

# RCX320

● Robot controller with advanced functions

A 2-axis model of the RCX340 controller has been launched finally.  
The high-level equipment construction such as simultaneous control of multiple robots is achieved by the advanced functionality and flexible expandability.



RCX320

## Main functions ▶ P.69



Programming box  
▶ **PBX/PBX-E**  
**P.575**



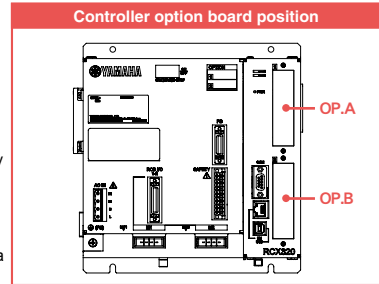
Support software for PC  
▶ **RCX-Studio Pro**  
**P.571**

## Ordering method

<b>RCX320</b>							
<b>Controller</b>	<b>No. of controllable axes</b>	<b>Safety standards</b>	<b>Regenerative unit</b> <small>Note 8</small>	<b>Controller option A (OP.A)</b>	<b>Controller option B (OP.B)</b>	<b>Vision System</b>	<b>Absolute battery</b>
	2: 2 axes 1: 1 axes	N: Normal E: CE	No entry: None R: YHX-RU	No entry: Non-selection NS : STD.DIO(NPN) <small>Note 1 Note 4</small> NE : EXP.DIO(NPN) <small>Note 1 Note 4</small> PS : STD.DIO(PNP) <small>Note 1 Note 4</small> PE : EXP.DIO(PNP) <small>Note 1 Note 4</small> GR : Gripper <small>Note 5</small> TR : Tracking <small>Note 5</small> YM1 : YC-Link/E master <small>Note 6</small> YS2 to 4: YC-Link/E slave <small>Note 6</small> EP : EtherNet/IP™ <small>Note 7</small> PB : PROFIBUS <small>Note 7</small> CC : CC-Link <small>Note 7</small> DN : DeviceNet™ <small>Note 7</small> PT : PROFINET <small>Note 7</small> ES : EtherCAT <small>Note 7</small>	No entry: Non-selection --- <small>Note 3</small> NE : EXP.DIO(NPN) <small>Note 2 Note 4</small> --- <small>Note 3</small> PE : EXP.DIO(PNP) <small>Note 2 Note 4</small> GR : Gripper <small>Note 5</small> TR : Tracking <small>Note 5</small> YM1 : YC-Link/E master <small>Note 6</small> YS2 to 4: YC-Link/E slave <small>Note 6</small> EP : EtherNet/IP™ <small>Note 7</small> PB : PROFIBUS <small>Note 7</small> CC : CC-Link <small>Note 7</small> DN : DeviceNet™ <small>Note 7</small> PT : PROFINET <small>Note 7</small> ES : EtherCAT <small>Note 7</small>	No entry: Non-selection VY: iVY2 without light VL: iVY2 with light	2: 2 pcs. 1: 1 pc. 0: 0 pc.

Please select desired selection items from the upper portion of the controller option A in order.

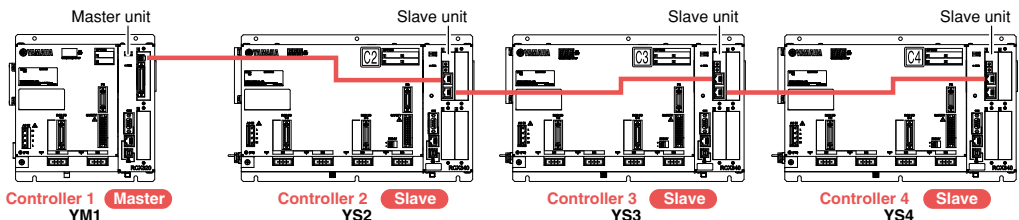
- Note 1. [STD.DIO] Parallel I/O board standard specifications  
Dedicated input 8 points, dedicated output 9 points, general-purpose input 16 points, general-purpose output 8 points  
Do not mix with field bus (CC/DN/PB/EP/PT/ES).
- Note 2. [EXP.DIO] Parallel I/O board expansion specifications  
General-purpose input 24 points, general-purpose output 16 points
- Note 3. Only one DIO STD specification board can be selected. Therefore, this board cannot be selected in OP.B to OP.D.
- Note 4. Select either NPN or PNP in DIO.
- Note 5. Only one tracking board can be selected.
- Note 6. Select only one master or slave board for YC-Link/E. For details, refer to "YC-Link/E ordering explanation" below.
- Note 7. Select only one fieldbus in a controller (CC/DN/PB/EP/PT/ES).
- Note 8. The regenerative unit (option) is required when operating a model designated by YAMAHA or a load with a large inertia.



## YC-Link/E explanation

Using the inter-controller communication "YC-Link/E", the RCX320 and RCX340 are connected and up to 14 axes (4 robots) can be expanded. The YC-Link/E can be executed by the program of only the master controller. This contributes to great reduction of the system startup time.

Example of YC-Link/E connections



- The "RCX320" and "RCX340" controllers support both the master and slave specifications.
- Up to four "RCX320" and "RCX340" controllers can be connected.
- The network board is inserted into only the master controller (YM1).

Controllable robot	<b>XY-X</b> <b>P.259</b>	<b>FLIP-X</b> <b>P.191</b>	<b>PHASER</b> <b>P.237</b>	<b>YP-X</b> <b>P.447</b>					
CE marking		Field networks	CC-Link	DeviceNet	EtherNet/IP	Ethernet			EtherCAT

