factor that affects the service life of the machine. If too high acceleration is set, this may cause the service life of the machine to shorten. If the acceleration is too low, the motor power cannot be used effectively, causing the tact time to lower. The acceleration/deceleration setting of YAMAHA robot controller is determined finely by load weight. Setting only payload parameters will automatically set optimal acceleration/deceleration by taking the service life of the machine and motor capability into consideration. Detailed robot knowledge from YAMAHA is what makes this possible. (Note: For the pulse train input, the customer may need to set the acceleration/deceleration.)

Concept of speed and acceleration

Specify a ratio (%) to the maximum speed of each robot.

Speed

"Acceleration" = 100 (%)
"Speed" = 100 (%)
"Deceleration" = 100 (%)
"Speed" = 50 (%)

Specify a ratio (%) to the acceleration.

Time

Specify a ratio (%) to the acceleration that is optimized according to the movement amount or movement speed based on the acceleration upper limit value automatically set by the payload setting.

Acceleration calculation algorithm

m/s^2

Acceleration upper limit value at 0kg (Maximum acceleration)

Acceleration upper limit value when setting a payload

Acceleration upper limit value when setting the maximum payload

Payload set value　　Maximum payload　　kg

Payload setting ▶ Automatic setting of acceleration upper limit value according to payload. (See the figure shown above.) ▶ Optimal acceleration is calculated from the movement amount and movement speed at startup based on acceleration upper limit. ▶ Acceleration determination and operation start

Zone control (= Optimal acceleration/deceleration automatic setting) function

The SCARA robot also incorporates a zone control function that always operates the robot at its maximum performance level by considering changes in inertia due to the arm posture. Therefore, the robot does not exceed the tolerance value of the motor peak torque or speed reducer allowable peak torque only by entering the initial payload to bring out the full power of the motor and keep the high acceleration / deceleration.

For X-axis of YK500XG

The torque in the arm folded state is 5 or more times different from that in the arm extended state.
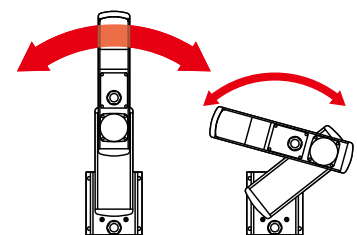
This may greatly affect the service life, vibration during operation, and controllability.

f the motor torque exceeds the peak value
→ **This may adversely affect the controllability and mechanical vibration, etc.**

If the torque exceeds the tolerable peak torque value of the speed reducer
→ **This may cause early breakage or shorten the service life extremely.**

111

POINT 3

Multi-function and expandability

■ Multi-axis controllers support up to 30,000 points while single-axis controllers support up to 1,000 points. Up to 100 programs can be created on each controller.

■ Various field networks, CC-Link, DeviceNet^{TM}, PROFIBUS, and EtherNet/IP^{TM} are supported.
   Note. Some models do not support all networks.

■ The TS series, RD series, SR1 series, and RCX series use a dual-power supply system with separate control power supply and power supply.

■ As the controllers conform to the CE marking that is safety standards in EU (Europe), they can be used safely even overseas.
   The TS series (except for TS-S), SR1 series, and RCX series conform to up to safety category 4.

Name	Type	Number of points	Number of programs	Applicable network						Industrial Ethernet	Compliance with CE
				CC-Link	DeviceNet^{TM}	EtherNet/IP^{TM}	PROFIBUS	PROFINET	EtherCAT		
TS-S2/TS-SH	1 axis robot positioner	255	–	○	○	○	–	○	–	–	○
TS-X/TS-P		255	–	○	○	○	–	○	–	–	○
EP-01		255	–	○	–	○	–	○	○	○	○
TS-SD	1 axis robot driver	–	–	–	–	–	–	–	–	–	○
RDV-X/RDV-P		–	–	–	–	–	–	–	–	–	○
ERCD	1 axis robot controller	1,000	100	–	–	–	–	–	–	–	–
SR1-X/SR1-P		1,000	100	○	○	–	○	–	–	–	○
RCX320	1 to 2 axes controller	30,000	100	○	○	○	○	○	○	○	○
RCX340	1 to 4 axes controller	30,000	100	○	○	○	○	○	○	○	○

RDV-X/RDV-P

FLIP-X   PHASER

[Robot driver]

RDV-X   RDV-P

Operation method	Pulse train

Input power	Main power
	  Single-phase/3-phase AC 200 V to 230 V
	Control power
	  Single-phase AC 200 V to 230 V

Origin search method	Incremental

Dedicated pulse train control

The dedicated pulse train control has achieved a compact body and a low price.

Position setting time reduced by 40%

The response frequency is enhanced about two times in comparison with former models. The position setting time of uniaxial robots is reduced by about 40%.[Note 1]

Large cost reduction possible

It is easy to assemble them in automated machinery. You can save much labor in designing, parts selection, setting and more. A large cost reduction is possible.

Contributing to saving space for the whole control board

The compact design has reduced the width up to a maximum of 38% in comparison with former models. In addition, the improvement of radiation efficiency makes it possible to arrange the devices with less space in between. Multiple units can be installed side by side in a neat arrangement.

Easy replacement

The parameter settings and fastening-hole pitches are the same as those of former models. It is easy to replace the software and the hardware as well.

Command input: Line driver (2 Mpps)

Command output: ABZ-phase output (with a divider function)

Real-time operation status monitoring

You can have analog outputs for speed, amperage, and more information to know the operation status in real time. RDV-Manager, the dedicated support software, is also available for a graphical view of the status.

Main power: Single and three phases supported (200V)

The full-specification operation is available with a single-phase power supply.

Note 1. With a 400W servomotor, 20mm ball screw lead, and portability of 40kg.
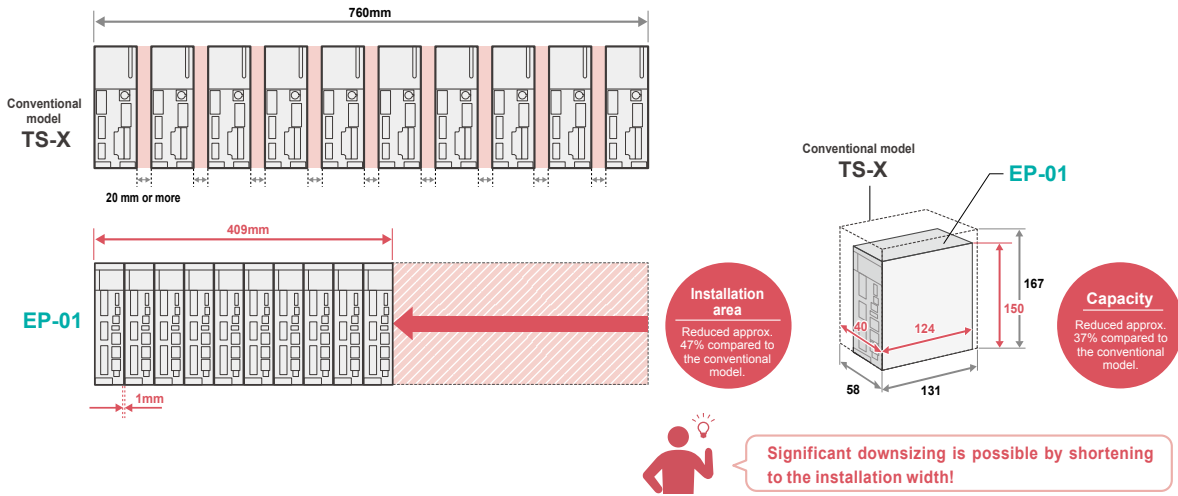
EP-01　P.68　Robonity ABAS/AGXS/ABAR

[Robot positioner]

EP-01-A10　　　　EP-01-A30

Operation method	Point trace (positioning operation by specifying the point number) / remote command	
Input power	Main power	Single-phase 200 to 230 V AC ± 10%, 50/60 Hz
	Control power	Single-phase 200 to 230 V AC ± 10%, 50/60 Hz
Return-to-origin method	Absolute	

Ideal for space saving

The controllers can be installed by narrowing the distance between them.

760mm

Conventional model
TS-X

20 mm or more

409mm

EP-01

1mm

Conventional model
TS-X　　　**EP-01**

167
150
40　124
58　131

Installation area
Reduced approx. 47% compared to the conventional model.

Capacity
Reduced approx. 37% compared to the conventional model.

Significant downsizing is possible by shortening to the installation width!

Support software "EP-Manager"

▍ Free download available

Support software "EP-Manager" that allows you to perform "Setting" → "Pre-check" → "Debug" → "Maintenance" in a single step is provided free of charge.
Easy edit for robot operation, positioning, timing, or monitoring motor load.

Free

EP-Manager

Download from the web site (member site).

What you can do with EP-Manager.

Parameter setting	Point setting	Debug (real-time trace)	Robot operation	Operation simulation	Maintenance (alarm history check)
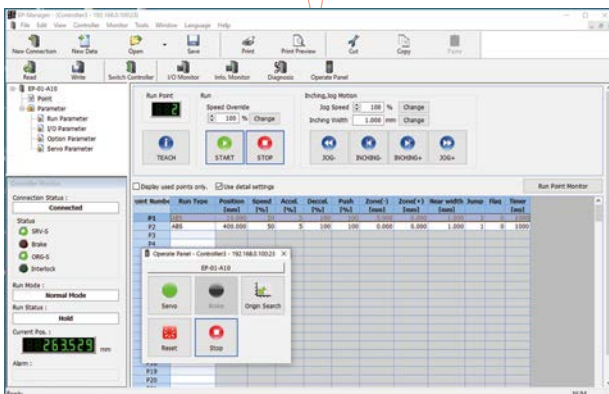
Main window

▍ Extensive functions from pre-check to maintenance

Pre-check

Operation simulator

Operation simulator function is included to enable offline simulation.

Debug

Real-time trace

This function traces the current position, speed, load percentage, current, and voltage at real-time. Additionally,once trigger conditions are set, data can be automatically obtained when these conditions are met. Furthermore, by specifying a zone from the monitor results, the maximum value, minimum value, and average value can be calculated. These values are handy for trouble shooting.

Maintenance

Alarm history check

In addition to the position, speed, operation status, current value, and voltage value in case of an alarm, the I/O status of the input/output is displayed.
This contributes to analysis of the status.

LCMR200 Linear conveyor modules
GX Single-axis robots
YHX Controller
LCM100 Linear conveyor modules
YK-X SCARA robots
RCX iVY2+ Robot Vision
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FLIP-X Single-axis robots
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YP-X Pick & place robots
CLEAN
CONTROLLER
YRG Electric Gripper
APPLICATION
SERVICE PERIOD

TS Series Common features

▌ Torque decrease in high-speed area is suppressed

As a vector control method is used, the torque decrease in high-speed area is small and high-speed operation even with high payload can be performed. This greatly contributes to shortening of the tact time.

▌ TS-Manager: Real-time trace function

The current position, speed, load factor, current value, and voltage value, etc. can be traced at real-time. Additionally, as trigger conditions are set, the data when the conditions are satisfied can be automatically acquired. Furthermore, as a range is specified from the monitor results, the maximum value, minimum value, and average value can be calculated. So, this is useful for the analysis if a trouble occurs.

Real-time traceable items (up to four items)		
• Voltage type	• Command position	• Current position
• Command speed	• Current speed	• Internal temperature
• Command current value	• Current current value	• Motor load factor
• Input/output I/O state	• Input pulse count [Note 1]	• Movement pulse count [Note 1]
• Word input/output state [Note 2]		

Note. 1: TS-SD only   Note. 2: TS controller only

▌ Excellent silence [Note]

High-pitched operation sounds unique to the stepping motor are suppressed to achieve silent operation sounds similar to the AC servo.
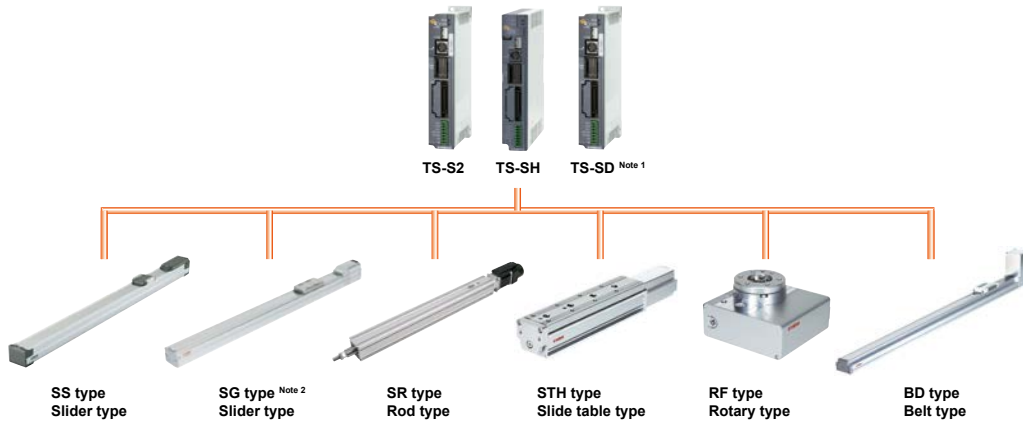
▌ Daisy chain function

As multiple TS series controllers and drivers are connected in a daisy chain, the data of a desired unit can be edited from the personal computer (up to 16 units).

