



MOTOMAN

# DX100 Optional Function Introduction



Yaskawa Electric Corporation  
Robotics Division  
Business Planning Department



# Index 1

Function	Option/ standard	Page	Function	option/ standard	Page	Function	option/ standard	Page
I/O jog operation in play-mode	option	4	Zeroing	option	21	Relative job	option	38
PMT	option	5	Twin drive	option	22	Analog output function corresponding to speed	option	39
TCP	option	6	Data transmission	option	23	Pause weaving	option	40
T-axis endless	option	7	Bilingual	option	24	Form cutting	option	41
T-axis speed control	option	8	Vision	option	25	Independent control	option	42
PAM	standard	9	Playback trajectory check	standard	26	Work piece thickness detection	option	43
Arc sensor COMARC	option	10	Edit function during play mode	option	27	Sensor	option	44
Interface panel	option	11	Macro command	option	28	Parallel shift	standard	45
Group change	option	12	Pulse mirror-shift	standard	29	Parallel shift job conversion	standard	46
Concurrent I/O	standard	13	Robot/user coordinates mirror-shift	standard	30	Playback with reserved start	standard	47
Conveyor tracking	option	14	Logging	option	31	Servo power supply individual control	option	48
Conveyor tracking with shift function	option	15	External reference point control	option	32	Speed override	standard	49
Search	option	16	External axis endless	option	33	Palletizing software MOTOPAL	option	50
Servo float	option	17	Coordinated function	option	34			
Station coordinated motion	option	18	Interrupt job	option	35			
Twin coordinated motion	option	19	Basic operation of starting point detecting	option	36			
Coordinated motion (Twin, Triple, Quad)	option	20	Teaching point adjustment	option	37			

**[Note]**

**Each function contained in this document is subject to change without notice as the function is improved.**



# Index 2

Function	Option/Standard	Page
Multi window	Standard	51
Simple menu	Standard	52
Jog key allocation	Standard	53
IO / Variable name alias function	Standard	54
Password protection	Optional	55
Alarm detail displaying	Standard	56
Energy-Saving	Standard	57
Gas preflow / afterflow	Standard	58
Weld condition slope Up / Down	Standard	59
Graphical arc monitor	Optional	60
Multistep pressure function	Optional	61
Spot monitor	Optional	62
Functional safety	Optional	63
I/O Trace	Optional	64
MotoSimEG-VRC Conveyor tracking	Optional	65
MotoSimEG-VRC Multi-layer welding	Optional	66
MotoSimEG-VRC Servo Simulation (Motor gun application)	Optional	67

Function	Option/Standard	Page
High-sensitivity Shock Detection	Standard	68
Program upload and Automatic backup	Standard	69
I/O Simulation Function (Signal search, Signal list)	Standard	70

## New function

**[Note]**  
**Each function contained in this document is subject to change without notice as the function is improved.**



# I/O jog operation in play-mode function

## Overview and Merits

### <Overview>

“I/O jog operation function” performs the axis operation for external axes using the general input signal instead of the programming pendant.

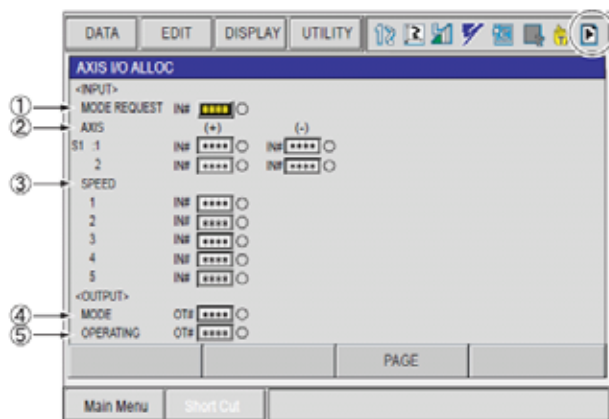
Axis operation (jog operation) by the general input signal is allowed by isolating the station control group that is independent of playback out of plural station control groups.

### <Condition>

This function is applied only to the case where using joint coordinate in the play mode, and the operating speed can be changed to one of the following five choices.

<Signal Setting window for I/O jog operation>

Displayed when plural control groups exist.