## Basic specifications

Item		RCX320	
Basic specifications	Applicable robots	YAMAHA single-axis robots, linear single-axis robots, P&P robots	
	Connected motor capacity	1200W or less (in total for 2 axes)	
	Power capacity	2400VA	
	Dimensions	W213 × H195 × D130mm (main unit only)	
	Weight	3.6kg (main unit only)	
Input power supply	Control power supply	Single-phase 200 to 230V AC +/-10% 50/60Hz	
	Main power supply	Single-phase 200 to 230V AC +/-10% 50/60Hz	
Axis control	No. of controllable axes	Max. 2 axes Up to four units of the RCX320 and RCX340 can be connected using the inter-controller communication "YC-Link/E".	
	Drive method	AC full digital servo	
	Position detection method	Resolver or magnetic linear scale	
	Control method	PTP motion (point to point), ARCH motion, linear interpolation, circular interpolation	
	Coordinate systems	Joint coordinates, Cartesian coordinates	
	Position display units	Pulses, mm (1/1000 steps), degree (1/1000 steps)	
	Speed setting	0.01 to 100% (below 1% can be changed by programming)	
Acceleration/deceleration setting		Optimized by robot model and tip weight parameter Setting by acceleration coefficient and deceleration rate parameters (1% steps) * Can be changed by programming. Zone control (For SCARA robots only, optimized according to arm posture)	
Programming	Program language	YAMAHA BASIC II conforming to JIS B8439 (SLIM language)	
	Multi-task	Max. 16 tasks	
	Sequence program	1 program	
	Memory capacity	2.1MB (Total of program and point data) (Available capacity for program when the maximum number of points is used: 300KB)	
	Program	100 programs (maximum number of programs) 9999 lines (maximum number of lines per program)	
	Point	30000 points (maximum number of points)	
	Point teaching method	MDI (coordinate data input), direct teaching, teaching playback, offline teaching (data input from external unit)	
	System backup (Internal memory backup)	Lithium battery (service life about 4 years at 0 to 40°C)	
	Internal flash memory	512 KB	
External I/O	SAFETY	Input	Emergency stop ready input, 2 systems Auto mode input, 2 systems (Enabled only when the global specifications are used.)
		Output	Emergency stop contact output, 2 systems Enable contact output, 2 systems (Enabled only when the PBX-E is used.) Motor power ready output, 2 systems
	Brake output	Transistor output (PNP open collector)	
	Origin sensor input	Connectable to 24V DC B-contact (normally closed) sensor	
	External communications	RS-232C: 1CH (D-SUB 9-pin (female)) Ethernet: 1CH (In conformity with IEEE802.3u/IEEE802.3) 100Mbps/10Mbps (100BASE-TX/10BASE-T) Applicable to Auto Negotiation RS-422: 1CH (Dedicated to PBX)	
General specifications	Operating temperature	0 to 40°C	
	Storage temperature	-10 to 65°C	
	Operating humidity	35 to 85% RH (no condensation)	
	Atmosphere	Indoor location not exposed to direct sunlight. *No corrosive, flammable gases, oil mist, or dust particles	
	Anti-vibration	All XYZ directions 10 to 57Hz unidirectional amplitude 0.075mm 57 to 150Hz 9.8m/s <sup>2</sup>	
	Protective functions	Position detection error, power module error, temperature error, overload, overvoltage, low voltage, excessive position deviation, overcurrent, motor current error	
	Noise immunity	Conforms to IEC61000-4-4 Level 3	
	Protective structure	IP20	
Appliance classes	Class I		
Options	Parallel I/O board	Standard specifications	Dedicated input 8 points, dedicated output 9 points General-purpose input 16 points, general-purpose output 8 points NPN/PNP specifications are selected. (maximum 1 board)
		Expansion specifications	General-purpose input 24 points, general-purpose output 16 points NPN/PNP specifications are selected. (maximum 4 boards)
	Option board	CC-Link board Ver1.1/2.0	Remote I/O
		DeviceNet™ board	Dedicated input/output: 16 points each General-purpose input/output: 96 points each
		EtherNet/IP™ board	
		PROFIBUS board	Remote register Input/output: 16 words each
		PROFINET board	
	EtherCAT board		
	YC-Link/E board (master/slave)	Communication cycle: 1 ms, control cycle: minimum 1 ms / maximum 8 ms, maximum number of robot units: four units Maximum number of control axes: total 14 axes (including two master controller axes), maximum 12 axes for slaves only Position detection method: optical rotary encoder, minimum setting distance: 0.01 mm Speed setting: 20 to 100% relative to the maximum parameter speed, number of connected gripper units: maximum two units Drive power: DC 24V +/-10%, 1.0A Max	
	YRG (gripper) board		
Tracking board	Number of connected encoders: maximum two units, supported encoders: 26LS31/26C31 equivalent line driver (RS422 compliant) Encoder power supply: DC5V (2 counter (ch) total 500 mA or less) (supplied from controller)		
iVY2 unit	Camera pixels: maximum 5 million pixels, number of registered models: 254 models, number of connected cameras: maximum two units Power supply: DC24V +/-10% 1.5A Max		
Programming box	PBX, PBX-E		
Absolute battery	3.6V 2750mAh / axis Backup retention time: About 1 year		
Support software for personal computer	RCX-Studio Pro		

Articulated robots  
YA

Linear conveyor modules  
LCM100

Motor-assisted single-axis actuator  
Robonity

Compact single-axis robots  
TRANSERVO

Single-axis robots  
FLIP-X

Linear motor single-axis robots  
PHASER

Cartesian robots  
XY-X

SCARA robots  
YK-X

Pick & place robots  
YP-X

CLEAN

CONTROLLER INFORMATION

Robot positioner

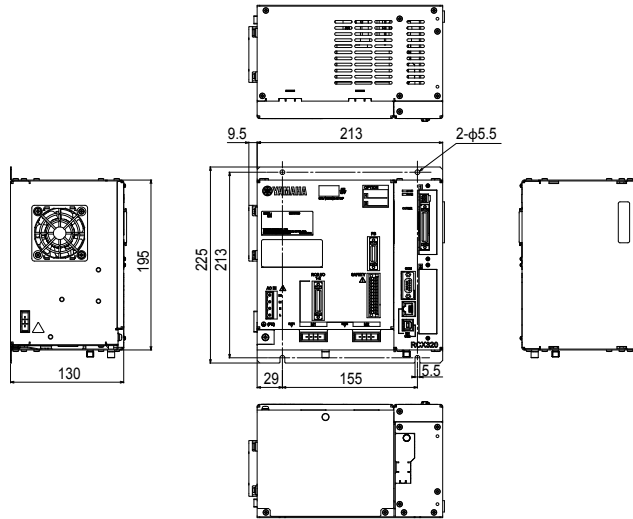
Pulse string driver

Robot controller

iVY2 Electric gripper

Option

## ■ Dimensions



## ■ Power supply capacity and heat emission

The required power supply capacity and heat emission will vary depending on the robot type and number of axes.

Using the following table as a general guide consider the required power supply preparation and control panel size, controller installation, and cooling method.