Up to 16 units
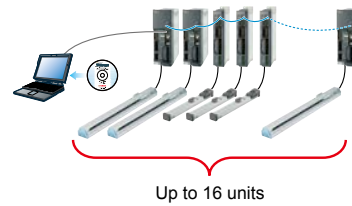
Note. TRANSERVO series

POINT

Usable for all TRANSERVO series models

TS-S2 **TS-SH** **TS-SD** [Note 1]

SS type
Slider type

SG type [Note 2]
Slider type

SR type
Rod type

STH type
Slide table type

RF type
Rotary type

BD type
Belt type

Note 1. The STH type vertical specifications and RF type sensor specifications do not support the TS-SD.
Note 2. SG07 is only applicable to TS-SH.

TS-SD   TRANSERVO

[Robot driver]

TS-SD

Operation method	Pulse train	
Input power	Main power	DC 24 V +/- 10 %
	Control power	DC 24 V +/- 10 %
Origin search method	Incremental	

▌ Pulse train input driver dedicated to "TRANSERVO"

A robot driver dedicated to the pulse train input for "TRANSERVO".

▌ Easy operation with support software TS-Manager

In the same manner as the robot positioner TS series, the operation can be performed with the TS-Manager (Ver.1.3.0 or later) having various convenient functions, such as robot parameter setting, backup, and real-time trace (The handy terminal "HT1" cannot use this TS Manager).

▌ Applicable to a wide variety of pulse train command inputs

This robot driver can be made applicable to the open collector method or line driver method using the parameter setting and signal wiring. In the open collector method, a wide voltage range from 5 V to 24 V is supported. So, the robot driver can be matched to the specifications of the host unit to be used.

LCMR200 Linear conveyor modules
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YHX Controller
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CONTROLLER
YRG Electric Gripper
APPLICATION
SERVICE PERIOD

TS-S2/TS-SH TRANSERVO   TS-X/TS-P FLIP-X PHASER

[Robot positioner]

Operation method	Point trace Remote command Online command
Number of points	255 points
Input power	Main power DC 24 V +/- 10 % Control power DC 24 V +/- 10 %
Origin search method	TS-S2 Incremental TS-SH Absolute Incremental

TS-S2   TS-SH

Operation method	Point trace Remote command Online command
Number of points	255 points
Input power	AC 100 V / AC 200 V
Origin search method	TS-X Absolute Incremental TS-P Incremental Semi-absolute

TS-X   TS-P

Design that allows a clean installation

Unified installation sizes

Height and installation pitch are unified throughout the series. Units can be installed neatly within the control board.

Status indication lamps (PWR,ERR)

Communication connectors (COM1,COM2)

Robot I/O connector (ROB I/O)

Motor connector (MOTOR)

I/O connector

Regenerative unit connector (RGEN)

Power supply connector

Absolute battery is neatly accommodated

The absolute battery is stored inside the unit. Replacement can be performed easily from the front side. (TS-X and TS-SH supported)

TS-X

DIN rail installation

On-board installation is made easy by the DIN rail installation mechanism that is standard on the TS-SH.
(Optionally installable on other models)

TS-P   TS-X   TS-S2   TS-SH

Selectable I/O interfaces

Two RS-232C ports provided

● **Connect support tools**

Intuitive operation supports controller design and maintenance.

● **Daisy-chaining**

Two ports can be used to daisy-chain up to 16 units.

● **Communication commands**

Easily understood ASCII text strings can be used to perform robot operations.

Selectable 100V/200V

- The TS-X/P let you select AC100/200V as the power input.

  (The 20A model is 200V only.)

- The TS-S2/SH is DC24V input.

A variety of I/O interfaces

In addition to NPN and PNP, you can choose CC-Link, DeviceNet™, EtherNet/IP™, and PROFINET field networks.

CC-Link   DeviceNet   EtherNet/IP   PROFINET

● **Positioner interface**

Functionality has been condensed into an I/O interface with 16 inputs and 16 outputs. In addition to easy positioning, this also includes functionality that enhances interoperability with the control device.

● **Remote commands**

Numerical data can be directly manipulated by using the four-word input and four-word output areas. You can add new direct positioning commands to further unify the data at the control device.
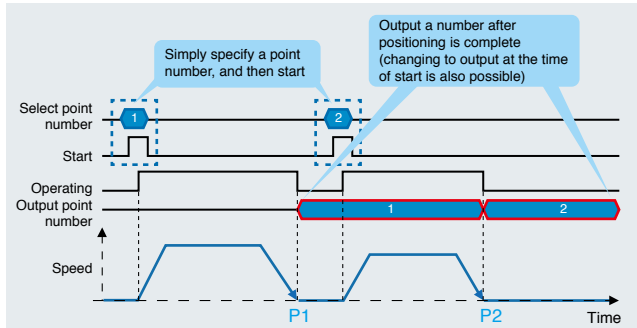
● **Gateway function**

New types of connection are provided to reduce network costs. (CC-Link, EtherNet/IP™, and PROFINET are supported.)

Positional interface

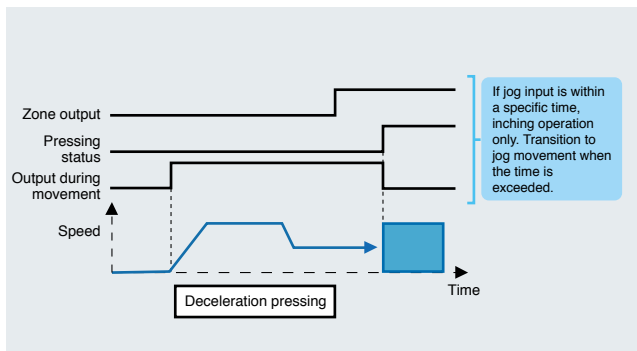## ▋ "Positioner function" for easy positioning

You can easily perform positioning operations by specifying the number of a point that is registered in the data, and entering a start command.

Simply specify a point number, and then start

Output a number after positioning is complete (changing to output at the time of start is also possible)

Number	Operation type	Position (mm)	Speed (%)	Acceleration (%)	Deceleration (%)	Branch	Timer (ms)
P1	ABS	100.00	100	100	100	0	0
P2	ABS	200.00	80	100	100	0	0

▋ A variety of output functions

The TS controller provides a variety of status outputs that are linked with positioning operations. By selecting and using an output appropriate for the scene, this can contribute to cost-saving measures such as making the steps of the control device's program more efficient or by reducing the peripheral equipment.

If jog input is within a specific time, inching operation only. Transition to jog movement when the time is exceeded.

Deceleration pressing

List of outputs

• Zone output ....Output ON when between the two specified points
• Near position output ....Output ON when entering the specified region from the goal position
• In movement output ....Output ON when above the specified speed
• Pressing status...............Output ON when specified pressing strength is reached
  Also provided are return-to-origin completed status, manual mode status, warning output, and alarm number output, etc.

▋ Consecutive operation, linked operation

By specifying a branch destination, it is possible to execute positioning operations consecutively. Additionally, by specifying linked operation, operation with the branch destination can be executed while changing the speed without positioning stops; this allows control programming to be simplified and takt to be shortened.
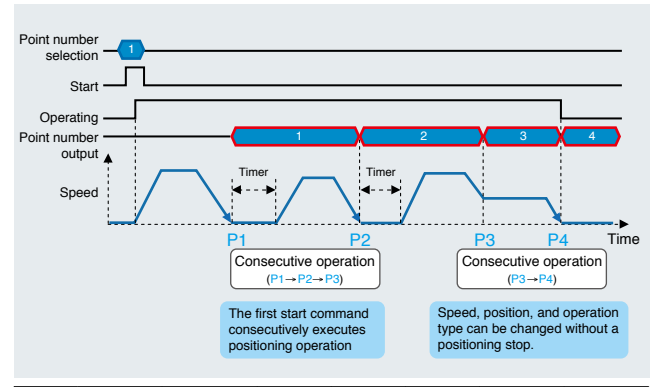
Consecutive operation (P1→P2→P3)

The first start command consecutively executes positioning operation

Consecutive operation (P3→P4)

Speed, position, and operation type can be changed without a positioning stop.

Number	Operation type	Position (mm)	Speed (%)	Acceleration (%)	Deceleration (%)	Branch	Timer (ms)
P1	ABS	100.00	100	100	100	2	500
P2	ABS	200.00	80	100	100	3	800
P3	ABS linked	300.00	100	100	100	4	0
P4	ABS	350.00	30	100	100	0	0

▋ Jog and point teaching functions are provided as standard

Jog movement and point teaching functions are provided as standard for input signals. By linking these with buttons of a touch panel etc., a simple teaching system can be constructed.
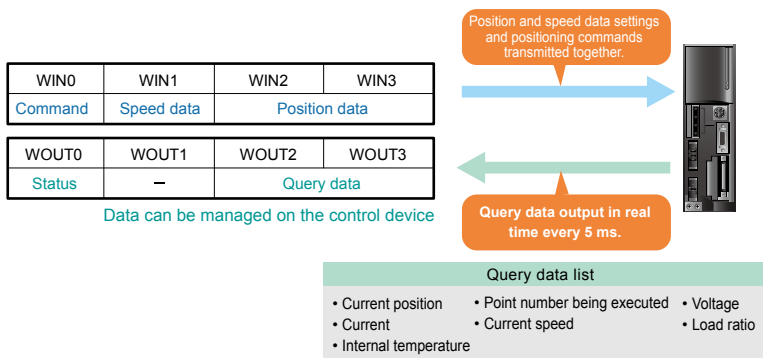

Construct a simple teaching system

LCMR200 | Linear conveyor modules
GX | Single-axis robots
YHX | Controller
LCM100 | Linear motor modules
YK-X | SCARA robots
RCX iVY2+ | Robot Vision
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CLEAN
CONTROLLER
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APPLICATION
SERVICE PERIOD

TS-S2/TS-SH/TS-X/TS-P

Remote commands

Ideal for unifying data management

Remote commands are functions by which the control device can directly handle data such as points and parameters using the word area of the field network.

Numerical data can be operated directly by using the word area. This promotes unification of data management.

WIN0	WIN1	WIN2	WIN3
Command	Speed data	Position data	

WOUT0	WOUT1	WOUT2	WOUT3
Status	—	Query data	

Data can be managed on the control device

Position and speed data settings and positioning commands transmitted together.

Query data output in real time every 5 ms.

Query data list
- Current position
- Current
- Internal temperature
- Point number being executed
- Current speed
- Voltage
- Load ratio

New function

Direct positioning commands that directly specify position and speed data

As remote commands, "direct positioning commands" are provided, allowing the position and speed data to be specified directly and then positioning operations to be performed. In addition to unifying the positioning data on the control device, this allows it to be done with a single command, simplifying programming of the control device.

Consecutive queries for realtime update of various status information

Normally, remote commands only update data when responding, but if a consecutive query is issued, the data continues to be updated at a fixed interval until permission is given to stop. This is useful in various cases such as when it is desirable to obtain positioning data during operation for interoperation with peripheral devices, or to obtain current values in order to monitor the status of a robot.

Parallel processing of "positioner interface" and "remote commands"

Since positioner interface and remote commands operate independently of each other, parallel processing is possible.