- 1. Axis motion request (external manual operation request)
- 2. Axis designation (forward/reverse direction motion designation)
- 3. Speed level (motion speed designation)
- 4. Axis motion enabled (external manual operation enabled)
- 5. Axis moving (during external manual operation)

### <Merits>

External axes can be moved without stopping production lines!

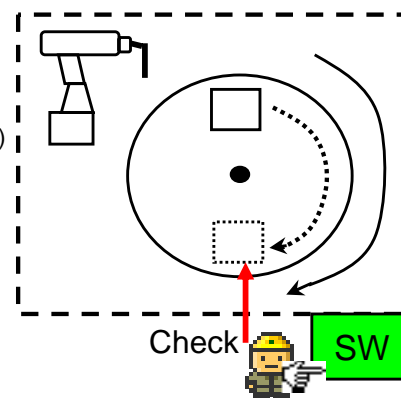
\* Example of useful application \*

Welding quality of the work piece on the revolving table is checked by the operator.

I/O jog operation function allows operation for currently unused external axes using general input signals, which enables checking the work piece without the following additional works.

1. Performing temporal stop and entering inside the safeguard.
2. Changing to teaching mode and moving the axis to a position where the work piece can be viewed with the PP.

**⇒ Allows working efficiency to be increased and working hours to be reduced !**



Example) The switch for input signal is provided outside the safeguard, and the mechanism is set up so that the work piece moves to the operator when there is an input.

\* Operation works only while the switch is pressed down.

## Necessary equipment

Hardware

Software

Nothing

I/O jog operation in play-mode function

## Related document

DX100 I/O JOG Operation in Play-mode Instruction Manual (in preparation)



# PMT function

## Overview and Merits

### <Overview>

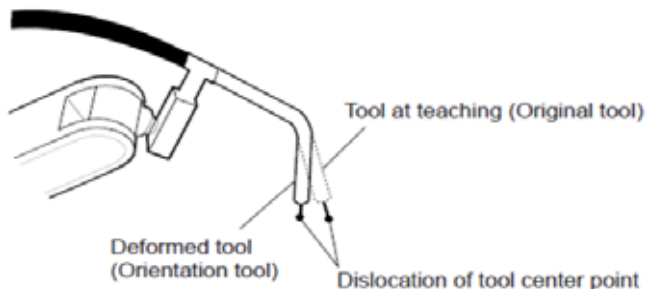
“PMT function” easily and accurately modifies positional data if the tool is deformed. (PMT: Position Modification for Tool deformation: position data modification function for tool deformation)

If the tool accidentally collides with a surrounding jig or wall and is deformed, the control points are shifted. As a result, teaching positions in the job that has been taught are also shifted.

PMT function allows time and works for modifying the shift to be reduced.

When a job is specified, the position data of the tool dimensions before the deformation (during teaching) is automatically converted to the position data of the tool dimensions after the deformation.

The tool before modification is called the old tool, and the tool after the deformation is called the new tool in PMT function.



0016 MOVJ  
0017 WAIT INR1=0  
0018 MOVJ V=70

Position data of the step taught by the original tool is converted.

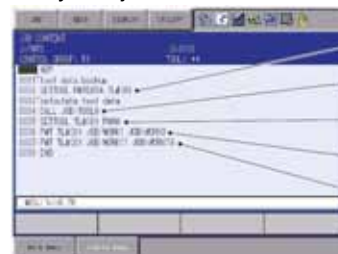
### <Merits>

- 1. Time and works for teaching modification can be reduced.**  
Teaching modification work can be efficiently performed because position data can be automatically converted from the old tool to the new one.
- 2. Original tool data can be easily restored by storing tool data record.**  
The original tool data can be easily restored because the change record of the tool constant can be checked in the “Tool Backup” window.

The data can be converted by the PMT function using instruction or the programming pendant.

#### 1. PMT data conversion by instruction

The following window is a job example (PMT0) to convert the data by instruction. Carry out job PMT0 to convert the data using the PMT function.



- Saves the tool constants used before deformation as the original tool data.
- Calls the job to obtain the amount of tool deformation.
- Sets the tool constants after deformation.
- Job: Converts WORK1 using the PMT function
- Job: Converts WORK11 using the PMT function

#### 2. PMT data conversion by programming pendant

The following windows are example to convert the data by using programming pendant.

