

2-axis  
robot controller

# RCX221/RCX222

**High performance  
2-axis robot controller.  
Small, light, compact  
and very easy to use.**

## Features

### 1 Compact and high performance 2-axis controller

This newly developed 2-axis type controller has the same well-reputed high performance of RCX controller. Small size, light weight and compact design with overall height of 210mm and main unit weight of 2.8kg. While having high performance and outstanding functions, the cost remains the same as the conventional model DRCX. Therefore, the conventional controller property can be utilized and it is very easy to use.

### 2 The back-up period has been increased greatly

With the new type ASIC adopted, the absolute position data retention period while no electricity is supplied becomes much longer. The period expands to one year while conventional type was one month at maximum. The current position information is monitored even during a long vacation, while the controller is kept unused and while it is transported so that the return to the origin process is not required when the controller is activated again, assuring quick start of production.

### 3 Anti-collision control function is added

Provided with a control function in the controller, it is possible to prevent collision of carriages when using double carriage. Thus, collision prevention by using zone judgment or use of an outside sensor becomes unnecessary. In this way, it is much easier to use the double carriage.

### 4 Lead free mounting PCB is used

As lead free mounting PCB is used taking influence to the environment and safety considered.

### 5 Applicable to various peripheral equipments

It is possible to select the I/O board as necessary and combine parallel I/O (NPN/PNP), CC-Link, DeviceNet, Profibus, Ethernet as needed by the user.

### 6 Capable of using additional function of "YC-Link option" for additional axis

Using an optional YC-Link, the RCX series controller and SR1 series single axis controller can be linked easily. If necessary, by linking some controllers, it is possible to control up to 8 axes (Max. 6 axes for simultaneous control).

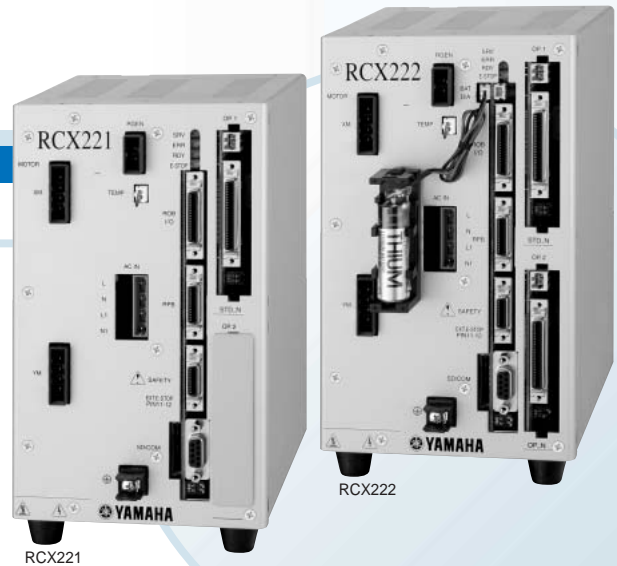
### 7 Controllable robot

**RCX221** PHASER series (MR type, MF50), X series single axis (200V motor) can be controlled as mixed, XY-X series, YP-X series

**RCX222** FLIP-X series (200V motor), XY-X series, YP-Xseries

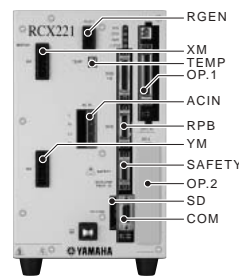
Note : In any case, up to 2-axis can be controlled.

Note : Refer to page 42 for the installation examples.

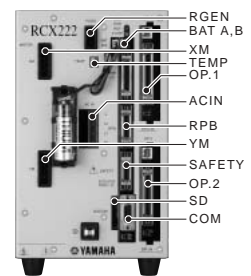


## RCX221 / 222 part names / dimensions

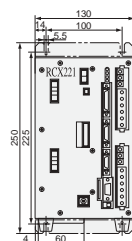
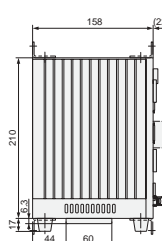
### RCX221



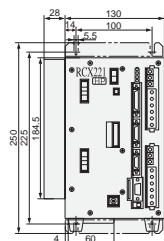
### RCX222



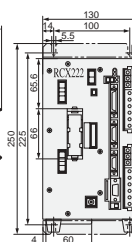
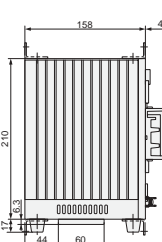
### RCX221