< Usage examples >
- Obtain the current position during positioning operation
- Obtain the current position during jog movement
- Change the target position during linked operation

Parallel processing is possible

Positioner interface

Remote command

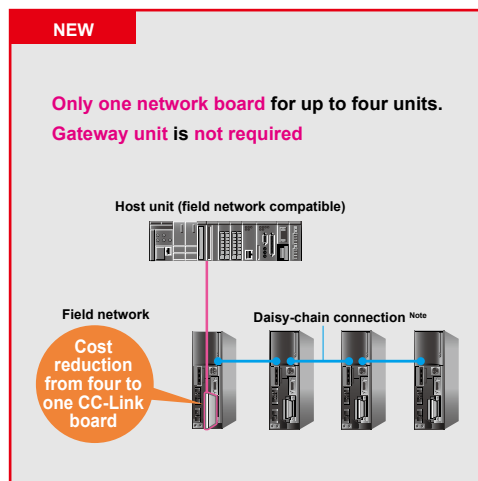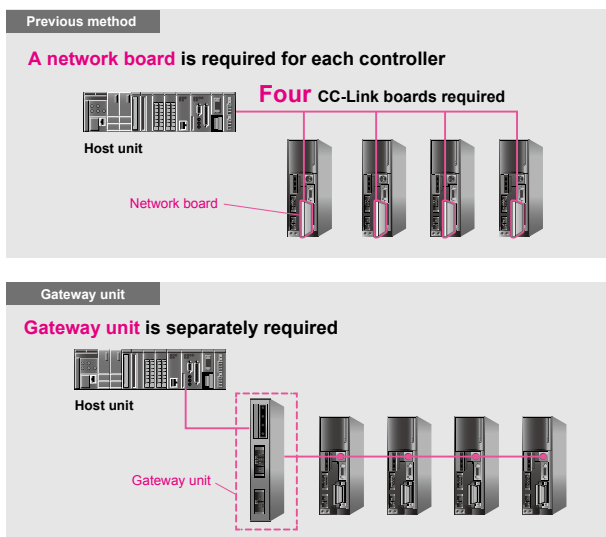|		Positioner interface		Remote command
		Positioning operation	Jog movement	Positioning operation
Remote commands	Data write	○	○	—
	Data read	○	○	—
	Consecutive query	○	○	○

○ : Parallel processing possible
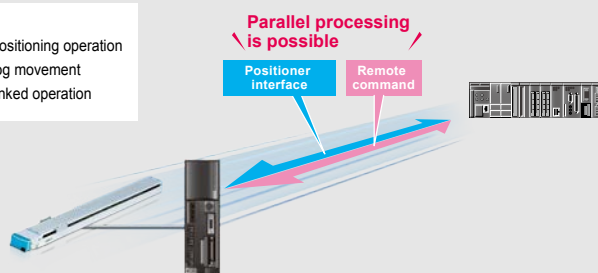
"Gateway function" — a new way to connect   New function

Decrease network cost

One controller equipped with a field network board can provide unified management of up to four I/O interfaces via a daisy-chain connection. This allows network cost to be decreased while enabling the same type of I/O control as when one board is installed for each unit. (CC-Link and EtherNet/IP™ are supported)

Previous method

A network board is required for each controller

Four CC-Link boards required

Host unit

Network board

Gateway unit

Gateway unit is separately required

Host unit

Gateway unit

NEW

Only one network board for up to four units.
Gateway unit is not required

Host unit (field network compatible)

Field network

Daisy-chain connection Note

Cost reduction from four to one CC-Link board

Note. Daisy chain connection cable is required.

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Daisy chain connection

No need to connect or disconnect cables during operation (up to 16 units)

From a single PC, handy terminal, or touch-panel display, it is possible to specify point data and parameters, perform operations, and monitor the status for up to 16 axes on daisy-chained controllers. For everything from design to maintenance, a connection to only the first controller is sufficient; any desired controller can be accessed simply by switching the station number, without having to connect or disconnect cables.

HT1

Pro-face touch-panel

Connect up to 16 units
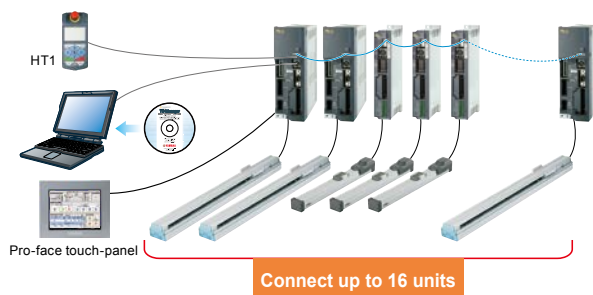
Communication commands

An easily handled command protocol using ASCII text strings supports a wide range of needs from data editing to operation and status monitoring. By daisy-chaining multiple devices, simple multi-axis control can be performed.

START

OK
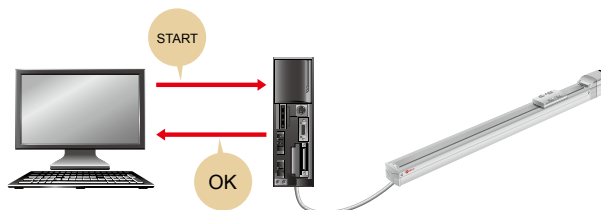
"KEYENCE PROTOCOL STUDIO Lite" serial communication settings software

By loading a TS settings file into PROTOCOL STUDIO Lite, communication settings and main communication commands can be registered automatically. Ladder-less data editing and daisy-chaining can be easily accomplished.

Contact for questions regarding PROTOCOL STUDIO Lite
Keyence Corporation, www.keyence.co.jp/red/kv01/

Daisy-chain connections (up to 16 axes)

Communication with the KV-L21V uses a Yamaha-made communication cable (D-sub type). By using daisy-chain connections, up to 16 axes can be managed together.

RS-232C

KV-L21V

Connect up to 16 units
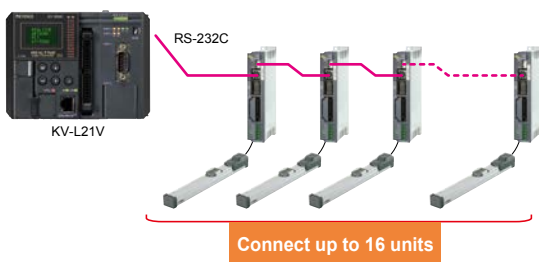
Automatic device assignment for each communication command

If the communication type is specified as cyclic, the desired information to be obtained is automatically stored in data memory.

Touch operator interface "Pro-Face" GP4000 Series

Connecting GP4000 Series made by Pro-face to Robot Positioner, TS-S2, TS-SH, TS-X, TS-P enables you to use a lot of functions as well as basic operations on Touch Operator Interface.
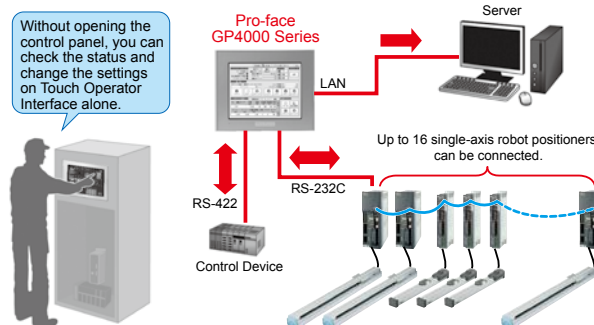
Free download of the program file from the Pro-face home page
http://www.proface.com

Can easily check a state and change settings.

- Check the status (the current position, speed etc)
- Basic operations such as Jog operation, inching operation, return to origin, error reset etc.
- Set, edit, or back up point data and parameters
- Check triggered alarms and detailed descriptions of alarm history

Supports 3 languages

- Supports Japanese, English, and Chinese (simplified, traditional)

Without opening the control panel, you can check the status and change the settings on Touch Operator Interface alone.

Pro-face GP4000 Series

Server

LAN

RS-422

RS-232C

Up to 16 single-axis robot positioners can be connected.

Control Device

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Linear conveyor modules LCMR200

Single-axis robots GX

Controller YHX

Linear conveyor modules LCM100

SCARA robots YK-X

Robot Vision RCX iVY2+

Single-axis robots Robonity

Linear motor single-axis robots PHASER

Single-axis robots FLIP-X

Compact single-axis robots TRANSERVO

Cartesian robots XY-X

Pick & place robots YP-X

CLEAN

CONTROLLER

Electric Gripper YRG

APPLICATION

SERVICE PERIOD

SR1-X/SR1-P   FLIP-X   PHASER

[Single-axis robot controller]

SR1-X   **SR1-P**

Operation method	Program Point trace Remote command Online command	
Number of points	1000 points	
Input power	Control power	Single phase 100 to 115/200 to 230V AC +/-10% maximum

	Main power	SR1-X05/SR1-X10
		  Single phase 100 to 115/200 to 230V AC
		  +/-10% maximum
		SR1-X20
		  Single phase 200 to 230V AC +/-10%
		  maximum
		SR1-P05/SR1-P10
		  Single phase 100 to 115/200 to 230V AC
		  +/-10% maximum
		SR1-P20
		  Single phase 200 to 230V AC +/-10%
		  maximum

Origin search method	SR1-X Absolute, Incremental SR1-P Incremental, Semi-absolute	

Various command methods

An optimal method can be selected from various command methods, such as program, point trace, remote command, and online command. The program uses the YAMAHA SRC language that is similar to the BASIC. Various operations, such as I/O output and conditional branching, etc. can be executed using simple operations.

Applicable to complete absolute position system

The SR1-X is applicable to complete absolute position system. No return-to-origin is needed. (The backup period is one year in the non-energizing state.)

I/O assignment function

As the I/O assignment is changed, the point trace operation, point teaching, and trace operation by specifying coordinate values can be selected in addition to the normal program operation. Since the JOG movement through the I/O is possible in the point teaching mode, the point teaching can be performed from the host unit without the HPB.

Current position output function

The position data is output as feedback pulse or binary data. This allows the host unit to understand the current robot position at re-al-time. Furthermore, functions, zone output or point zone output to output near point number are incorporated.

Torque limiting

As this function limits the maximum torque command value at desired timing, it is effective in operations such as pushing and work-piece gripping operations. Furthermore, in addition to the torque limiting by the parameter data value, the torque limiting by the analog input voltage can be performed.

ERCD   T4L/T5L

[Single-axis robot controller]

ERCD

Operation method	Program Point trace Online command Pulse train
Number of points	1000 points
Input power	DC 24 V +/-10% maximum
Origin search method	Incremental

Four command formats

A desired command format can be selected from four command formats, program operation using various commands, point trace operation only by instructing a point number, online command, and pulse train input.

Compact design

Compact box size of W 44 × H 142 × D 117mm is achieved with the functions improved.
The installation space can be reduced greatly.

Various input/output functions

As a feedback pulse output function is provided, the host control unit can easily manage the current position. Additionally, as the movement point number can be output in binary format during point trace, the operation can be checked easily. As a teaching function using the I/O is added, the flexibility and usability of the system configuration are further improved.
This output is enabled in the program or point trace operation and the number of outputs can be changed to a desired level using the division setting.

Various monitor functions

The controller status can be checked using the input/output status monitor, duty monitor, and LED status display.

Error history and alarm history

The error or alarm history that occurred in the past can be displayed and checked on the HPB or personal computer screen.

Robot number management

As the controller is initialized by the robot number of the robot to be controlled, parameters suitable for each robot model are automatically registered and no complicated servo adjustment is needed.

Torque limiting control

The torque limiting control can be performed using the program command. The axis can be stopped with the torque applied. This torque limiting control can be used for continuous positioning of workpieces with different sizes, press-fitting work, and workpiece holding operation.
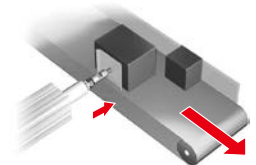
Zone output function

The general-purpose output on/off setting between desired points can be performed using the parameter setting. The positive logic/negative logic setting can be made and the axis position can be easily judged by an external unit. Up to four patterns can be set.
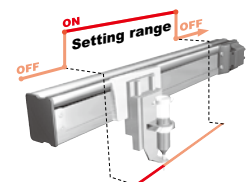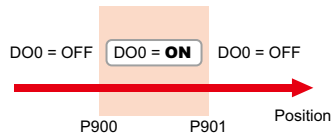
SR1-X/SR1-P/ERCD Various functions

Position data output function

Zone output

Outputs whether or not the robot position is within the specified range.

DO0 = OFF   DO0 = **ON**   DO0 = OFF

P900   P901   Position

It is possible to reverse the output logic.

Point zone output

Outputs the point number near the robot position in binary format.

DO (7)   (0)
0000 0011

DO (7)   (0)
0111 1111

P3   P127   Position
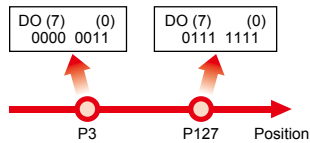
It is also possible to limit to only the moving point.