### ● When connected to 2 axis (Cartesian robot and/or multi-axis robot)

Axial current sensor value		Power capacity (VA)	Generated heat amount (W)
X axis	Y axis		
05	05	500	53
10	05	700	58
20	05	1500	78
10	10	900	63
20	10	1700	83
20	20	2400	100

### Motor capacity vs. current sensor table

Connected motor capacity	Current sensor
100W or less	05
200W	10
400W or more	20

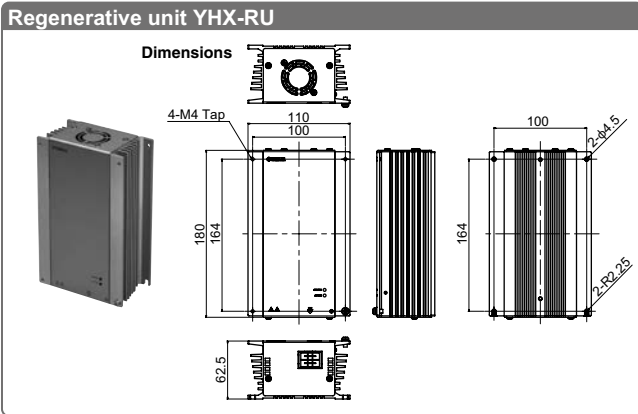
Note. Motor output of the B14H is 200W but the current sensor is 05.

Note. Even if axial current sensor values for each axis are interchanged no problem will occur.

## Conditions where regenerative unit is needed on multi robots

- Motor capacity exceeds a total of 450W.
- Motor capacity for perpendicular axis exceeds a total of 240W.
- The following conditions apply when perpendicular axis capacity is 240W or less.
  - perpendicular axis is 200W.
  - perpendicular axis is 100W and stroke is 700mm or more.
  - there are 2 perpendicular axes at 100W, and includes leads of 5mm.
- B14H which maximum speed exceeds 1250mm per second.

## ■ Regenerative unit YHX-RU



### ● Basic specifications

Item	YHX-RU	
Model	KEK-M5850-0A	
Dimensions	W62.5×H180×D110mm	
Weight	1.45kg	
Absorbable electric power	100 W (Equivalent to RGU 3) * 200 W when 2 are connected	
Power Supply	Input: 254 to 357 V DC (Controller DCBUS Connecting)	
Connector	Regenerative unit connector (for unit connection and extension)	
Installation Environment	Working Temperature	0 to 40 °C
	Working Humidity	35 to 85% RH (No Condensation)
	Location of Use	Altitude 2,000 m or lower and indoor (free from corrosive gases and dust)
	Storage Temperature	-10 to 65 °C
	Vibration Withstanding	1G
Protective Construction / Rating	IP20 / Class 1	

### ● Regenerative unit connection cable

Used when connecting a regenerative unit.



0.5m	Model	YHX-RU-50C
	Parts No.	KEK-M5363-00

### ● Regenerative unit selection table

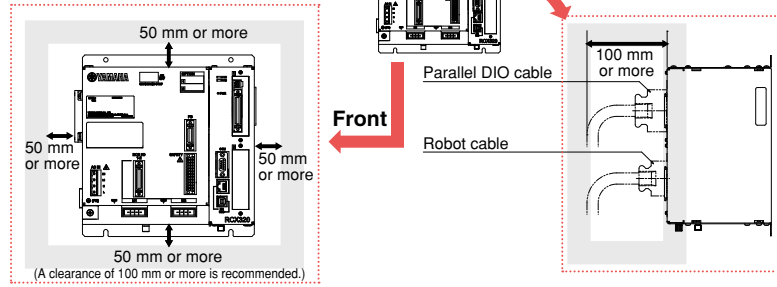
Whether the regenerative unit is needed is automatically determined by the robot model.

Regenerative unit	No entry (None) R (YHX-RU)	PHASER		FLIP-X	XY-X												YP-X	Clean					
		MF7D	MF15D	MF20D	MF30D	MF50D	MF75D	N15D	N18D	Arm type, Gantry type, Moving arm type, Pole type						XZ type			YP20BX	YP320X	SXYXC		
										PXYx	FXYx	FXYBx	SXYx	SXYBx	NXY	MXyX	HXYx	HXYLx				SXYx (ZF)	SXYBx (ZF)
		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

● : Applicable ○ : Select per conditions

## Installation conditions

- Use the screws to secure the controller to the installation plate inside the control panel so that it is in a horizontal position. Be sure to use the metallic installation plate.
- Install the RCX320 in a well ventilated location, with space on all sides of the RCX320 (See fig. at right.).
- Ambient temperature : 0 to 40°C
- Ambient humidity : 35 to 85% RH (no condensation)



## Standard specification I/O connector signal list

Pin	I/O No.	Signal name	Remarks
1	DI 01	Dedicated input: Servo ON input	
2	DI 10	Dedicated input: Sequence control	
3	DI 03	Spare	Do not use.
4	CHK 1	Check signal 1	Short-circuit with CHK2.
5	DI 05	Spare	Do not use.
6	DI 06	Dedicated input: Stop	
7	DI 07	Spare	Do not use.
8	DI 20	General-purpose input 20	
9	DI 21	General-purpose input 21	
10	DI 22	General-purpose input 22	
11	DI 23	General-purpose input 23	
12	DI 24	General-purpose input 24	
13	DI 25	General-purpose input 25	
14	DI 26	General-purpose input 26	
15	DI 27	General-purpose input 27	
16	DO 00	Spare	Do not use.
17	DO 01	Dedicated output CPU OK	
18	DO 10	Dedicated output AUTO mode output	
19	DO 11	Dedicated output Return-to-origin complete	
20	DO 12	Dedicated output Sequence program-in-progress	
21	DO 13	Dedicated output Robot program-in-progress	
22	DO 14	Dedicated output Program reset status output	
23	DO 15	Dedicated output Warning output	
24	DO 16	Spare	Do not use.
25	DO 17	Spare	Do not use.
26	DI 12	Dedicated input: Automatic operation start	
27	DI 13	Spare	Do not use.
28	DI 14	Dedicated input: Return-to-origin (for INC axis)	
29	DI 15	Dedicated input: Program reset input	
30	DI 16	Dedicated input: Alarm reset input	
31	DI 17	Dedicated input: Return-to-origin (for ABS axis)	
32	DI 30	General-purpose input 30	
33	DI 31	General-purpose input 31	
34	DI 32	General-purpose input 32	
35	DI 33	General-purpose input 33	
36	DI 34	General-purpose input 34	
37	DI 35	General-purpose input 35	
38	DI 36	General-purpose input 36	
39	DI 37	General-purpose input 37	
40	CHK 2	Check signal 2	Short-circuit with CHK1.
41	DO 02	Dedicated output: Servo ON output	
42	DO 03	Dedicated output: Alarm output	
43	DO 20	General-purpose output 20	
44	DO 21	General-purpose output 21	
45	DO 22	General-purpose output 22	
46	DO 23	General-purpose output 23	
47	DO 24	General-purpose output 24	
48	DO 25	General-purpose output 25	
49	DO 26	General-purpose output 26	
50	DO 27	General-purpose output 27	