##### 1. Select PMT under UTILITY in job content window



##### 2. Save the tool constants used before the tool deformation as the original tool data.



##### 3. Set new tool constants to be used after the tool's deformation.



##### 4. Convert the data of WORK1 using the PMT function



### Necessary equipment

Hardware	Software
Nothing	PMT function

### Related document

DX100 OPTIONS INSTRUCTIONS FOR PMT(HW0485419)



# TCP function

## Overview and Merits

### <Overview>

“TCP function” moves the tool along the track that was taught by another tool. (TCP: Tool Center Point)

### <Merits>

#### Reducing the job creation time.

When moving plural tools along the same track, only one-time teaching is applied to each tool, which allows the job creation time to be reduced.

### <Job preparation>

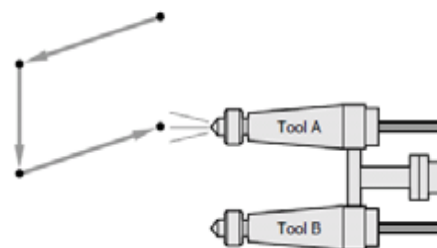
1. The job copied from the job taught with Tool A, defined a “Job A” can be defined as “Job B”.
2. Add the TCP instructions before and after the sections where Tool B is to be used in Job B.
3. Set a tool file number for Tool B in the TCPON instruction.

### <Example>

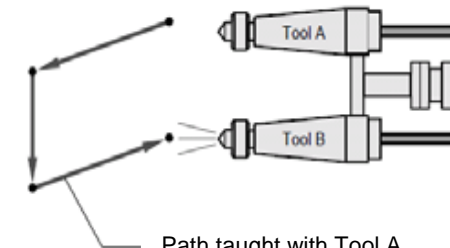
The following picture is a painting system with two tools. One tool is used for undercoat paint operation, the other is used for the top coat paint operation.

Teach a path to either one of the two tools, then the teaching for the other tool is not necessary.

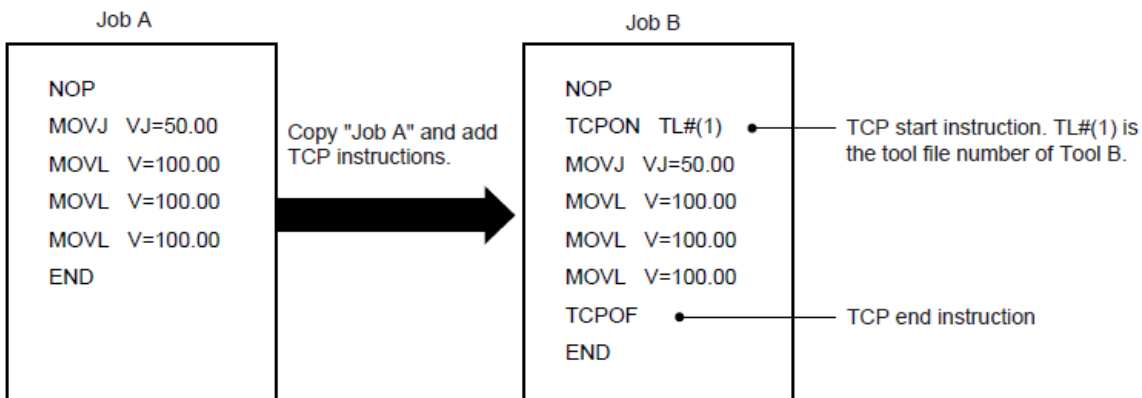
1. After teaching with Tool A, put the undercoat using Tool A.