Binary output

Outputs the current robot position in 16-bit binary format. (This function is available only in the SR1.)

DO (15)   (0)
0011 1111 1100 0000

163.20 [mm]   Position
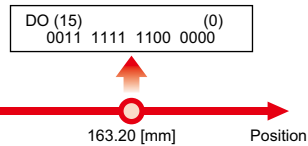
It is possible to adjust the unit of the output position data to be output using parameters.

Feedback pulse output

Outputs the current position counter value of the robot through the A/B-phase line driver.

A -phase
B -phase

Host unit (Counter)
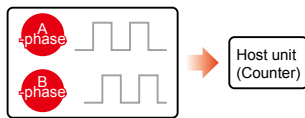
**It is possible to perform the monitoring by host unit at real-time.
A frequency division function is built-in.**

Point teaching

The JOG movement of the robot and the point reaching can be performed from the host unit.

■ Concept

● The robot is moved to the teaching position using the JOG+/JOG- command.

JOG-   JOG+

0   Position

● The current position is registered into the point number specified by the PSET input.

PSET

0   Position
Current position

Torque limiting function

As the torque limiting is performed during operation, the operation, such as pushing and workpiece gripping can be performed.

■ Concept

CW

TLM

Torque limiting value 1
Electric current
Torque limiting value 2

CCW
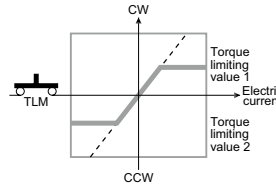
■ Features

SR1
● Host unit manages the limiting time using the TLM input.
● Limiting status is understood using the torque limiting status output (TLON).
● Torque limit value is changed (up to 4 patterns) using the input.
● Torque can be limited using the program command.
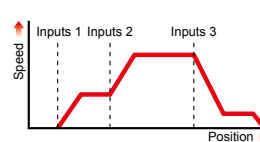● Torque can be limited using the analog input (0 to +10 V / 12 bit).

ERCD
● Torque can be limited using the T program command.

Movement data change function

The movement speed or target position can be changed during movement. (This function is available only in the SR1.)

■ Concept

Inputs 1 Inputs 2   Inputs 3

Speed

Position

■ Features

● Host unit manages the limiting time using the movement command input.
● Movement command is ABS-PT (absolute movement command) or ABS-BN (binary specified movement command).
● Change speed can be specified in a range of 1 to 100 % (up to 4 patterns).
● Changing is disabled in the deceleration zone.

YAMAHA SRC language convenient functions

Multi-task function

This function can execute multi tasks, such as robot peripheral units in parallel at the same time. Up to four tasks can be executed. With the multi-task function combined with JMPP command, the I/O signals can be output when the robot passes through the specified point during movement.

ON
Setting range   OFF
OFF   P2   P3
P0   P1
P2
P1
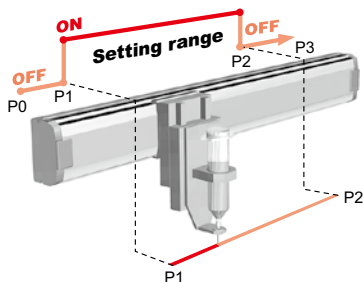
Conditional stop function during movement

The arm can be decelerated and stopped using I/O conditions of the MOVF command while it is moving. This function is useful when searching for the target position with the sensor.

I/O conditions

Stop
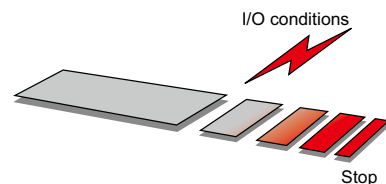
RCX3 series

RCX320 [2 axes]   ## RCX340 [3 to 4 axes]

[Multi-axis robot controller]

RCX320

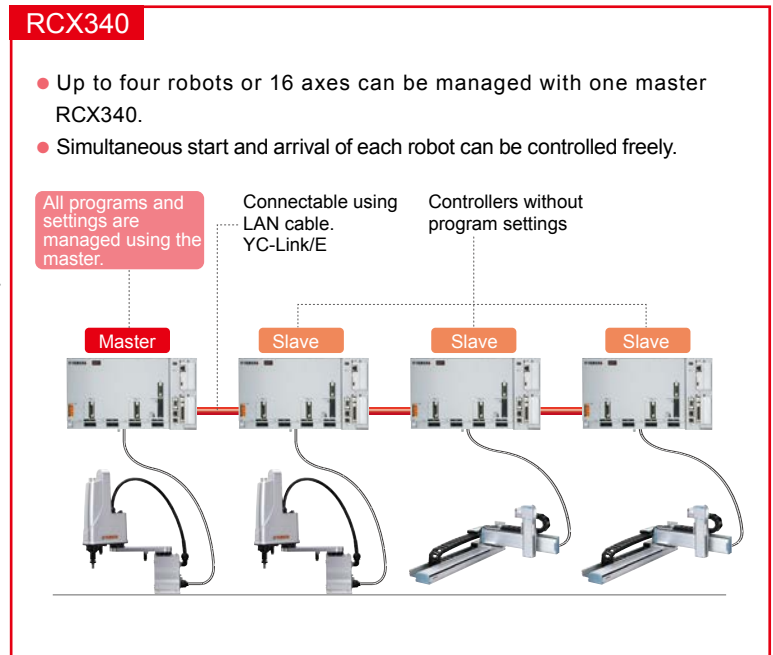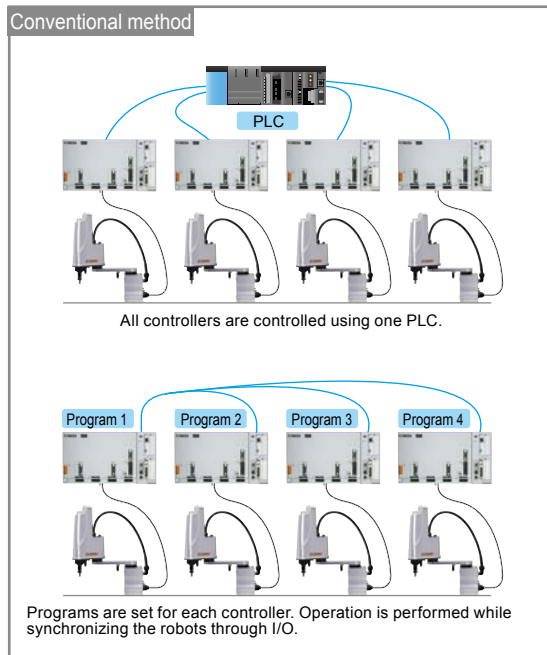| Number of axes	2 axes
Operation method	Program, Remote command Online command
Number of points	30000 points
Input power	Control power	Single phase 200 to 230V AC +/-10% maximum
	Main power	Single phase 200 to 230V AC +/-10% maximum
Origin search method	Absolute, Incremental Semi-absolute

RCX340

Number of axes	3 to 4 axes
Operation method	Program, Remote command Online command
Number of points	30000 points
Input power	Control power	Single phase 200 to 230V AC +/-10% maximum
	Main power	Single phase 200 to 230V AC +/-10% maximum
Origin search method	Absolute, Incremental Semi-absolute

Advanced functionality allowing construction of high-level equipment

Multiple robots can be operated synchronously through the high-speed communication. Use of linking among controllers makes it possible to store programs into only one controller. Use of a newly developed algorithm achieves shortening of the positioning time and improvement of the tracking accuracy.

The control of multiple robots can be managed using one master controller

The RCX340 controller allows high-speed communication among the controllers. As the operation command can be sent to the controller of each slave from the master controller, the programs or points can be managed only using the host master controller. Additionally, since the controller flexibly supports multitasking, interactions using PLCs can be simplified, making it easier to build systems at lower costs.

Conventional method

PLC

All controllers are controlled using one PLC.

Program 1   Program 2   Program 3   Program 4

Programs are set for each controller. Operation is performed while synchronizing the robots through I/O.

RCX340

- Up to four robots or 16 axes can be managed with one master RCX340.
- Simultaneous start and arrival of each robot can be controlled freely.

All programs and settings are managed using the master.

Connectable using LAN cable. YC-Link/E

Controllers without program settings
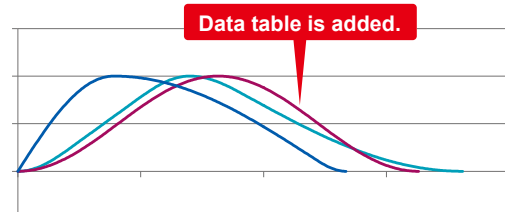
Master   Slave   Slave   Slave

Motion optimization

The optimization of the motion to meet the operation pattern is further strengthened to bring out the robot performance at its maximum level. Higher quality robot operations, such as shortening of the operation time and suppression of vibrations during stopping are achieved.

■ Optimal acceleration/deceleration motion

Acceleration/deceleration motion is generated that can perform the high-speed operation while suppressing vibrations.

Data table is added.

Linear conveyor modules LCMR200
Single-axis robots GX
Controller YHX
Linear conveyor modules LCM100
SCARA robots YK-X
Robot Vision RCX iVY2+
Single-axis robots Robonity
Linear motor single-axis robots PHASER
Single-axis robots FLIP-X
Compact single-axis robots TRANSERVO
Cartesian robots XY-X
Pick & place robots YP-X
CLEAN
CONTROLLER
Electric Gripper YRG
APPLICATION
SERVICE PERIOD

Smooth movement is achieved by greatly improving motion functions

As a new servo motion engine is incorporated, various operations can be merged. Use of a newly developed algorithm achieves shortening of the positioning time and improvement of the tracking accuracy.
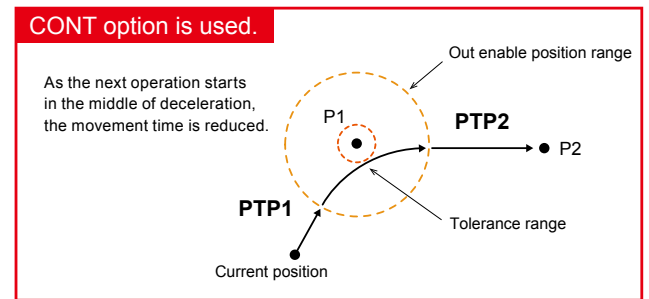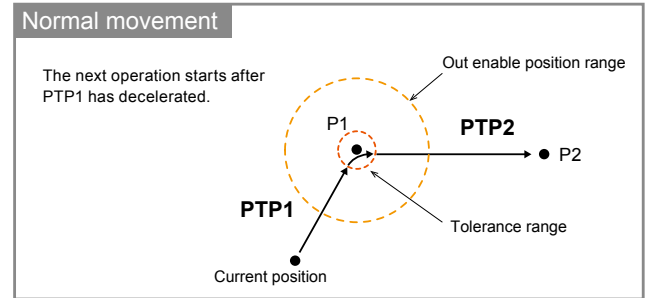
■ Expansion of CONT option function

Different type operations, such as PTP, interpolation operation, and conveyor tracking, etc. are merged to improve the speed.
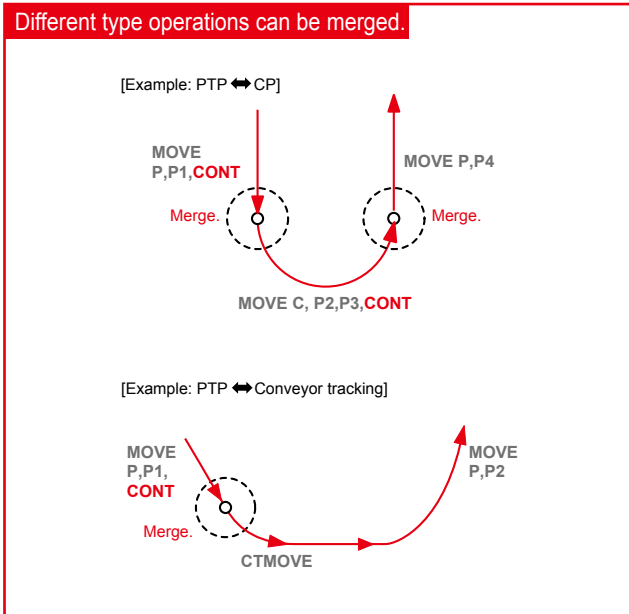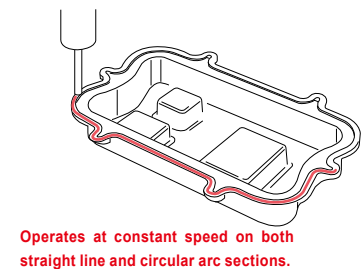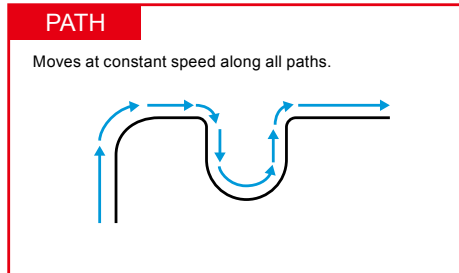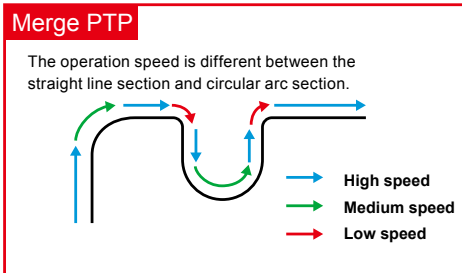
■ Improvement of continuous operation

By using the CONT option, such as when passing through a relay point in the middle of an operation to avoid an obstacle, it is possible to smoothly merge operations without decelerating and stopping for each operation. Regardless of the type of operation (PTP, interpolation operation), operations can be merged.