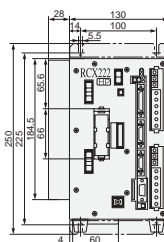
### RCX221HP



### RCX222



### RCX222HP



## RCX221 / 222 ordering method

<b>RCX222-</b>		<b>E</b> <sup>Note 1</sup>	-	<b>R</b>	-	<b>N</b>	-	<b>N1</b> <sup>Note 1</sup>
Controller	Usable for CE	Regenerative unit		Input/Output Selection 1		Input/Output Selection 2		
<ul style="list-style-type: none"> <li>- RCX221</li> <li>- RCX222</li> <li>- RCX221HP</li> <li>- RCX222HP</li> </ul>	<ul style="list-style-type: none"> <li>- No entry: Standard</li> <li>- E: CE specification</li> </ul>	<ul style="list-style-type: none"> <li>- No entry: None</li> <li>- R: RG2<sup>Note 2</sup></li> </ul>		<ul style="list-style-type: none"> <li>- N: STD.DIO 16/8 (NPN)<sup>Note 1</sup></li> <li>- P: STD.DIO 16/9 (PNP)</li> <li>- CC: CC-Link</li> <li>- DN: DeviceNet</li> <li>- PB: Profibus</li> <li>- EN: Ethernet<sup>Note 1</sup></li> <li>- YC: YC-Link<sup>Note 4</sup></li> </ul>		<ul style="list-style-type: none"> <li>- No entry: None</li> <li>- N1: OP.DIO 24/16 (NPN)<sup>Note 3</sup></li> <li>- P1: OP.DIO 24/17 (PNP)</li> <li>- EN: Ethernet<sup>Note 3 Note 5</sup></li> </ul>		

Note 1 : It will be a customer's choice.  
 Note 2 : The regenerative unit RG2 (option) is required when operating a model designated by YAMAHA or a load with a large inertia.  
 Note 3 : It is not selectable for the CE model.  
 Note 4 : Available only for the master.  
 Note 5 : Only when you have selected CC, DN or PB for Input/Output selection 1, you can select EN for Input/Output selection 2.

## RCX221 / 222 basic specifications

Item	Model	RCX221	RCX221 HP	RCX222	RCX222 HP	
Basic specifications	Applicable robot	Cartesian robots, single-axis robots, linear motor single-axis robots		Cartesian robots, single-axis robots, pick & place robots		
	Connected motor capacity	2-axis total : 800W or less	2-axis total : 900W or more	2-axis total : 800W or less	2-axis total : 900W or more	
	Maximum power consumption	1700VA	2400VA	1700VA	2400VA	
	Dimensions	W130 x H210 x D158mm	W158 x H210 x D158mm	W130 x H210 x D158mm	W158 x H210 x D158mm	
	Weight <sup>Note</sup>	Approx. 2.9kg	Approx. 3.1kg	Approx. 2.9kg	Approx. 3.1kg	
Axis control	Power supply voltage	Single phase AC200 to 230V, +/-10 percent maximum (50/60Hz)				
	Number of controllable axes / Driving system	2 axis maximum / AC full digital servo				
	Drive method	PTP, Arch motion, linear interpolation, circular interpolation				
	Position detection method	Resolver, magnetic type linear scale		Resolver		
	Coordinates	Indirect coordinates (Pulse), Cartesian coordinates (mm)				
	Speed setting	1% to 100% (Setting by 1% unit, changeable in the program)				
Program	Acceleration setting	Automatic acceleration setting based on robot model type and end mass parameter, Setting based on acceleration and deceleration parameter				
	Program language	YAMAHA BASIC (Conforming to JIS B8439 SLIM Language)				
	Multitasks	8 tasks maximum				
	Memory size	364KB				
	Programs	100 program 9,999 : maximum lines per program 98KB : maximum capacity per program				
	Points / Point-data input method	10,000 points : maximum numbers of points / MDI, Direct teaching, Teaching playback, off-line teaching				
	Memory Backup	Lithium battery (service life 4 years at 0°C to 40°C)				
	Included flash memory	512KB				
External input/output	External memory backup	SD Memory card				
	SAFETY	Input	Emergency stop, service mode, inter lock			
		Output	Servo-out, main power input ready			
	Brake output	Relay contact				
	Origin sensor input	B contact sensor for DC24V connected				
	External communications	RS232C : 1CH D-SUB9 (female) RS422 : 1CH (MPB)				
	Optional slot	2 slots (inc.STD, DIO)				
	Selectable options	Parallel I/O board (STD.DIO) NPN, PNP	Dedicated input 10 points, General input 16 points dedicated output 12 points, general output 8 points			
		Parallel I/O board (OP.DIO) NPN, PNP	General input 24 points, general output 16 points			
		CC-Link	Dedicated input 13 points, dedicated output 12 points General input 96 points, general output 96 points			
		Profibus				
DeviceNet						
Ethernet	10 BASE-T, IEEE 802.3					
General specifications	Operating temperature / Storage temperature	0°C to 40°C / -10°C to 65°C				
	Operating humidity	35% to 85% RH				
	Noise resistance capacity	IEC61000-4-4 Level 3 / (UL1740)				
	Protecting structure	IP10				
Options	Programming unit	RPB, RPB-E				
	Absolute battery	-		3.6V 5400mAH (2700mAH x 2)		
	Absolute data backup period	-		1 year		
	Regenerative unit / Soft were	RG2 / VIP				

Note : Weight differs depending on selective options of external input / output.