2. With the TCP function, put the top coat using Tool B.



Path taught with Tool A



```

NOP
0001 MOVL V=100.00
0002 MOVL V=100.00
0003 MOVL V=100.00
0004 MOVL V=100.00
END

```

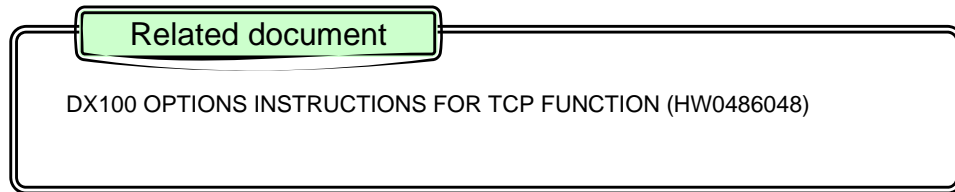
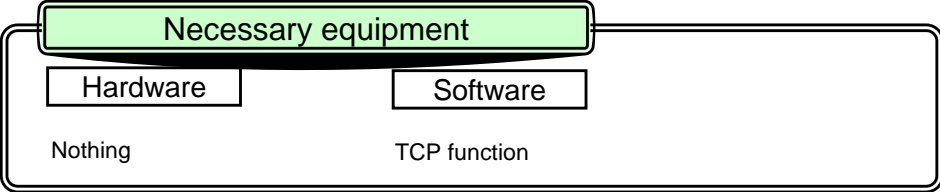
Job for teaching. Executing it provides operation with “Tool A”.

```

NOP
TCPON TL#(2)
0001 MOVL V=100.00
0002 MOVL V=100.00
0003 MOVL V=100.00
0004 MOVL V=100.00
TCPOF
END

```

Job to which TCP instruction is added. Executing it provides operation with “Tool B”.





# T-axis endless function

## Overview and Merits

### <Overview>

This function continuously rotates the T-axis a plural number of turns. Although the rotation angle of the T-axis is generally limited within  $\pm 360$  degrees, this function allows it to rotate endlessly. When executing the move instruction MOVJ with the "number of rotations of the T-axis" specified, T-axis rotates the "specified rotating amount + teaching position pulses" during the movement to the target position. One move command can specify up to  $\pm 100$  turns.



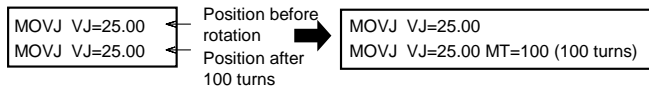
```
MOVJ VJ=2500 MT=100
Specified rotating amount: 100 turns
```

### <Merits>

#### 1. Teaching time can be reduced.

Even for a step that usually must be registered with the T-axis manually rotated 100 turns, using the T-axis endless function requires only adding the tag "MT=100(rotation of 100 turns)" to the move instruction. This eliminates the work for actually rotating the axis, which can reduce the teaching time.

Registry of job for rotating T-axis 100 turns



#### 2. Tact time can be reduced.

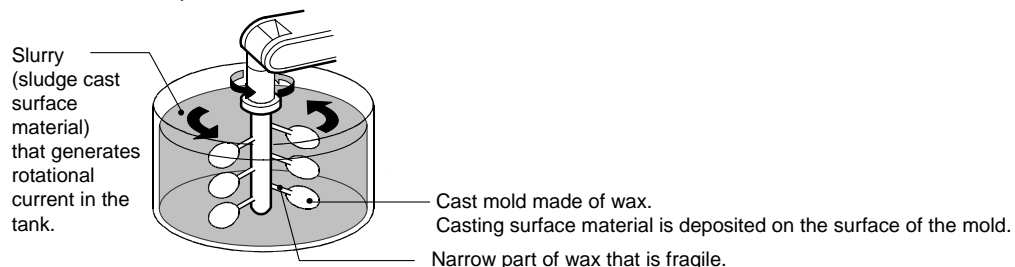
After the T-axis rotates plural turns in a step, it reversely rotates to the original position before executing the next step. The greater the number of rotations, the greater the number of reverse rotations before the next step, which takes longer. "MRESET" instruction of the T-axis endless function resets the rotation amount to less than one turn without reversely the rotating T-axis. This eliminates wasteful movement to reduce the tact time.

```
Rotation Reset → MOVJ VJ=25.00 MT=100
MRESET (100 turns)
```

#### 3. Product quality can be improved.

T-axis endless function can be effectively used in the "lost wax method" with which the mold is created in the casting process.