Different type operations can be merged.

[Example: PTP ⟷ CP]

MOVE P,P1,**CONT**   MOVE P,P4
Merge.   Merge.
MOVE C, P2,P3,**CONT**

[Example: PTP ⟷ Conveyor tracking]

MOVE P,P1, **CONT**   MOVE P,P2
Merge.
CTMOVE

Normal movement

The next operation starts after PTP1 has decelerated.

Out enable position range
P1
PTP2
P2
PTP1
Tolerance range
Current position

CONT option is used.

As the next operation starts in the middle of deceleration, the movement time is reduced.

Out enable position range
P1
PTP2
P2
PTP1
Tolerance range
Current position

■ Proper use according to application [Note]

In merge PTP, priority is given to the movement time, and the movement speed is changed between the straight line section and circular interpolation section. In PATH, by registering paths in advance, it is possible to operate at a constant speed even on complex paths, and tracking accuracy is further improved. This is ideal for applications such as sealing.

Merge PTP

The operation speed is different between the straight line section and circular arc section.

→ High speed
→ Medium speed
→ Low speed

PATH

Moves at constant speed along all paths.

Operates at constant speed on both straight line and circular arc sections.

■ PBX with USB port for backup

Simple and easy operation for adding function or editing work.

Storing backup data is a simple task.

The operation menu supports Japanese, English, and Chinese.

■ Built-in regenerative unit   RCX340

As the regenerative unit (equivalent to RGU3) is built-in, no additional regenerative unit is needed when connecting to the existing robot.

■ Convenient LED Display for Error Status.

The operation status is displayed on the "7-segment LED display" located on the front panel of the controller.

If an error occurs, the relevant error message is displayed. The error status can visibly recognized without connecting the programming box.
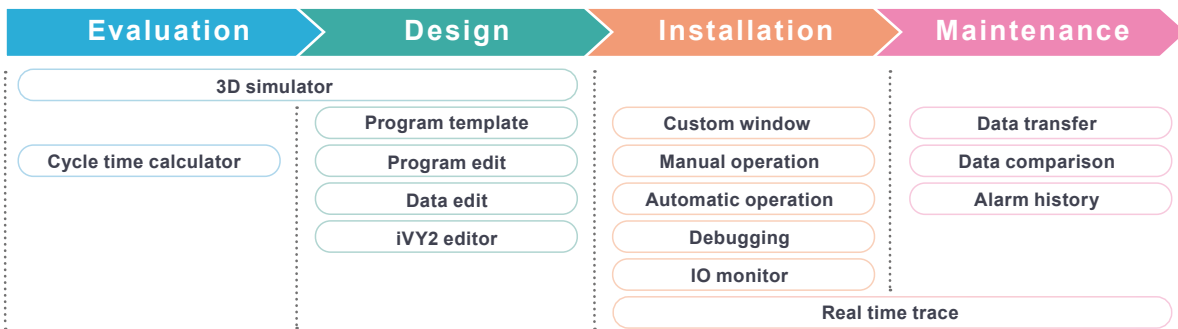

ON
OFF
SRV|ORG|E-STOP

▲ 7-segment LED display

LCMR200 | Linear conveyor modules
GX | Single-axis robots
YHX | Controller
LCM100 | Linear conveyor modules
YK-X | SCARA robots
RCX iVY2+ | Robot Vision
Robonity | Single-axis robots
PHASER | Linear motor single-axis robots
FLIP-X | Single-axis robots
TRANSERVO | Compact single-axis robots
XY-X | Cartesian robots
YP-X | Pick & place robots
CLEAN
CONTROLLER
YRG | Electric Gripper
APPLICATION
SERVICE PERIOD

PC Programming Software "RCX-Studio 2020"

New functions such as 3D simulator function and program template (program template automatic creation function) are added for ease of user operation.

Evaluation	Design	Installation	Maintenance

- 3D simulator
- Cycle time calculator
- Program template
- Program edit
- Data edit
- iVY2 editor
- Custom window
- Manual operation
- Automatic operation
- Debugging
- IO monitor
- Data transfer
- Data comparison
- Alarm history
- Real time trace

3D simulator

Layout can be verified beforehand without connecting robot.

Robots and peripheral devices are displayed in 3D, and the robot operation is simulated on PC. (This function supports SCARA and Cartesian robots.)

▶ Robot layout, teaching, and debugging can be performed.
▶ Physical interference between the robot and peripheral device can be checked before operation is started.
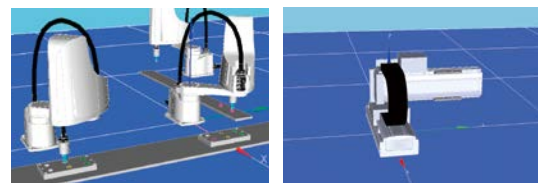
Program template (Program template automatic creation function)

Program creation time can be shortened greatly.

Program templates for 10 types of applications are incorporated. Just following the steps to perform the operation creates a program template automatically.
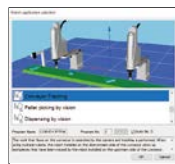

Supported applications
- Pick & place
- Palletizing
- Dispensing work
- Execution program switching
- Conveyor tracking
- Pallet picking using vision
- Dispensing with vision
- Gripping deviation correction using vision
- Parts orientation adjustment on the fly with vision
- Parts orientation adjustment on the fly with vision (without master)
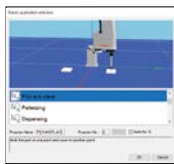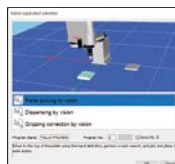

Pick & place

Palletizing

Conveyor tracking

Pallet picking using vision

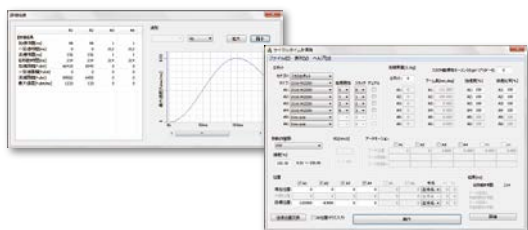Parts orientation adjustment on the fly with vision

Switching execution program

Program automatic conversion function

Controller program for RCX240 and earlier is converted to that for RCX3 series.

Other functions

All useful features from RCX-Studio Pro are succeeded to help supporting from startup to maintenance.

Cycle time calculator	Real time trace
Data comparison	Custom window creation function

Enhanced expandability

RS-232C and Ethernet ports are provided as standard equipment. A wide variety of high-speed and large capacity field networks, such as CC-Link, DeviceNet™, EtherNet/IP™, and EtherCAT are supported as options. Connections with general-purpose servo amplifier or other company's VISION are easy. So, the RCX320 and RCX340 is called "connectable controller".

Communication between controllers

YC-Link/E

Up to four RCX320 and RCX340 controllers (up to 16 controllable axes) can be connected.

- More flexible robot configuration
- Easy programming
- Centralized control of multiple robots
- Cost reduction

Applicable to various field buses/centralized control of robots through connections of up to four controllers

RS-232C and Ethernet ports are provided as standard equipment. Additionally, fulfilling field buses, such as CC-Link, EtherNet/IP™, DeviceNet™, PROFIBUS, PROFINET [Note 1], and EtherCAT can be supported to connect and control a wide variety of devices. For 5 or more axes, use of YC-Link/E makes it possible to connect up to four RCX340 controllers so as to perform the centralized control of multiple robots.

Additionally, when using YC-Link/E [Note 2], multiple robots can be handled as if they are operated using one controller. This ensures very easy robot programming and management.

Therefore, this robot controller contributes to reduction of unseen costs, such as labor cost necessary for the setup work.

Note 1. Supports PROFINET Ver. 2.2
Note 2. When ordering YC-Link/E, please specify what robot is connected to what number controller.

Centralized program control

Standard equipment, Ethernet

Up to four RCX340 controllers (16 axes) can be connected.

YC-Link/E
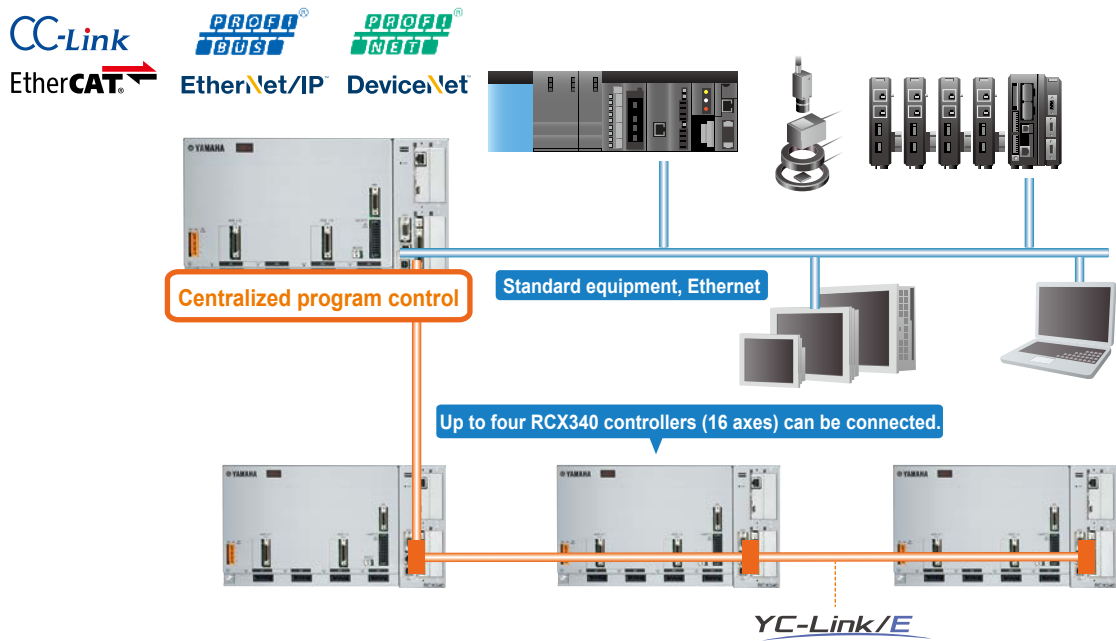
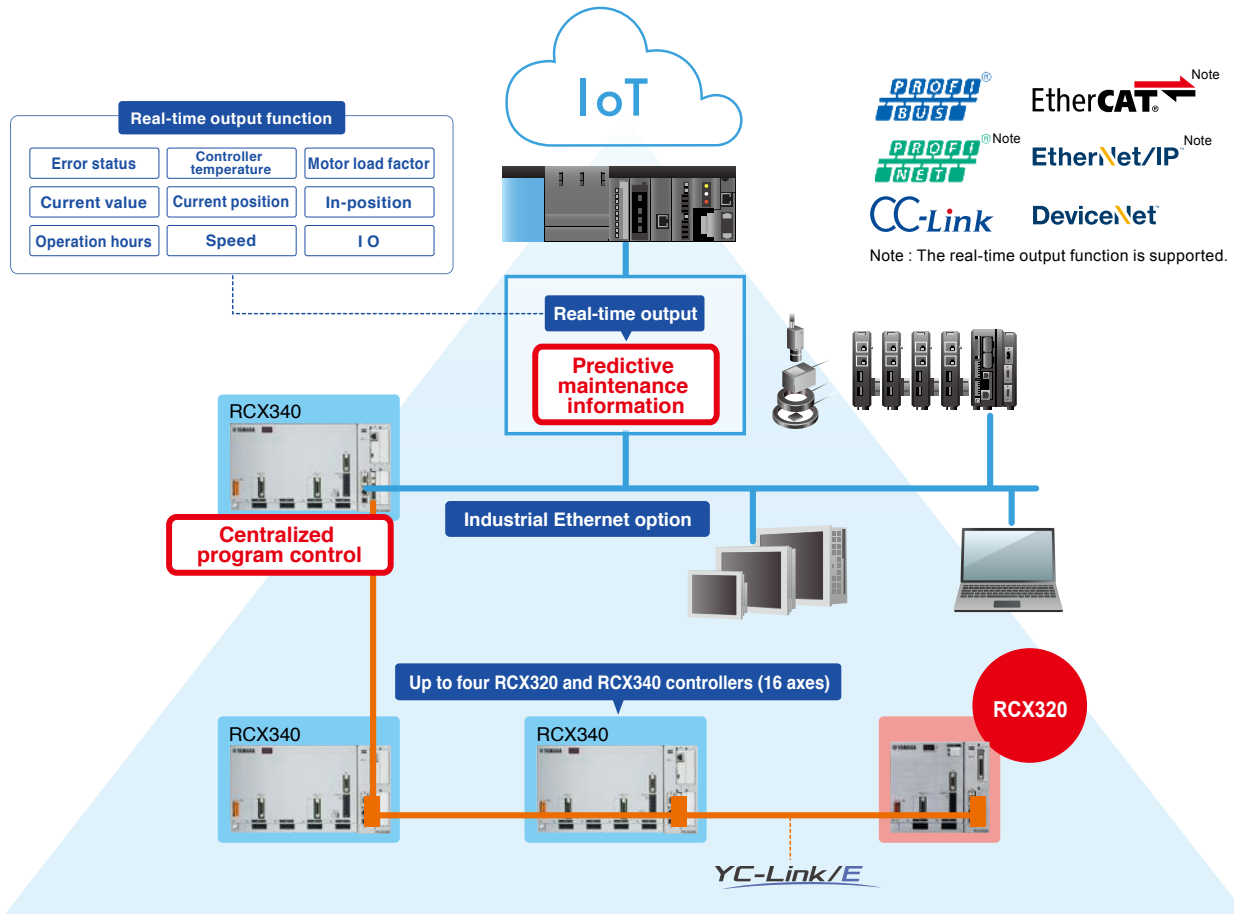### Applicable to robot vision and electric gripper