## RCX221 / 222 command list

### General commands

Command	Function
DECLARE	Specify label in shared external program
DEF FN	Define user function
DIM	Array variable declaration statement
FOR	Repeat command
GOSUB	Call subroutine
GOTO	Unconditionally jump to specified label
HALT	Stop and reset program execution
HOLD	Temporarily stop program execution
IF THEN ELSE	Conditional branch instruction
LET	Assignment statement
ON GOSUB	Call specified subroutine
ON GOTO	Unconditionally jump to specified label
REM:'	Define comment
SELECT CASE	Execute specified block
SWI	Switch execution program
WHILE	Conditional repeat instruction
*CHARACTER STRING:	Define label name

### Robot movement

DRIVE	PTP absolute movement of specified axis
DRIVEI	PTP relative movement of specified axis
MOVE P	PTP absolute movement on all axes
MOVE L	Two-dimensional linear interpolation movement
MOVE C	Two-dimensional arc interpolation movement
MOVEI P	PTP relative position movement on all axes
PMOVE	Move to pallet point
SERVO	Servo ON/OFF for all axes or specified axis
SPEED	Set movement speed

### Input/output control

DELAY	Standby time setting
DO	Specified bit output to specified por
MO	Specified bit output from internal simulation port
RESET	Specified output OFF
SET	Specified bit output from specified port (with timeout)
WAIT	Conditional input/output standby (with timeout)

### MPB control

PRINT	Display specified data on MPB screen
INPUT	Wait for MPB keyboard input
SEND	MPB keyboard input of specified file

### RS-232C communication support control

SEND	Input/output to specified file from communication port
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### Coordinate control

CHANGE	Change hand coordinate system
HAND	Define hand coordinate
SHIFT	Specify shift coordin

### Date/time setting

DATE \$, TIMER \$, TIMER
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### Parameter change

ACCEL	Change acceleration coefficient for all axes or specified axis
ARCH	Change arch position parameter for specified axis
AXWGHT	Change tip weight parameter for specified axis
ONLINE/OFFLINE	Change RS-232C communication mode
OUTPOS	Change out effective position for specified axis
TOLE	Change positioning tolerance for specified axis
WEIGHT	Change tip weight para

### Procedure

CALL	Call sub-procedure
EXIT SUB	End sub-procedure
SUB	Define sub-procedure
SHARED	Define common variables in sub-procedure

### Task control

CHGPRI	Change operation task priority
CUT	Forcibly end task
EXIT TASK	Self-end of task
RESTART	Restart temporarily stopped task
START	Start specified task
SUSPEND	Suspend task

### Error control

ERL	Error occurrence line function
ERR	Error code function
ON ERROR GOTO	Jump to error processing routine
RESUME	Restart program after error recovery processing

### Point functions

JTOXY	Convert pulse value data into cartesian coordinate data
LOCx	Specify point data for each axis
Pn	Define point data (n = point number)
PPNT	Read data on specified pallet nu
Sn	Define shift coor (n = 0 to 9)
WHERE	Read current robot position
XYTOJ	Convert cartesian coordinate data into pulse data

### Arithmetic functions

ABS, ARMCND, ATN, COS, DEGRAD, INT, LSHIFT, RADDEG, RSHIFT, SIN, SQR, TAN
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### Character string functions

CHR \$, LEFT \$, LEN, MID \$, ORD, RIGHT \$, STR \$, VAL
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## RCX221 / 222 sequence

### Sequence program input/output variables

Command	Function
DI (mb)	Input variable
DO (mb)	Output variable
MO (mb)	Internal auxiliary output variable
LO (mb)	Arm lock output variable
TO (mb)	Timer output variable

### Sequence program timer definition

TIMmb=<expression>	Timer output variable
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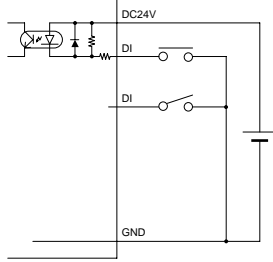
### Sequence program logical operators