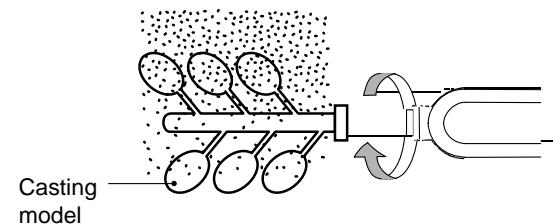
\*Problems in template are reduced.



In the process that the workpiece (cast mold made of wax) is soaked in the slurry tank as shown in the left figure, if the workpiece is put into the slurry tank as is, the workpiece may be damaged because of resistance received from the rotational current. In that case, soaking the T-axis to which the workpiece is attached in the slurry tank while continuously rotating the T-axis at the same speed of the rotational flow will mitigate the resistance from the rotational current, which prevents the workpiece from being damaged and deposits the slurry to be uniformly deposited.

\*Uniformity is obtained.

In the process that powder falls and deposits on the cast mold, the powder can be uniformly deposited by keeping rotating the T-axis, which leads to quality improvement in the mold and simplification of the makeup operation.



## Necessary equipment

Hardware

Nothing

Software

T-axis endless function

## Related document

DX100 OPTIONS INSTRUCTIONS FOR T-AXIS ENDLESS FUNCTION (HW0486075)

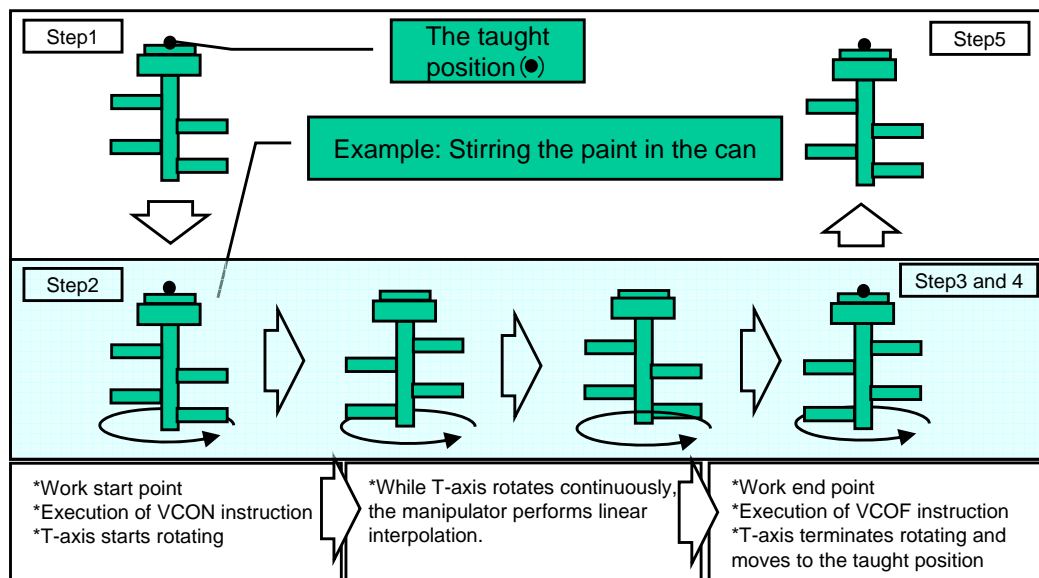


# T-axis speed control function

## Overview and Merits

### <Overview>

This function continuously rotates T-axis, the tip axis of the manipulator, according to the specified rotational speed. Continuous rotation is not possible in the normal position control method because the operating range of the T-axis is limited. However, this function allows for continuous rotation regardless of the limited operating range.



### <Merits>

1. Teaching time can be reduced.

T-axis speed control function allows the T-axis to easily rotate by registering "VCON-VCOF" commands even if positions are not registered. This eliminates work for actually rotating the T-axis, which reduce the teaching time.

2. Working efficiency can be improved.

The T-axis can be continuously rotated with the robot interpolated by the move instruction because axes other than the T-axis perform the moving operation according to the teaching. This provides improvement in the working efficiency.

This function can be applied to the paint mixing work and others that require continuous rotation at a constant speed.