Robot integrated vision "RCXiVY2+" and electric gripper "YRG series" are supported. All control is possible with one robot controller. Data exchanging with the host unit, such as PLC is not needed. The setup or startup is very easy.

Robot vision: RCXiVY2+ System

Camera Light

Electric gripper: YRG series

RCX340
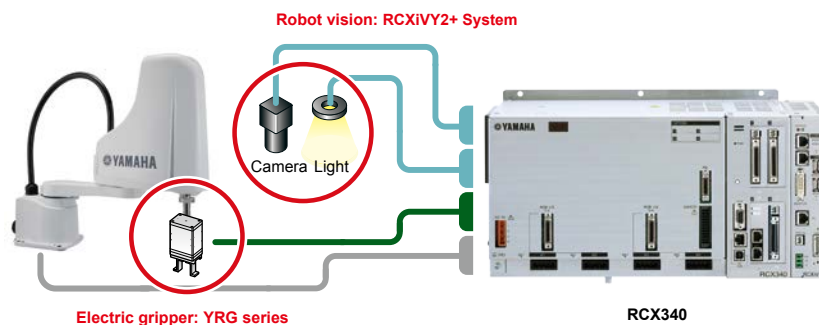
Real-Time output function for Preventive Maintenance.

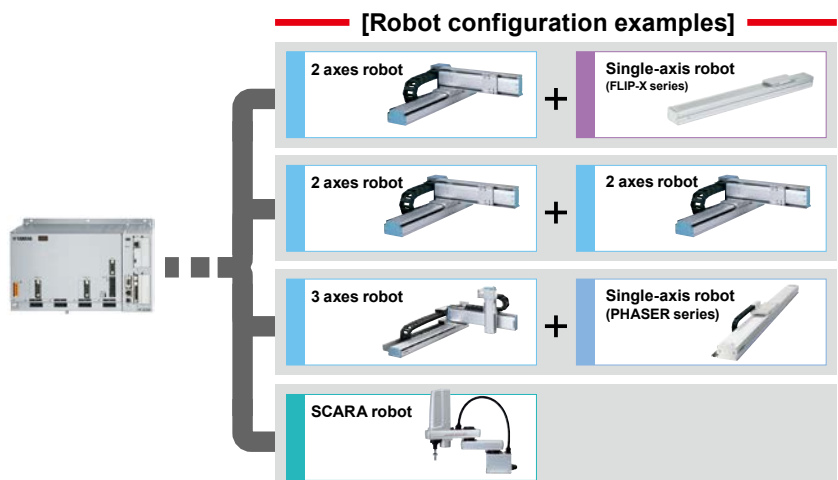## ▌Industrial Ethernet option Real-Time output function

When the industrial Ethernet option (EtherNet/IP, EtherCAT, or Profinet) is selected, the information necessary for the predictive maintenance such as error status, current position, current value, motor load factor, operation hours, and others can be output in real-time to contribute to achievement of the "non-stop production line".

Note : The real-time output function is supported.

Real-time output function

Error status	Controller temperature	Motor load factor
Current value	Current position	In-position
Operation hours	Speed	I O

IoT

Real-time output

Predictive maintenance information

RCX340

Centralized program control

Industrial Ethernet option

Up to four RCX320 and RCX340 controllers (16 axes)

RCX340   RCX340   **RCX320**

YC-Link/E

RCX340 are applicable to all single-axis, Cartesian, SCARA, and P&P robots Note

The 4-axis robot controller RCX340 are applicable to all robot models including single-axis, Cartesian, SCARA, and Pick & Place robots.
As the mixed control of the ball screw type FLIP-X series and linear motor type PHASER series can be performed, the robots can be combined freely according to the applications. Additionally, when preparing the robot controllers for the maintenance work of multiple robots, it is enough to prepare only one robot controller. This robot controller can be used for any model only by changing the setting.

Note. Except for 24 V specification models.

[Robot configuration examples]

2 axes robot	+	Single-axis robot (FLIP-X series)
2 axes robot	+	2 axes robot
3 axes robot	+	Single-axis robot (PHASER series)
SCARA robot		

Linear conveyor modules LCMR200
Single-axis robots GX
Controller YHX
Linear conveyor modules LCM100
SCARA robots YK-X
Robot Vision RCX iVY2+
Single-axis robots Robonity
Linear motor single-axis robots PHASER
Single-axis robots FLIP-X
Compact single-axis robots TRANSERVO
Cartesian robots XY-X
Pick & place robots YP-X
CLEAN
CONTROLLER
Electric Gripper YRG
APPLICATION
SERVICE PERIOD

Major features and functions of RCX controller

To palletize.

Function: Palletize

By entering the coordinate values of the four corners on the palette and specifying the number of palettes in the vertical and horizontal directions, the coordinate values of each point are automatically generated. By specifying the coordinate values and the number of palettes in the height direction, a three-dimensional palette is also supported.

The maximum number of pallets that can be defined is 40, but the coordinate values of the four corners and the number of pallets in each direction can be changed by program, so virtually any number of pallets can be supported.
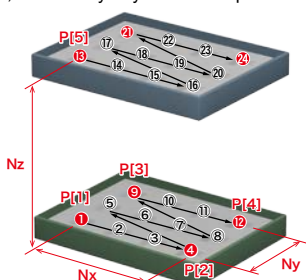
- **Number of pallets that can be used at the same time: 40**
- **2D/3D pallets are supported.**

Sample program
PDEF(1)=3,4,2,P3991 ··· Defines pallet definition 1 to Nx : 4, Ny : 3, and Nz : 2 using P3991 to P3995.
PMOVE(1,16),S=50 ··· Moves the robot to the point at position number 16 of palette number 1 at 50% speed.

To prevent interference with peripheral devices.

Function: Area judgement output

When the robot enters the pre-registered range, a signal is output to the specified port. This function is useful when there are interfering objects in the equipment to limit the robot operation range or when multiple robots are used in a layout where they interfere with each other. This function operates regardless of the automatic or manual operation mode, so it is also effective for jog operation during teaching.

- **Max: 32 areas can be specified.**
- **Effective even during manual operation.**
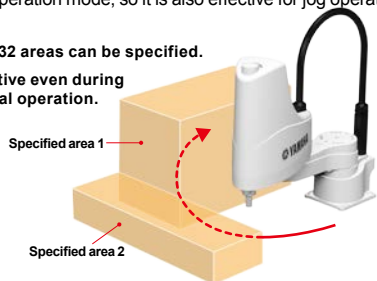
- **Number of areas that can be registered: 32**
- **Functions not only during automatic operation, but also during manual operation.**

To use the tool offset from the tip of the robot.

Function: Hand definition

This function is used to operate the robot based on the coordinates of the off-set tool tip when a tool is attached to the tip axis of the robot in an offset state. This function is especially effective when there are multiple hands or when a SCARA robot or a robot with rotation axis rotates around the tool.

Without hand definition **With hand definition**
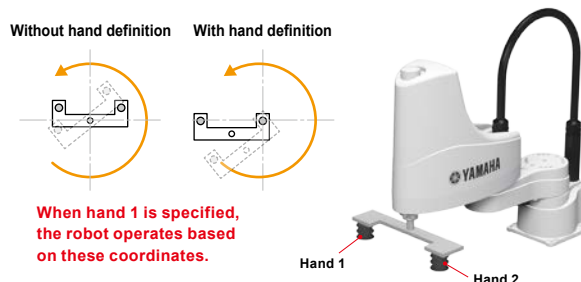
When hand 1 is specified, the robot operates based on these coordinates.

Hand 1 Hand 2

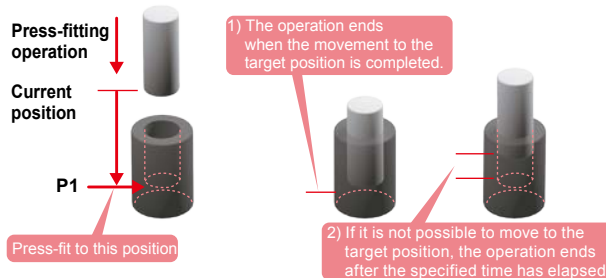- **Number of hands that can be registered: 32**
- **How to specify when there is R axis:** 1) Angle based on +X direction
                                          2) Hand length
                                          3) Z-axis offset amount

Sample program
HAND H1= 0.000 150.000 0.000 R
HAND H2= -90.000 100.000 0.000 R
P1= 150.000 300.000 0.000 0.000 0.000 0.000
CHANGE H1 ··· Changes the hand data of robot 1 to hand 1.
MOVE P,P1 ··· Moves the tip of hand 1 of robot 1 to P1.
CHANGE H2 ··· Changes the hand data of robot 1 to hand 2.
MOVE P,P1 ··· Moves the tip of hand 2 of robot 1 to P1.
HALT

To push the workpiece lightly.

Function: Torque limit (PUSH)

It is possible to operate by limiting the motor torque and movement speed when press-fitting a workpiece. If the movement to the target position is not completed even after the specified pressing time has elapsed, the operation stops.

Press-fitting operation

Current position

P1

1) The operation ends when the movement to the target position is completed.

Press-fit to this position

2) If it is not possible to move to the target position, the operation ends after the specified time has elapsed.

- **Specified by axis.**
- **Pressing force designation: Specified by % to rated thrust.**
- **Pressing time value: 1 to 32767 msec**
- **Pressing speed designation: 1 to 100%**
- **STOPON condition designation: Movement stops when the conditions are met.**

Sample program
PUSH(3,P1),F=20,TIM=5000,S=10
··· Moves the 3rd axis to the position specified by P0 under the following conditions. Pressing force: 20% of rated thrust, Pressing time: 5 sec, Speed: 10% * The command ends when the pressing force reaches 20% for 5 seconds or more.