## Expanded specification I/O connector signal list

Pin	I/O No. (ID=1)	I/O No. (ID=2)	I/O No. (ID=3)	I/O No. (ID=4)	Signal name
1	---	---	---	---	Reserved
2	DI 10	DI 40	DI 70	DI 120	General-purpose input 10,40,70,120
3	---	---	---	---	Reserved
4	DI 11	DI 41	DI 71	DI 121	General-purpose input 11,41,71,121
5	---	---	---	---	Reserved
6	---	---	---	---	Reserved
7	---	---	---	---	Reserved
8	DI 20	DI 50	DI 100	DI 130	General-purpose input 20,50,100,130
9	DI 21	DI 51	DI 101	DI 131	General-purpose input 21,51,101,131
10	DI 22	DI 52	DI 102	DI 132	General-purpose input 22,52,102,132
11	DI 23	DI 53	DI 103	DI 133	General-purpose input 23,53,103,133
12	DI 24	DI 54	DI 104	DI 134	General-purpose input 24,54,104,134
13	DI 25	DI 55	DI 105	DI 135	General-purpose input 25,55,105,135
14	DI 26	DI 56	DI 106	DI 136	General-purpose input 26,56,106,136
15	DI 27	DI 57	DI 107	DI 137	General-purpose input 27,57,107,137
16	---	---	---	---	Reserved
17	---	---	---	---	Reserved
18	DO 10	DO 30	DO 50	DO 70	General-purpose output 10,30,50,70
19	DO 11	DO 31	DO 51	DO 71	General-purpose output 11,31,51,71
20	DO 12	DO 32	DO 52	DO 72	General-purpose output 12,32,52,72
21	DO 13	DO 33	DO 53	DO 73	General-purpose output 13,33,53,73
22	DO 14	DO 34	DO 54	DO 74	General-purpose output 14,34,54,74
23	DO 15	DO 35	DO 55	DO 75	General-purpose output 15,35,55,75
24	DO 16	DO 36	DO 56	DO 76	General-purpose output 16,36,56,76
25	DO 17	DO 37	DO 57	DO 77	General-purpose output 17,37,57,77
26	DI 12	DI 42	DI 72	DI 122	General-purpose input 12,42,72,122
27	DI 13	DI 43	DI 73	DI 123	General-purpose input 13,43,73,123
28	DI 14	DI 44	DI 74	DI 124	General-purpose input 14,44,74,124
29	DI 15	DI 45	DI 75	DI 125	General-purpose input 15,45,75,125
30	DI 16	DI 46	DI 76	DI 126	General-purpose input 16,46,76,126
31	DI 17	DI 47	DI 77	DI 127	General-purpose input 17,47,77,127
32	DI 30	DI 60	DI 110	DI 140	General-purpose input 30,60,110,140
33	DI 31	DI 61	DI 111	DI 141	General-purpose input 31,61,111,141
34	DI 32	DI 62	DI 112	DI 142	General-purpose input 32,62,112,142
35	DI 33	DI 63	DI 113	DI 143	General-purpose input 33,63,113,143
36	DI 34	DI 64	DI 114	DI 144	General-purpose input 34,64,114,144
37	DI 35	DI 65	DI 115	DI 145	General-purpose input 35,65,115,145
38	DI 36	DI 66	DI 116	DI 146	General-purpose input 36,66,116,146
39	DI 37	DI 67	DI 117	DI 147	General-purpose input 37,67,117,147
40	---	---	---	---	Reserved
41	---	---	---	---	Reserved
42	---	---	---	---	Reserved
43	DO 20	DO 40	DO 60	DO 100	General-purpose output 20,40,60,100
44	DO 21	DO 41	DO 61	DO 101	General-purpose output 21,41,61,101
45	DO 22	DO 42	DO 62	DO 102	General-purpose output 22,42,62,102
46	DO 23	DO 43	DO 63	DO 103	General-purpose output 23,43,63,103
47	DO 24	DO 44	DO 64	DO 104	General-purpose output 24,44,64,104
48	DO 25	DO 45	DO 65	DO 105	General-purpose output 25,45,65,105
49	DO 26	DO 46	DO 66	DO 106	General-purpose output 26,46,66,106
50	DO 27	DO 47	DO 67	DO 107	General-purpose output 27,47,67,107

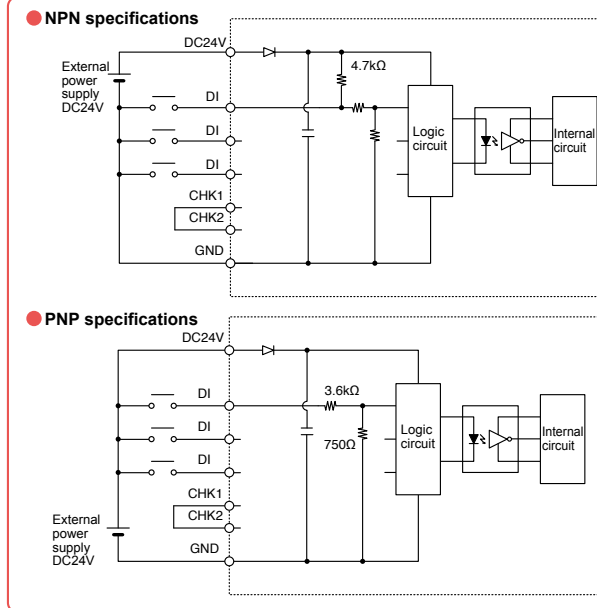
Note. The IDs are set using the parameter.