### <Job example>

Line	Step		
000		NOP	
001	001	MOVJ VJ=12.50	Moves to the waiting point.
002	002	MOVJ VJ=12.50	Moves to the work start point.
003		VCON RV=10	Starts rotation. Speed : 10 [min <sup>-1</sup> ]
004		TIMER T=0.50	Waits for rotation to start.
005	003	MOVL V=100	Moves to work end point by linear interpolation at 100.0 [mm/s].
006		VCOF	Terminates rotation.
007	004	MOVJ VJ=12.50	Moves T-axis to the taught position.
008	005	MOVJ VJ=12.50	Moves to the waiting point.
009		END	

## Necessary equipment

Hardware	Software
Nothing	T-axis speed control function

## Related document

DX100 OPTIONS INSTRUCTIONS FOR T-AXIS SPEED CONTROL FUNCTION (in preparation)





# PAM function

## Overview and Merits

### <Overview>

The function for position adjustment during playback (PAM function: Position Adjustment by Manual) provides easy operation for modifying teaching positions and speed while checking the operating status of the robot without stopping the robot.

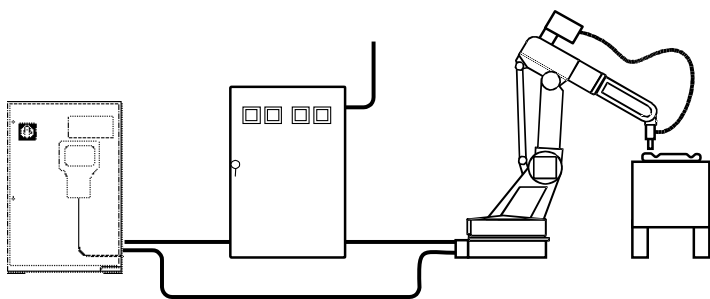
Modification can be performed in both TEACH and PLAY modes.

The following data can be modified.

- \*Teaching positions (position and posture angle)
- \*Operating speed
- \*Positioning level

### Application Example:

Job modification during continuous trial in the sealing work

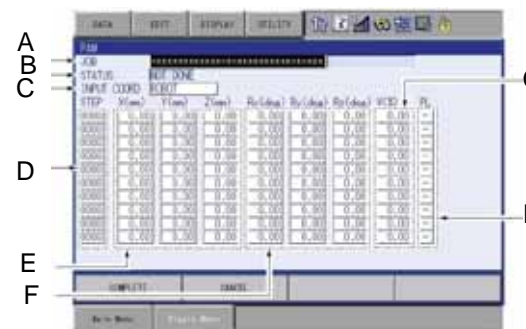


### <Merits>

1. Teaching modification time is significantly reduced.  
Because positions can be modified during the robot operation (playback), there is no need to stop the robot.
2. Modified positions can be quickly checked.  
Because positions can be modified without stopping the robot, the robot performs movement modified by a specified value at the next cycle after position modifications.  
Therefore, modified positions can be quickly checked.
3. Positions can be easily modified by using the following window.

### <Setting adjustment data>

- A. Job(Set the job name to be adjusted)
- B. Status(Shows the status of adjustment in the PAM function)
- C. Input coordinates(Set the desired coordinates)
- D. Step number(Set the step number to be adjusted)
- E. XYZ coordinate adjustment (Set the direction and amount of the coordinates)
- F. Rx,Ry,Rz coordinate adjustment (Set the direction and amount of the posture angles)
- G. V coordinate adjustment (Set the speed)
- H. PL(The position level of the job to be adjusted for the step set in "D. step number" is displayed, and the data can be modified)



## Necessary equipment

Hardware

Nothing

Software

Standard function

## Related document

- DX100 OPERATOR'S MANUAL FOR MATERIAL HANDLING, PRESS TENDING, CUTTING, AND OTHER APPLICATIONS (RE-CSO-A037)
- DX100 OPERATOR'S MANUAL FOR ARC WELDING(RE-CSO-A038)
- DX100 OPERATOR'S MANUAL FOR SPOT WELDING USING MOTOR GUN(RE-CSO-A040)
- DX100 OPERATOR'S MANUAL FOR SPOT WELDING USING AIR GUN(RE-CSO-A041)



# Arc sensor COMARC function

## Overview and Merits

### <Overview>

COMARC (arc sensor) is the function with which the robot performs welding while automatically modifying deviation from welding lines based on the variation information of welding current in welding.