LCMR200 Linear conveyor modules

GX Single-axis robots

YHX Controller

LCM100 Linear conveyor modules

YK-X SCARA robots

RCX iVY2+ Robot Vision

Robonity Single-axis robots

PHASER Linear motor single-axis robots

FLIP-X Single-axis robots

TRANSERVO Compact single-axis robots

XY-X Cartesian robots

YP-X Pick & place robots

CLEAN

CONTROLLER

YRG Electric Gripper

APPLICATION

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To move along a specified path.

Function: Linear interpolation and circular interpolation (2D/3D)

2D/3D linear and circular interpolation control is possible. This function is effective for sealing work and when you want to specify a path to avoid obstacles.

For PTP movement   **For linear interpolation**
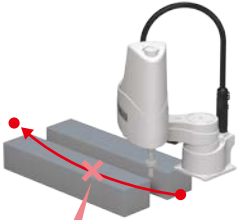
Movement hits an obstacle in PTP.
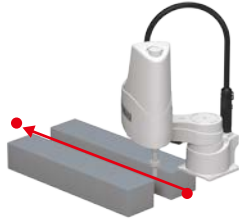
- Linear interpolation and circular interpolation are supported.
- <Option>
- **SPEED**: Relative speed designation
- **DSPEED**: Absolute speed designation
- **VEL**: Linear speed designation (Specified in mm/s)
- **STOPON condition designation**: Deceleration stops when the conditions are met.
- **CONT designation**: Connects with next movement command.
- **Acceleration/deceleration designation**
- **Port output designation**: Outputs a signal after moving a specified distance.

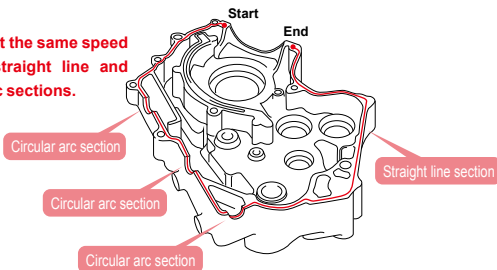| Sample program	
MOVE L,P20	··· Linear interpolation movement from the current position to P20
MOVE C,P21,P22,P23,P20	··· Circular interpolation movement consisting of P21, P22, P23, and P20
MOVE L,P24	··· Linear interpolation movement to P24

To perform sealing at constant speed.

Function: PATH statement

Sealing requires the path accuracy and constant movement speed. PATH is a function that moves at a specified speed on a path consisting of straight lines and circular arcs, and is suitable for sealing applications because there is little speed fluctuation during movement.

It is possible to change the speed only for a part of the path or output a signal to a specified port at an arbitrary section during movement.

Operates at the same speed on both straight line and circular arc sections.

Start
End
Circular arc section
Circular arc section
Straight line section
Circular arc section

- Moves at a "constant speed" along a specified path.
- After specifying the path in advance with "PATH SET, PATH, PATH END", start the movement with "PATH START".
- Up to 1000 points can be specified.

Sample program	
PATH SET	
PATH L,P1,DO(20)=1@10	··· While moving from the current position to P1 by linear interpolation, set to output "1" to DO(20) at a 10 mm radius position from the start position.
PATH L,P2,DO(21)=1@12.5	··· While moving to P2 by linear interpolation, set to output "1" to DO(21) at a 12.5 mm radius position from P1.
PATH END	
PATH START	

To remove the robot, but not to reteach it.

Function: Shift coordinates

A deviation may occur in the coordinate system when re-installing or replacing the robot during maintenance work. In this case, the coordinate system can be corrected using the shift coordinate function. So, the point data can be used as it is. No re-teaching is needed.

Original coordinates   **Coordinates after reinstallation**   **Correction with shift coordinates**
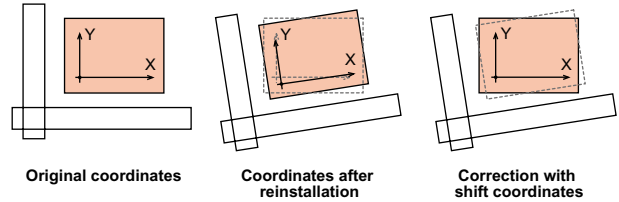
- **Number of shifts that can be defined: 40**

Sample program	
S0= 0.000 0.000 0.000 0.000	··· Defines the shift coordinates of S0.
S1= 100.000 200.000 50.000 90.000	··· Defines the shift coordinates of S1.
P3= 100.000	··· Defines the point data of P3.
SHIFT S0	··· Changes the shift coordinates to S0.
MOVE P,P3	··· PTP movement to P3.
SHIFT S1	··· Changes the shift coordinates to S1.
MOVE P,P3	··· PTP movement to P3.
HALT	

To output a signal during sealing movement.

Function: Passing point output

For applications such as turning discharge ON/OFF during sealing, general-purpose outputs can be controlled ON/OFF at a specified position without stopping the axis operation during interpolation operation. This function can be used with either the MOVE or PATH command.

OFF
ON
START
Distance1
Distance 2
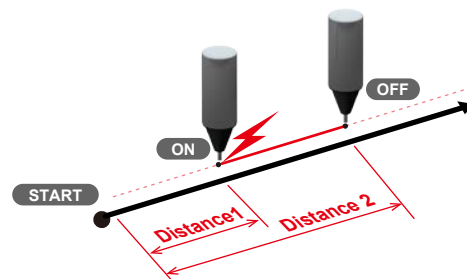
- Up to 3 decimal places can be specified (mm).
- Up to two times can be specified in one MOVE statement.
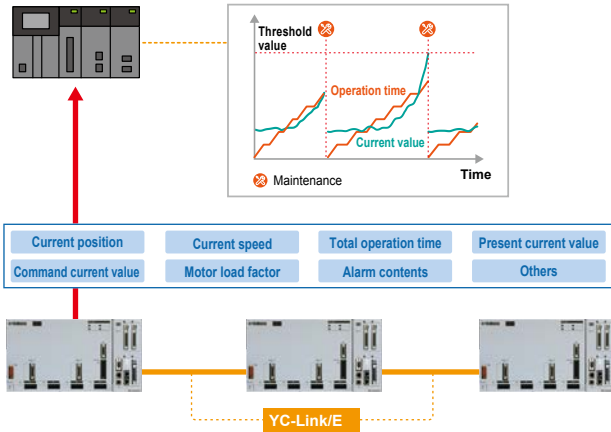
Sample program	
A!=10	
B!=20	
MOVE L,P1,DO(20)=1@A!,DO(20)=0@B!	···After starting to move to P1, DO (20) is turned ON at the timing of 10 mm away and DO (20) is turned OFF at the timing of 20 mm away.

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To output information necessary for predictive maintenance.

Function: Real-time output

Information necessary for predictive maintenance, such as error status, current position, current value, motor load factor, and operation time, can be output in real time.

* Industrial Ethernet options (EtherNet/IP, EtherCAT, Profinet) are supported.

| Current position | Current speed | Total operation time | Present current value |
| Command current value | Motor load factor | Alarm contents | Others |

YC-Link/E

To control multiple robots with one controller.

Function: YC-Link/E

Multiple RCX controllers can be linked and controlled by one master controller. Single-axis, Cartesian, and SCARA robots can be mixed, and all network boards and vision units are mounted only on the master controller. Therefore, information on one camera can be shared by multiple robots.

- Up to 4 controllers can be connected.
- When the RCX340 is used, up to 16 axes are supported.

To operate two robots efficiently.

Function: Multi-task

Multiple tasks (up to 16 tasks) such as robots and peripheral devices can be executed in parallel at the same time. Each task can be prioritized, and the priority can be changed while the task is running.

This is effective for applications such as simultaneously executing vision and robot operations in different tasks during conveyor tracking, and constantly monitoring the workpiece even during robot operation.
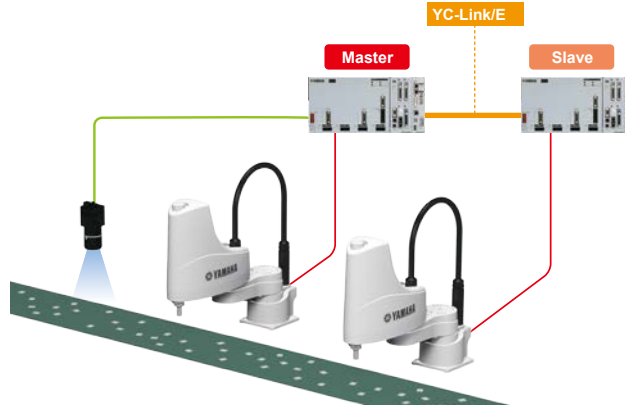
- Number of tasks that can be executed at the same time: 16
- Priority: 1 to 64 (high to low)

Sample program

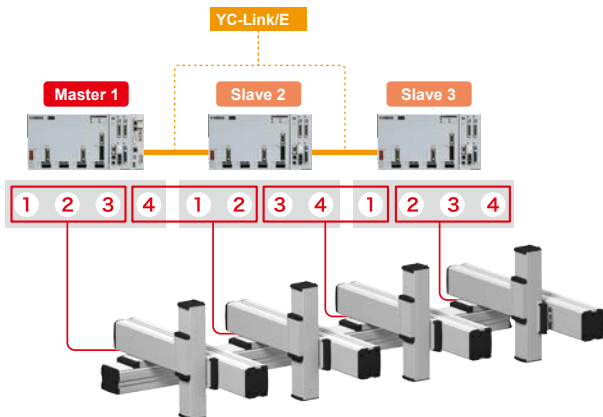| Program name <TRACK_MAIN>	
START<CONV_SCAN>,T2	···Starts the search task.
*CONVEYOR:	
WHILE CCHEKQUE(1)=-1	···Repeats until no workpiece passes through the work area.
CRMVQUE(1)	···Deletes workpiece elements that have
WEND	passed through the area.
IF CCHKQUE(1)>0 THEN	···Starts the work when workpiece enters the work area.
(Robot operation routine)	
ENDIF	
GOTO *CONVEYOR	···Repeats the routine.
Program name <CONV_SUB>	
CTVISION ON(1)	···Switches to vision use on conveyor 1.
*SCAN:	
VSEARCH 1,2,0	···Performs the search.
IF VGENCNT>0 THEN	···Process when workpiece is detected.
FOR I%=0 TO VGETCNT-1	···Adds search results to the position monitoring array.
CADDQUEV 1,VGETPOS(I%),TG=I%	···Adds to the position monitoring queue.
NEXT I	
ENDIF	
GOTO *SCAN	···Repeats the search.

Linear conveyor modules LCMR200
Single-axis robots GX
Controller YHX
Linear conveyor modules LCM100
SCARA robots YK-X
Robot Vision RCX iVY2+
Single-axis robots Robonity
Linear motor single-axis robots PHASER
Single-axis robots FLIP-X
Compact single-axis robots TRANSERVO
Cartesian robots XY-X
Pick & place robots YP-X
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Electric Gripper YRG
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To control multiple robots with one controller.

Function: Multiple-robot setting

Each axis of one controller can be distributed and set to multiple robots.
The RCX320 supports up to 2 axes and the RCX340 supports up to 4 axes.
Furthermore, by connecting multiple controllers via YC-LINK/E, up to 4 robots and 16 axes can be set.
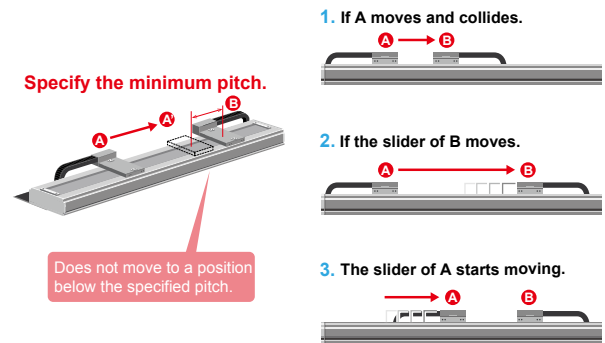

RCX340

Robot 2

Robot 1   Collision prevention
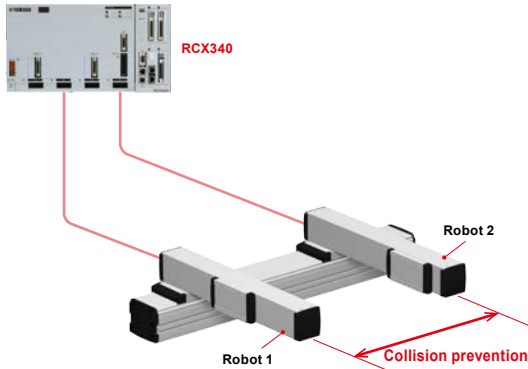
- **Each robot can be operated using MOVE [1] to MOVE [4] commands.**
- **Using multi-task also allows smooth coordination of each robot.**

To prevent pallet interference with the double carrier robot.