Articulated robots  
**YA**  
 Linear conveyor modules  
**LCM100**  
 Motor-less single axis actuator  
**Robonity**  
 Compact single-axis robots  
**TRANSERVO**  
 Single-axis robots  
**FLIP-X**  
 Linear motor single-axis robots  
**PHASER**  
 Cartesian robots  
**XY-X**  
 SCARA robots  
**YK-X**  
 Pick & place robots  
**YP-X**  
**CLEAN**  
**CONTROLLER**  
**INFORMATION**  
 Robot positioner  
 Pulse string driver  
 Robot controller  
 IVZ Electric gripper  
 Option

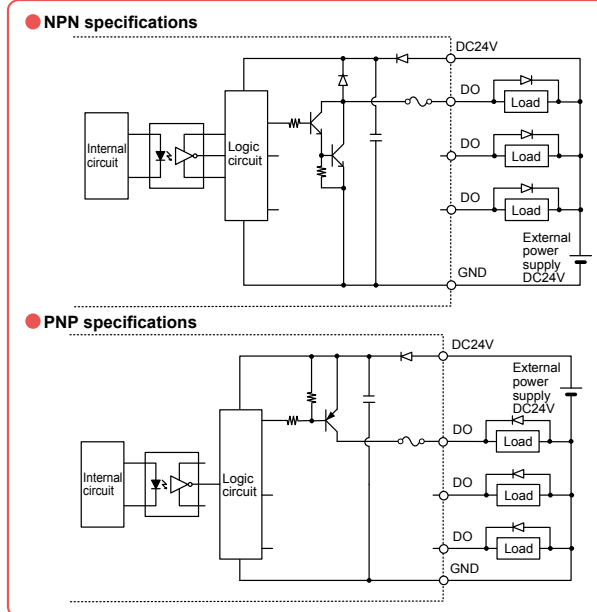
## Standard specification I/O connector pin assignment lists

Pin	I/O No.	Name
1	DI01	Servo ON
2	DI10	SEQ enable
3	DI03	(Spare)
4	CHK1	Check input 1
5	DI05	(Spare)
6	DI06	STOP
7	DI07	(Spare)
8	DI20	General-purpose input
9	DI21	General-purpose input
10	DI22	General-purpose input
11	DI23	General-purpose input
12	DI24	General-purpose input
13	DI25	General-purpose input
14	DI26	General-purpose input
15	DI27	General-purpose input
16	DO00	(Spare)
17	DO01	CPUOK
18	DO10	AUTO
19	DO11	ORGOK
20	DO12	SEQRUN
21	DO13	RUN
22	DO14	RESET
23	DO15	WARNING
24	DO16	(Spare)
25	DO17	(Spare)
26	DI12	RUN
27	DI13	(Spare)
28	DI14	ORIGIN (for INC axis)
29	DI15	RESET
30	DI16	ALMRST
31	DI17	ORIGIN(for ABS axis)
32	DI30	General-purpose input
33	DI31	General-purpose input
34	DI32	General-purpose input
35	DI33	General-purpose input
36	DI34	General-purpose input
37	DI35	General-purpose input
38	DI36	General-purpose input
39	DI37	General-purpose input
40	CHK2	Check input 2
41	DO02	SERVO
42	DO03	ALARM
43	DO20	General-purpose output
44	DO21	General-purpose output
45	DO22	General-purpose output
46	DO23	General-purpose output
47	DO24	General-purpose output
48	DO25	General-purpose output
49	DO26	General-purpose output
50	DO27	General-purpose output

## Typical input signal connection



## Typical output signal connection



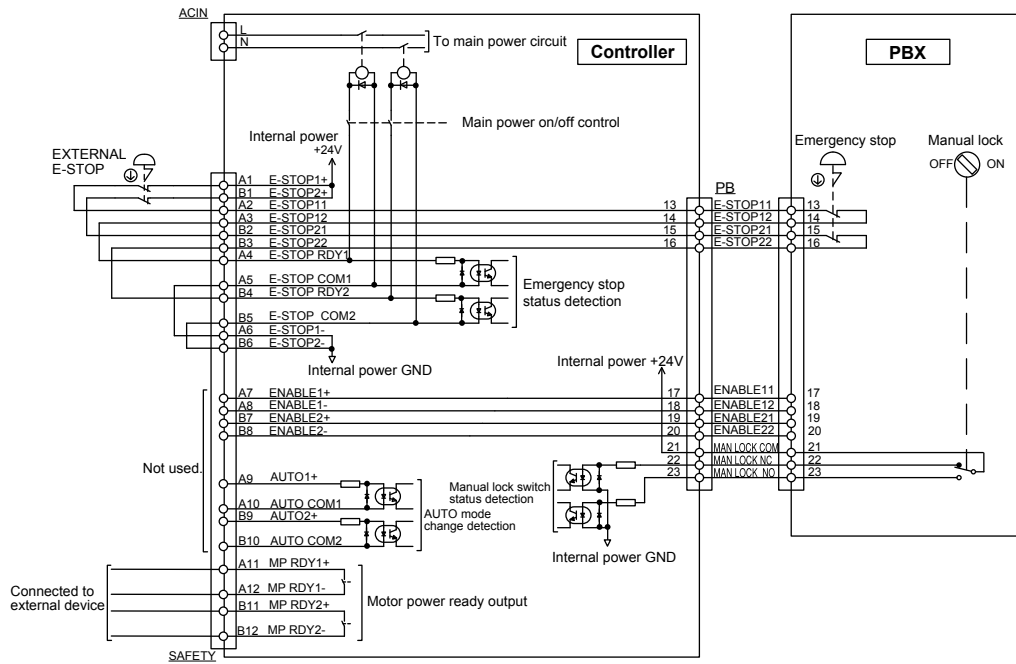
## Basic functions

Function	Description
<b>Operation modes</b>	AUTO mode (Major functions: program creation, program execution, step execution, etc.) MANUAL mode (Major functions: jog movement, point data teaching, parameter editing, etc.)
<b>Commands</b>	Array declaration commands (DIM statement) Assignment commands (Numeric assignment, character string assignment, point definition statements, etc.) Movement commands (MOVE, DRIVE, PMOVE statements, etc.) Conditional branching commands (IF, FOR, WHILE statements, etc.) External output commands (DO, MO, LO, TO, SO statements) Parameter commands (ACCEL, OUTPOS, TOLE statements, etc.) Condition wait command (WAIT statement) Task related commands (START, SUSPEND, CUT statements, etc.) etc.
<b>Functions</b>	Arithmetic functions (SIN, COS, TAN functions, etc.) Character string functions (STR\$, LEFT\$, MID\$, RIGHT\$ functions, etc.) Point functions (WHERE, JTOXY, XYTOJ functions, etc.) Parameter functions (ACCEL, OUTPOS, TOLE statements, etc.) etc.
<b>Variables</b>	Simple variables (integer variables, real variables, character variables) Array variables (integer variables, real variables, character variables) Point variables Shift variables I/O variables etc.
<b>Arithmetic operation</b>	Arithmetic operators (+, -, *, /, MOD) Logic operators (AND, OR, XOR) Relational operators (=, <, >, <=>, >=)
<b>Monitor</b>	I/O status monitor (200 ms intervals)
<b>Online commands</b>	Program operation commands (RUN, STOP, RESET, STEP, etc.) Utility commands (COPY, ERA, INIT, etc.) Data handling commands (READ, WRITE, etc.) Robot language commands (independent-executable commands)
<b>Data files</b>	Program, point, parameter, shift, hand, all, error history etc.
<b>Internal timer</b>	Timer count variable (TCOUNTER), 1 ms interval
<b>Program break points</b>	Max. 32 points