### <Basic Principle>

The welding machine with constant voltage characteristic has the property that welding current changes as the distance between the chip and base metal changes. The arc sensor utilize this property. (Fig. 1)

This information is acquired in the robot side while performing weaving for the welding torch, modification is performed in the horizontal directions of welding lines for the direction of robot movement so that a current difference between the both sides of weaving is decreased, and simultaneously modification is performed in the vertical directions of welding lines for the direction of robot movement so that the preset current value is reached. (Fig. 4)

Modification position in horizontal direction → Figs 2-1, 2-2, and 2-3

Modification position in vertical direction → Fig. 3

### <Pass-over Function>

This function automatically modifies the teaching path by operating along a path that is different from the actual teaching line.

To consider safety in this case, this standard function monitors positions so that the teaching path is not too far from the welding path. This function prevents welding with large position deviation during welding.

### <Advantages>

\*High reliability

Assured welding quality by adopting the latest digital filtering technology.

Software automated creation of appropriate current filter.

•Simplified operation

Only 4 parameters for sensing:

- Weaving amplitude: AMP=
- Weaving frequency: FREQ=
- Welding current value: U/D=
- Horizontal sensing parameter: L/R=

### <Merits>

#### 1. Even if weld line is deviated, welding is performed with the path automatically compensated.

Even if there is a deviation of work piece itself, jig setting, or weld line during welding of lengthy work piece, the weld line is automatically tracked.

\*A maximum tracking angle of 5 degrees (theoretical value):Note that this value greatly depends on the welding condition.

#### 2. Improved quality and reduced working time.

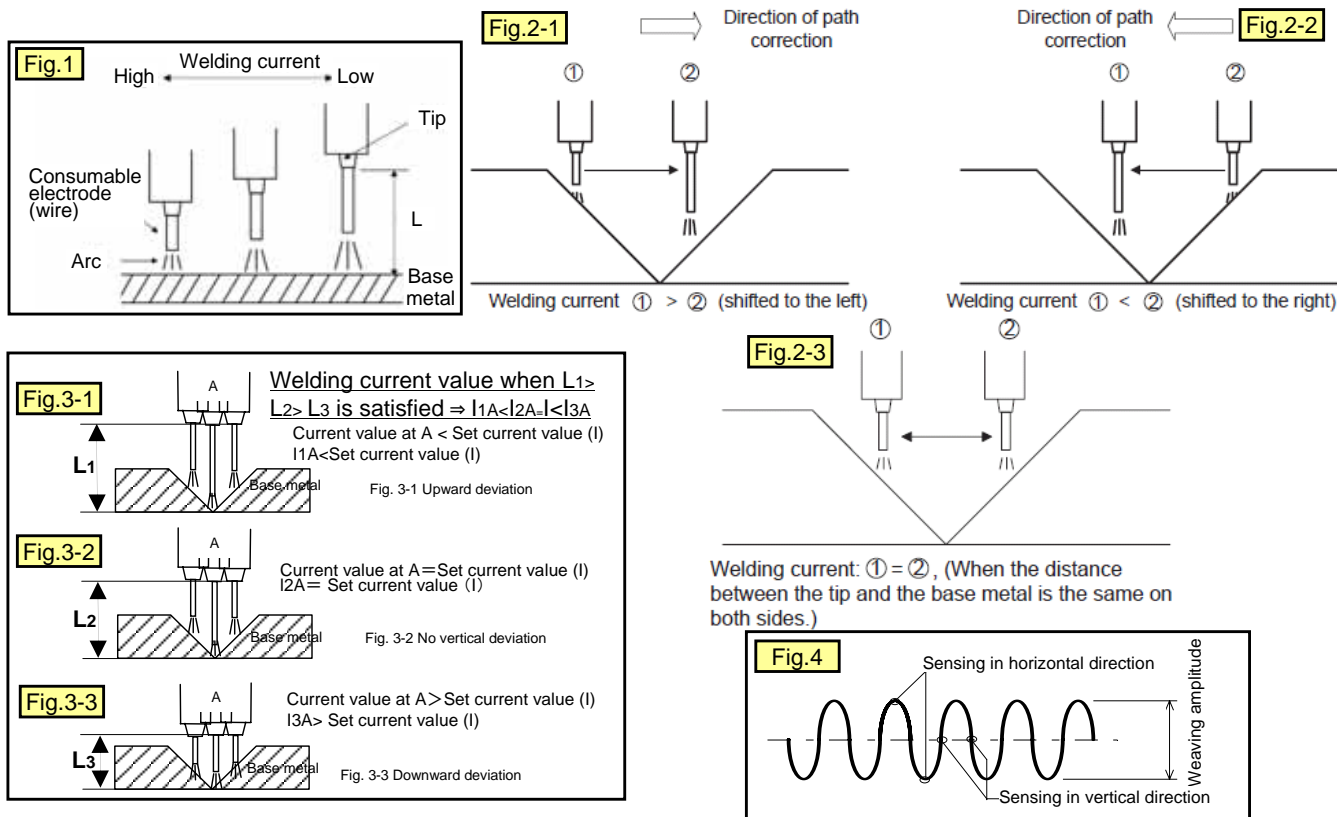
Improved quality is provided for a work piece for which quality was unable to be improved because of the work piece deviation.