Function: Collision prevention function

With the double-carrier robot, collision of both carriers is prevented by control in the controller. No zone control or external sensor installation is required.
When a pallet larger than the carrier is mounted, the minimum distance between the carriers can be set using parameters.
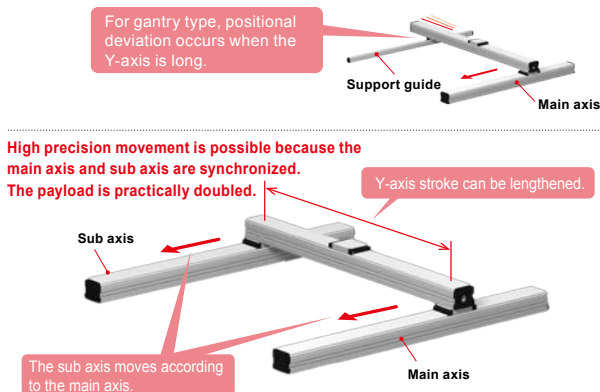
Specify the minimum pitch.

Does not move to a position below the specified pitch.

1. **If A moves and collides.**

A → B

2. **If the slider of B moves.**

A → B

3. **The slider of A starts moving.**

A   B

- **Support for operating double-carrier robot with RCX (N15, N18, and PHASER series)**

To lengthen the Y-axis stroke of the Cartesian robot.

Function: Dual drive

This function synchronously controls two robots of the same type. When the main axis is moved, the sub axis follows in accordance with the movement of the main axis.
This function is effective for transferring heavy objects and supporting the long Y-axis stroke of the Cartesian robot. It is also possible to synchronize two sliders with a double-carrier robot such as a linear motor.

For gantry type, positional deviation occurs when the Y-axis is long.

Support guide

Main axis

High precision movement is possible because the main axis and sub axis are synchronized.
The payload is practically doubled.

Y-axis stroke can be lengthened.

Sub axis

The sub axis moves according to the main axis.

Main axis

- **Rigid dual: The main axis and sub axis are connected with high rigidity.**
- **Flexible dual: The main axis and sub axis do not have any force interference or are not connected.**
- **Tandem dual: Two sliders on the same axis are synchronized.**

To pick up a workpiece while following a moving object.

Function: Conveyor tracking

Picking can be made by following the movement of the workpiece moving on the conveyor.
Straight line and circular arc tracking is supported. Since the follow-up operation is performed based on the encoder input signal, the follow-up operation is possible even when the conveyor speed fluctuates.
This function supports not only workpieces searched by robot vision, but also tracking by sensor signal input.

Follows the workpiece in circular arc.
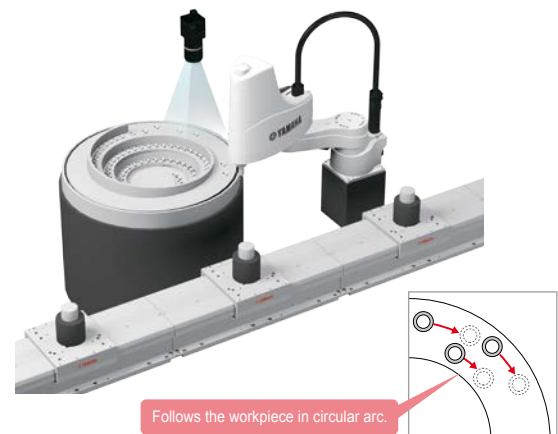
- **Vision tracking and sensor tracking are supported.**
- **Number of encoders connected: 2**
- **Target encoder: Line driver equivalent to 26LS31/26C31**
- **Maximum response frequency: 2 MHz**

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To increase the tact.

Function: Payload setting, arch motion, out enable position

Arch motion is effective for increasing the tact such as pick and place of workpieces. By specifying the linear movement distance when the Z-axis moves up or down, the operation can be performed with the optimal movement pattern.

In addition, increasing the value of the out enable position speeds up the timing for executing the next operation, which has the effect of reducing operation time.

* The robot is automatically set to the optimum acceleration when the payload is set. (Moment of inertia can also be set for SCARA robots.)

Target position

Tolerance

Out enable position
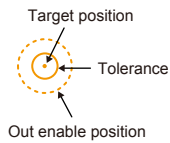
Out enable position:
When the axis tip enters this range, the next operation starts. When passing through relay points to avoid obstacles, etc., the operation time can be shortened by increasing this value.
* The value can be changed using the program.

▶ Normal movement

P2   P3

P1   P4

Normally, P1 to P4 are specified. Each operation starts the next operation when it enters the out enable position range.

MOVE P,P2,CONT	⋯	Moves from the current position to P2.
MOVE P,P3,CONT	⋯	Moves to P3 without stopping when the out enable position is entered.
MOVE P,P4	⋯	Moves to P4 without stopping when the out enable position is entered.

▶ Arch motion is used.

Z0

Z1   Z2

P1   P4
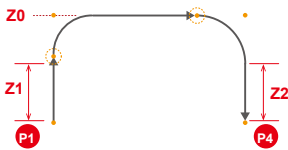
When the arch motion is operated,
• Only P1 and P4 are specified.
• Z-axis height during movement is specified. (Z0)
• The linear movement distances when ascending and descending are specified. (Z1, Z2)

A%=OUTPOS(3)	⋯	Assigns the parameter at the out enable position to A%.
OUTPOS(3)=2000	⋯	Changes the parameter at the out enable position to 2000.
MOVE P,P4,A3=0.00{50.00,70.00}		
	⋯	The A3-axis moves up to 0.00 mm when moving to P4. The A3 axis moves linearly 50.00 mm when ascending and 70.00 mm when descending.
OUTPOS(3)=A	⋯	Returns the parameter at the out enable position to the original value.

To improve the accuracy.

### Function: WAIT ARM, tolerance setting, acceleration setting

In a normal movement command, the next command is executed when the out enable position is entered. If positioning accuracy during operation is required, use "WAIT ARM" to execute the command after waiting for the position to fall within the tolerance range.

Additionally, since the tolerance range can be changed using the program, it is possible to move with different tolerance for each movement command.

• **WAIT ARM**
  Executes the next command after entering the tolerance range.

• **TOLE**
 Sets/acquires the tolerance parameter.

▶ Normal movement

Signal is output before entering the tolerance range.

Out enable position range

Tolerance range

P1 : Target position

Signal is output to DO (20).
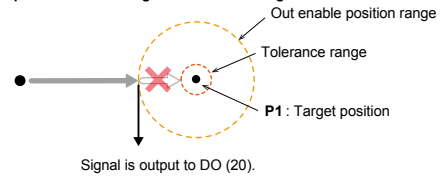
| MOVE P,P1 | ⋯ | Moves to P1. |
| DO(20)=1 | ⋯ | "1" is output to DO20 when the out enable position is entered. |

▶ WAIT ARM is used.

Signal is output after entering the tolerance range.

Out enable position range

P1 : Target position

Tolerance range

This range can be changed using the program.

Signal is output to DO (20).
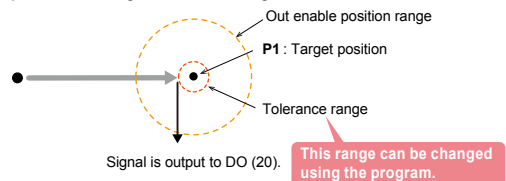
MOVE P,P1	⋯	Moves to P1.
WAIT ARM	⋯	Continues to move until entering the tolerance.
DO(20)=1	⋯	"1" is output to DO20 when entering the tolerance range.

LCMR200 | Linear conveyor modules
GX | Single-axis robots
YHX | Controller
LCM100 | Linear conveyor modules
YK-X | SCARA robots
RCX iVY2+ | Robot Vision
Robonity | Single-axis robots
PHASER | Linear motor single-axis robots
FLIP-X | Single-axis robots
TRANSERVO | Compact single-axis robots
XY-X | Cartesian robots
YP-X | Pick & place robots
CLEAN
CONTROLLER
YRG | Electric Gripper
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To operate without stopping at the avoidance point

Function: CONT option

When there is an obstacle on the robot movement path and an escape point is set to avoid it, use the CONT option in the movement command to enable smoother movement.

The normal MOVE command performs the positioning at each point, but when the CONT option is used, each movement is linked so that the movement continues without stopping in the middle.
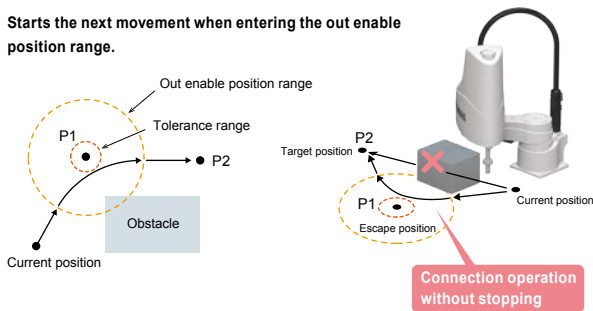
▶ Normal movement

Starts the next movement after entering the tolerance range.
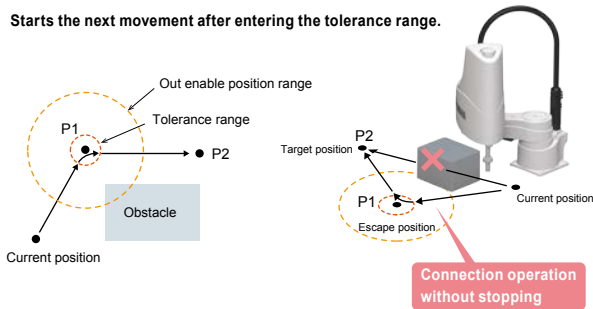
MOVE P,P1	⋯ Moves to P1. When the movement axis enters the tolerance range,
MOVE P,P2	the movement to P2 starts.

▶ CONT option is used.

Starts the next movement when entering the out enable position range.


For out enable position

OUTPOS 10000	⋯ Changes the OUTPOS parameters of all axes to 10000.
MOVE P,P1,CONT	⋯ Moves to P1. When the movement axis enters the out
MOVE P,P2	enable position range, the movement to P2 starts.

To increase the tact using two robots.

Function: Area judgement output, internal output variable

When two robots are used to transfer a workpiece for tact-up purposes, the area judgment output can be used to ensure that the robots do not interfere with each other. In this case, by using the internal output variables (MI, MO), it is possible to exchange signals at high speed without using the host PLC.

▶ Area judgement output setting
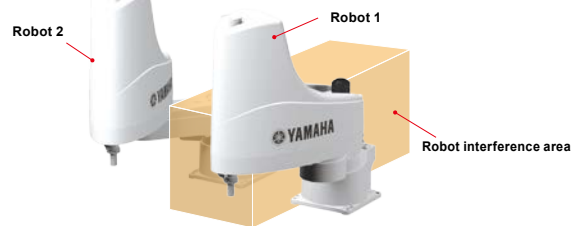
MO(20)	⋯ ON when robot 1 enters the area.
MO(40)	⋯ ON when robot 2 enters the area.

▶ Program example

Program name <ROB1_MAIN>

START <ROB2_SUB>,T2	⋯ Starts the sub task.
MOVE[1] P,P1,A3=0.00	⋯ Moves to the standby position.
***LOOP1:**	
WAIT MO(50,40)=&B10	⋯ Waits until robot 2 moves out of area.
MO(30)=0	⋯ Operating flag is OFF.
MOVE[1] P,P3	⋯ Moves to the place position.
WAIT ARM[1]	
MO(30)=1	⋯ Operating flag is ON.
MOVE[1] P,P2	⋯ Moves to the pick position.
WAIT ARM[1]	
GOTO *LOOP1	

Program name <ROB2_SUB>

MOVE[2] P,P11,A3=0.00	⋯ Moves robot 2 to the standby position.
***LOOP2:**	
MO(50)=1	⋯ Operating flag is ON.
MOVE[2] P,P12	⋯ Moves to the pick position.
WAIT ARM[2]	
WAIT MO(30,20)=&B10	⋯ Waits until robot 1 moves out of area.
MO(50)=0	⋯ Operating flag is OFF.
MOVE[2] P,P13	⋯ Moves to the place position.
WAIT ARM[2]	
GOTO *LOOP2	