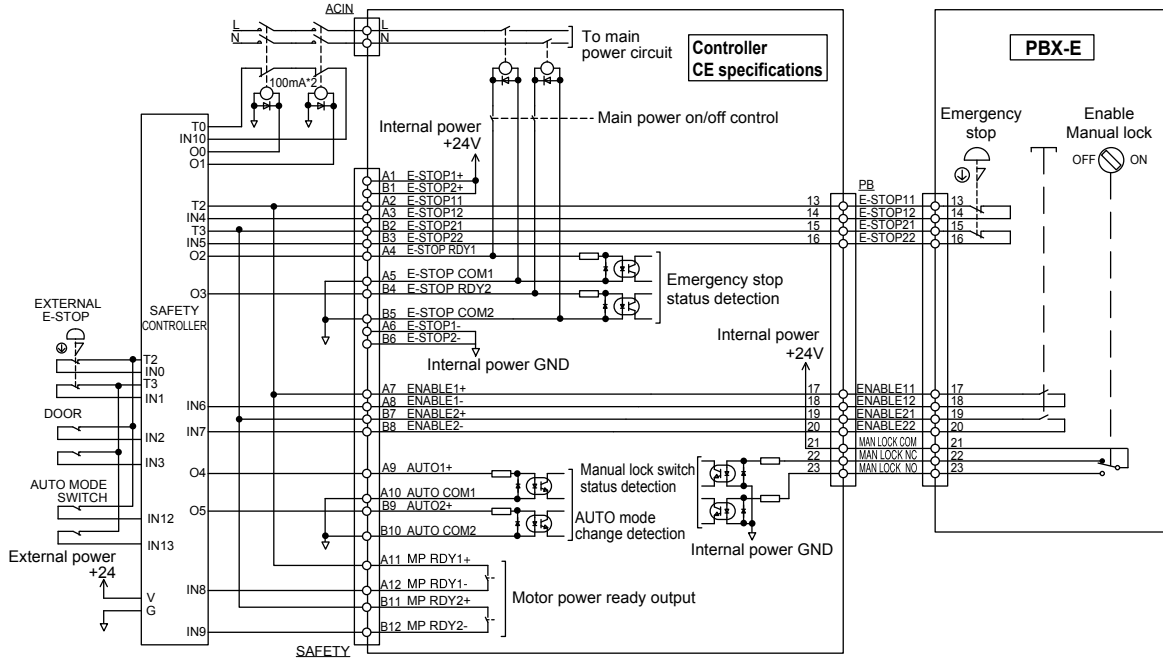
**Emergency input signal connections**

Articulated robots  
**YA**  
 Linear conveyor modules  
**LCM100**  
 Motor-less single axis reducer  
**Robonity**  
 Compact single-axis robots  
**TRANSERVO**  
 Single-axis robots  
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**CONTROLLER INFORMATION**  
 Robot positioner  
 Pulse string driver  
 Robot controller  
 I/V2 Electric gripper  
 Option

**Connection example of controller with normal specifications and PBX**



**Connection example of controller with CE specifications and PBX-E**



## Robot Language Table

### General commands

Command	Description
DIM	Declares the array variable name and the number of elements.
LET	Executes a specified assignment statement.
REM	Expresses a comment statement.

### Arithmetic commands

Command	Description
ABS	Acquires the absolute value of a specified value.
ATN	Acquires the arctangent of the specified value.
ATN2	Acquires the arctangent of the specified X-Y coordinates.
COS	Acquires the cosine value of a specified value.
DEGRAD	Converts a specified value to radians (↔RADDEG).
DIST	Acquires the distance between 2 specified points.
INT	Acquires an integer for a specified value by truncating all decimal fractions.
LSHIFT	Shifts a value to the left by the specified bit count. (↔RSHIFT)
RADDEG	Converts a specified value to degrees. (↔DEGRAD)
RSHIFT	Shifts a value to the right by the specified bit count. (↔LSHIFT)
SIN	Acquires the sine value for a specified value.
SQR	Acquires the square root of a specified value.
TAN	Acquires the tangent value for a specified value.

### Date / time

Command	Description
DATE \$	Acquires the date as a "yy/mm/dd" format character string.
TCOUNTER	Outputs count-up values at 1ms intervals starting from the point when the TCOUNTER variable is reset.
TIME \$	Acquires the current time as an "hh:mm:ss" format character string.
TIMER	Acquires the current time in seconds, counting from midnight.

### Character string operation

Command	Description
CHR \$	Acquires a character with the specified character code.
LEFT \$	Extracts a character string comprising a specified number of digits from the left end of a specified character string.
LEN	Acquires the length (byte count) of a specified character string.
MID \$	Extracts a character string of a desired length from a specified character string.
ORD	Acquires the character code of the first character in a specified character string.
RIGHT \$	Extracts a character string comprising a specified number of digits from the right end of a specified character string.
STR \$	Converts a specified value to a character string (↔VAL).
VAL	Converts the numeric value of a specified character string to an actual numeric value. (↔STR\$)

### Point, coordinates, shift coordinates

Command	Description
CHANGE	Switches the hand of a specified robot.
HAND	Defines the hand of a specified robot.
JTOXY	Converts joint coordinate data to Cartesian coordinate data of a specified robot. (↔XYTOJ)
LEFTY	Sets the hand system of a specified robot to the left-handed system.
LOCx	Specifies/acquires point data for a specified axis or shift data for a specified element.
PATH	Sets the movement path.
Pn	Defines points within a program.
PPNT	Creates point data specified by a pallet definition number and pallet position number.
RIGHTY	Sets the hand system of a specified robot to the right-handed system.
Sn	Defines the shift coordinates within the program.
SHIFT	Sets the shift coordinate for a specified robot by using the shift data specified by a shift variable.
XYTOJ	Converts the point variable Cartesian coordinate data to the joint coordinate data of a specified robot. (↔JTOXY).

### Branching commands

Command	Description
EXIT FOR	Terminates the FOR to NEXT statement loop.
FOR to NEXT	Executes the FOR to NEXT statement repeatedly until a specified value is exceeded.
GOSUB to RETURN	Jumps to a subroutine with the label specified by GOSUB statement, and executes that subroutine.
GOTO	Unconditionally jumps to the line specified by a label.
IF	Allows control flow to branch according to conditions.
ON to GOSUB	Jumps to a subroutine with labels specified by a GOSUB statement in accordance with the conditions, and executes that subroutine.
ON to GOTO	Jumps to label-specified lines in accordance with the conditions.
SELECT CASE to END SELECT	Allows control flow to branch according to conditions.
WHILE to WEND	Controls repeated operations.