OR,	Logical OR
AND, &	Logical AND
NOT, ~	Logical NOT

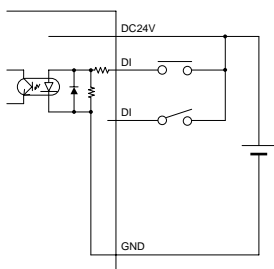
# RCX221/RCX222

RCX221 / 222 example of input signal connection

● NPN specification

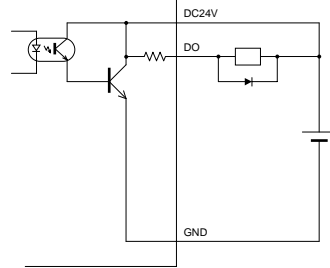


● PNP specification

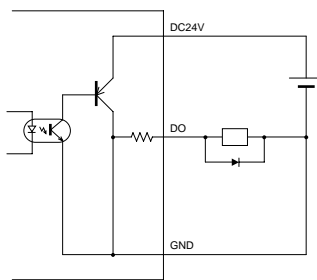


RCX221 / 222 example of output signal connection

● NPN specification

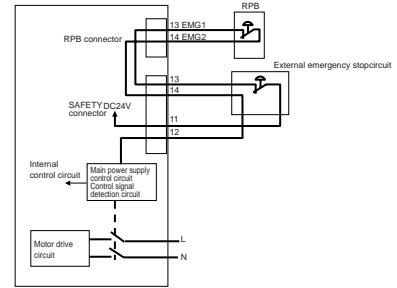


● PNP specification

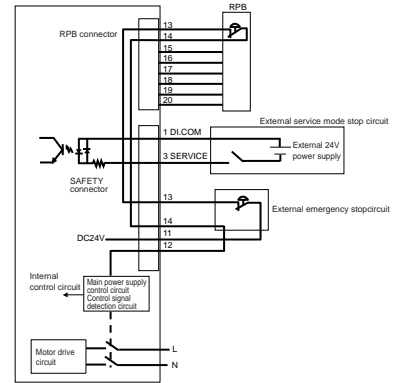


RCX221 / 222 emergency input signal connections

● Connection when using the standard RPB with an external emergency stop circuit



● Connection when using the standard RPB with an external emergency stop circuit



## RCX221 / 222 connector I/O signals

### STD.DIO

PIN	I/O No.	Signal name	RCX221	RCX222
1	DI01	Servo ON		
2	DI10	Sequence program control		
3	DI03	Step run		
4	CHK1	Check input 1		
5	DI05	I/O command run		
6 / 7	DI06 / DI07	Spare		
8 to 15	DI20 to DI27	General input 20 to 21		
16	DO00	EMG monitor (emergency stop monitor)		
17	DO01	CPU OK		
18	DO10	AUTO mode		
19	DO11	Return-to-origin complete		
20	DO12	Sequence program in progress		
21	DO13	Auto operation in progress		
22	DO14	Program reset		
23	DO15	Battery alarm		
24	DO16	END		
25	DO17	BUSY		
26	DI12	Auto operation start		
27	DI13	AUTO mode switching		
28	DI14	ABS reset		Return-to-origin
29	DI15	Program reset		
30	DI16	MANUAL mode		
31	DI17	Return-to-origin		ABS reset
32 to 39	DI30 to DI37	General input 30 to 37		
40	CHK2	Check input 2		
41	DO02	Servo-on state		
42	DO03	Alarm		
43 to 50	DO20 to DO27	General output 20 to 27		

### OP.DIO

Option I/O module N1

PIN	I/O No.	Signal name
1	-	Spare
2	DI40	General input
3	-	Spare
4	DI41	General input
5 to 7	-	Spare
8 to 15	DI50 to DI57	General input
16 / 17	-	Spare
18 to 25	DO30 to DO37	General output
26 to 31	DI42 to DI47	General input
32 to 39	DI60 to DI67	General input
40 to 42	-	Spare
43 to 50	DO40 to DO47	General output

### SAFETY

PIN	I/O No.	Signal name
1	DI.COM	Dedicated input common
2	INTERLOCK	Interlock signal
3	SERVICE	SERVICE mode input
4	DO.COM	Dedicated output common
5	MPRDY	Main power supply ready
6	SERVO OUT	Servo-on state output
7	NC	No connection
8 / 9	KEY1 / KEY2	RPB key switch contact
10	24VGND	EMG 24V, GND
11	EMG24V	Power supply for emergency stop input
12	EMGRDY	Emergency stop ready signal
13 to 16	EMGIN1 to EMGIN4	Emergency stop input 1 to 4
17 to 20	LCKIN1 to LCKIN4	Enable switch input 1 to 4