### Error control

Command	Description
ERR / ERL	Acquires the error code number of an error which has occurred / the line number where an error occurred.
ON ERROR GOTO	This command allows the program to jump to the error processing routine specified by the label without stopping the program, or it stops the program and displays the error message.
RESUME	Resumes program execution after error recovery processing.

### Program control

Command	Description
CALL	Calls a sub-procedure.
HALT	Stops the program and performs a reset.
HALTALL	Stops and resets all programs.
HOLD	Temporarily stops the program.
HOLDALL	Temporarily stops all programs.
PGMTSK	Acquires the task number in which a specified program is registered.
PGN	Acquires the program number from a specified program name.
SGI	Assigns/acquires the value to a specified integer type static variable.
SGR	Assigns/acquires the value to a specified real type static variable.
SWI	Switches the program being executed, then begins execution from the first line.
TSKPGM	Acquires the program number which is registered in a specified task.

### Task control

Command	Description
CHGPRI	Changes the priority ranking of a specified task.
CUT	Terminates another task currently being executed or temporarily stopped.
EXIT TASK	Terminates its own task which is in progress.
RESTART	Restarts another task during a temporary stop.
START	Specifies the task number and priority ranking of a specified program, and starts that program.
SUSPEND	Temporarily stops another task which is being executed.

### Robot operations

Command	Description
DRIVE	Moves a specified axis of a specified robot to an absolute position.
DRIVEI	Moves a specified axis of a specified robot to a relative position.
MOTOR	Controls the motor power status.
MOVE	Performs absolute movement of all axes of a specified robot.
MOVEI	Performs relative movement of all axes of a specified robot.
MOVET	Performs relative movement of all axes of a specified robot when the tool coordinate is selected.
ORIGIN	Performs return-to-origin.
PMOVE	Executes the pallet movement command of a specified robot.
PUSH	Executes a pushing operation in the axis unit.
SERVO	Controls the servo ON/OFF of a specified axis or all axes of a specified robot.

● Status acquisition

Command	Description
ABSRPOS	Acquires the machine reference value for specified robot axes. (Valid only for axes whose return-to-origin method is set as "mark".)
ARMCND	Acquires the current arm status of a specified robot.
ARMSEL	Specifies/acquires the current "hand system" setting of a specified robot.
ARMTYP	Specifies/acquires the "hand system" setting of a specified robot.
CURTQST	Acquires the current torque value ratio of a specified axis to the rated torque.
MCHREF	Acquires the return-to-origin or absolute-search machine reference value for specified robot axes. (Valid only for axes whose return-to-origin method is set as "sensor" or "stroke-end".)
MTRDUTY	Acquires the motor load factor of the specified axis.
PSHRSLT	Acquires the status at the end of the PUSH statement.
PSHSPD	Specifies/acquires the push speed parameter.
PSHTIME	Specifies/acquires the push time parameter.
WAIT ARM	Waits until the axis operation of a specified robot is completed.
WHERE	Reads out the current position of the arm of a specified robot in joint coordinates (pulse).
WHRXY	Reads out the current position of the arm of a specified robot as Cartesian coordinates (mm, degrees).

● Status change

Command	Description
ACCEL	Specifies/acquires the acceleration coefficient parameter of a specified robot.
ARCHP1	Specifies/acquires the arch position 1 parameter of a specified robot.
ARCHP2	Specifies/acquires the arch position 2 parameter of a specified robot.
ASPEED	Specifies/acquires the AUTO movement speed of a specified robot.
AXWGHT	Specifies/acquires the axis tip weight parameter of a specified robot.
CHANGE	Switches the hand of a specified robot.
DECEL	Specifies/acquires the deceleration rate parameter of a specified robot.
HAND	Defines the hand of a specified robot.
LEFTY	Sets the hand system of a specified robot to the left-handed system.
ORGORD	Specifies/acquires the axis sequence parameter for performing return-to-origin and an absolute search operation in a specified robot.
OUTPOS	Specifies/acquires the "OUT position" parameter of a specified robot.
PDEF	Defines the pallet used to execute pallet movement commands.
PSHFRC	Specifies/acquires the "Push force" parameter.
PSHJGSP	Specifies/acquires the push judge speed threshold parameter.
PSHMTD	Specifies/acquires the push method parameter.
RIGHTY	Sets the hand system of a specified robot to the right-handed system.
SETGEP	Sets the General Ethernet Port.
SPEED	Changes the program movement speed of a specified robot.
TOLE	Specifies/acquires the tolerance parameter of a specified robot.
WEIGHT	Specifies/acquires the tip weight parameter of a specified robot.

● PATH control

Command	Description
PATH	Specifies the PATH motion path.
PATH END	Ends the path setting for PATH motion.
PATH SET	Starts the path setting for PATH motion.
PATH START	Starts the PATH motion.

● Torque control

Command	Description
CURTQST	Acquires the current torque value ratio of a specified axis to the rated torque.
CURTRQ	Acquires the current torque value of the specified axis of a specified robot.
PUSH	Executes a pushing operation in the axis unit.
TORQUE	Specifies/acquires the maximum torque command value which can be set for a specified axis of a specified robot.

● Input/output control

Command	Description
DELAY	Waits for the specified period (units: ms).
DO	Outputs a specified value to the DO port or acquires the DO status.
LO	Outputs a specified value to the LO port to enable/disable axis movement or acquires the LO status.
MO	Outputs a specified value to the MO port or acquires the MO status.
OUT	Turns ON the bits of the specified output ports and terminates the command statement.
RESET	Turns the bit of a specified output port OFF.
SET	Turns the bit at the specified output port ON.
SI	Acquires a specified SI status.
SID	Acquires a specified serial input's double-word information status.
SIW	Acquires a specified serial input's word information status.
SO	Outputs a specified value to the SO port or acquires the SO status.
SOD	Outputs a specified serial output's double-word information or acquires the output status.
SOW	Outputs a specified serial output's word information or acquires the output status.
TO	Outputs a specified value to the TO port or acquires the TO status.
WAIT	Waits until the conditions of the DI/DO conditional expression are met (with time-out).

● Communication control

Command	Description
CLOSE	Close the specified General Ethernet Port.
ETHSTS	Acquires the Ethernet port status.
GEPSTS	Acquires the General Ethernet Port status.
OFFLINE	Sets a specified communication port to the "offline" mode.
ONLINE	Sets the specified communication port to the "online" mode.
OPEN	Opens the specified General Ethernet Port.
SEND	Sends a file.

Articulated robots  
**YA**  
 Linear conveyor modules  
**LCM100**  
 Motor-less single axis actuators  
**Robonity**  
 Compact single-axis robots  
**TRANSEVO**  
 Single-axis robots  
**FLIP-X**  
 Linear motor single-axis robots  
**PHASER**  
 Cartesian robots  
**XY-X**  
 SCARA robots  
**YK-X**  
 Pick & place  
**YP-X**  
**CLEAN**  
**CONTROLLER**  
**INFORMATION**  
 Robot positioner  
 Pulse string driver  
**Robot controller**  
 I/VZ Electric gripper  
 Option



## Accessories and part options

### RCX320



#### Standard accessories

- LCC140
- TS-X
- TS-P
- SR1-X
- SR1-P
- RCX320
- RCX221
- RCX222
- RCX340

#### ● Power connector + wiring connection lever



Model KAS-M5382-00

#### ● Safety connector



Model KCX-M5370-00

- RCX320
- RCX340

#### ● PBX terminator (dummy connector)

Attach this to the PBX connector during operation with the programming box PBX removed.



Model KFR-M5163-00

- RCX320

#### ● NPN / PNP connector



Connector plug model KBH-M4424-00  
Connector cover model KBH-M4425-00

- SR1-X
- SR1-P
- RCX320
- RCX340

#### ● Absolute battery

Battery for absolute data back-up.

##### ● Basic specifications

Item	Absolute battery
Battery type	Lithium metallic battery
Battery capacity	3.6V/2,750mAh
Data holding time	About 1 year (in state with no power applied)
Dimensions	φ17 × L53mm
Weight <sup>Note1</sup>	22g



Model KCA-M53G0-01

- RCX320
- RCX340
- TS-SH

Note 1. Weight of battery itself.  
Note. The absolute battery is subject to wear and requires replacement.  
If trouble occurs with the memory then remaining battery life is low so replace the absolute battery. The battery replacement period depends on usage conditions. But generally you should replace the battery after about 1 year counting the total time after connecting to the controller and left without turning on the power.

#### Important

#### Absolute battery installation conditions

1 batteries are required for each 1 axes.  
● 1 battery, .....Data storage time of approximately 6 months (with no power applied)  
Note. No absolute battery is required for the incremental or semi-absolute axis.

#### ● Dust cover for COM connector

Model KR7-M5395-10

- RCX320
- RCX340

#### ● Dust cover for LAN connector

Model KCX-M658K-10

- RCX320
- RCX340

#### ● Dust cover for USB connector

Model KCX-M658K-00

- RCX320
- RCX340

**Options**

● **Programming box PBX/PBX-E**

**P.583**

This device can perform all operations such as manual robot operation, program entry and edit, teaching and parameter settings.



PBX

Type	Language	Cable length	Model
PBX	Japanese	5m	KCX-M5110-1J
		12m	KCX-M5110-3J
	English	5m	KCX-M5110-1E
		12m	KCX-M5110-3E
	Chinese	5m	KCX-M5110-1C
		12m	KCX-M5110-3C
PBX-E (with enable switch)	Japanese	5m	KCX-M5110-0J
		12m	KCX-M5110-2J
	English	5m	KCX-M5110-0E
		12m	KCX-M5110-2E
	Chinese	5m	KCX-M5110-0C
		12m	KCX-M5110-2C

Model	
Display language switching USB for PBX	KCX-M6498-00
USB cable	KCX-M657E-00

**RCX320**  
**RCX340**

● **Support software for PC RCX-Studio Pro**

**P.579**

This is support software for operating the RCX320 / RCX340 controller. A USB key is supplied to the RCX-Studio Pro to prevent robot operation mistakes.



**RCX-Studio Pro** Note.  
Note. This software is only downloaded from the website.



USB key (Dongle)

Model	RCX-Studio Pro (USB key included)	KCX-M4990-20

**RCX320**  
**RCX340**

Note. Although it is possible to install this software on multiple PCs, the functionality is limited if there is no USB key (see table below). Additional USB keys (additional licenses) are available at a special price. Please contact Yamaha for details.

● **Environment**

OS	Windows XP (32bit), Vista, 7, 8 / 8.1, 10 (Supported version: V.2.1.3 or later)
CPU	Intel® Core™ 2 Duo 2 GHz or higher is recommended
Memory	1 GB or more is recommended
Hard disk	80MB or more free space in the RCX-Studio Pro installation destination
Communication port	Communication cable: serial communication port, Ethernet, or USB port USB key: USB port (one port)
Display	1024×768 or higher resolution, 256 colors or higher
Other	CD-ROM drive Dedicated communication cable (for D-Sub or for USB) Ethernet cable (category 5 or higher)
Applicable robot controllers	RCX320 / RCX340

Note. Windows is the registered trademark of US Microsoft Corporation in U.S.A. and other countries. Other company names and product names listed in this manual may be the trademarks or registered trademarks of their respective companies.

■ **Functional limitations depending on USB key presence**

Function	USB key present	USB key absent
Connecting to the controller	○	×
Saving the file data	○	×
Emulator function	○	○
Real Time Trace	○	△ Emulator only
Cycletime Calculator	○	×
iVY2 editor	○	×
Data Difference	○	△ Except data saving

● **Data cables**

Communication cable for RCX-Studio Pro. Select from USB cable or D-sub cable.



USB

D-Sub

Model	USB type (5m)	KBG-M538F-00
	D-Sub type 9pin-9pin (5m)	KAS-M538F-10

Note. This USB cable supports Windows 2000/XP or later. Note. Data cable jointly used for POPCOM+, VIP+, RCX-Studio Pro.

Note. USB driver for communication cable can also be downloaded from our website.

**LCC140**  
**ERCD**  
**SR1-X**  
**SR1-P**  
**RCX320**  
**RCX221**  
**RCX222**  
**RCX340**

● **YC-Link/E master board**

Model	KCX-M4400-M0

**RCX320**  
**RCX340**

● **YC-Link/E slave board**

Model	KCX-M4400-S0

**RCX320**  
**RCX340**

● **YC-Link/E cable (1m)**

Model	KCX-M6479-10

**RCX320**  
**RCX340**

Articulated robots  
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Linear motor single-axis robots  
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SCARA robots  
YK-X  
Pick & place robots  
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iVY2 Electric gripper  
Option