Also, hand mending work is no longer required, which allows the working time to be reduced.

#### 3. Support for deviation of welding starting point.

Deviation of the starting point can also be supported with the starting point detection function (option) combined.

#### 4. Combination with the coordinated control function (option) allows improved quality of welding and reduced cycle time.



## Necessary equipment

### Hardware

YCP02 board (with analog input board), Current **detector**

Using the starting point detecting function at the same time, following addition is necessary.

MOTOWELD: Add the starting point detecting function to the welding source

Products except MOTOWELD: Starting point detecting unit

### Software

COMARC FUNCTION

## Related document

DX100 OPTIONS FOR ARC SENSOR COMARC FUNCTION(HW0485665)



# Interface panel function

## Overview and Merits

A virtual operation panel can be constructed in the programming pendant. No additional hardware is required. Pendant operation allows for cost cutting on the system. Configuration with software provides flexible support for rapid system change.

By performing settings on the interface panel setting display, the user can construct any operation panel on the pendant display.

Frequently-used buttons, switches, counters, and lamps can be integrated into one panel.



Operation by the operation button and switch

Variable and register values set by the numeric value setting counter



Status displayed by lamp

Variable and register values displayed by counter

## Necessary equipment

Hardware

Software

Nothing

INTERFACE PANEL FUNCTION

## Related document

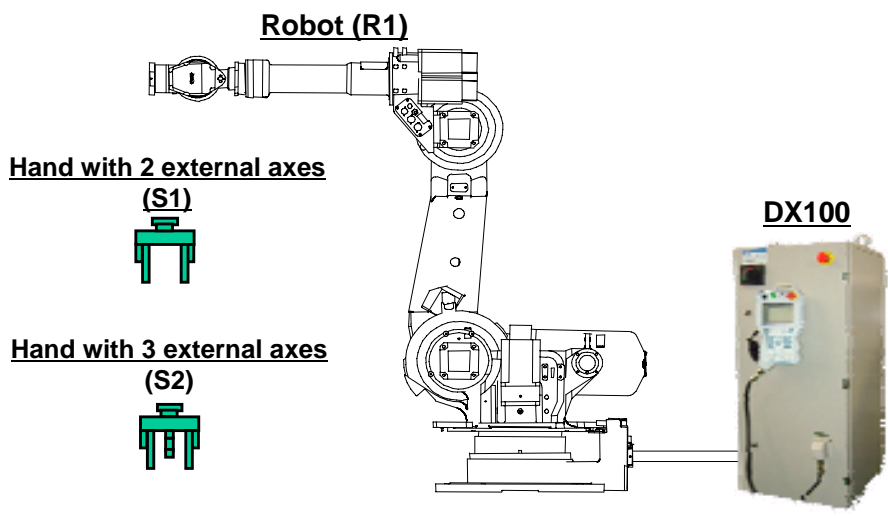
DX100 OPTIONS INSTRUCTIONS FOR INTERFACE PANEL FUNCTION(HW0485444)



# Group change function

## Overview and Merits

### Setup example of group change



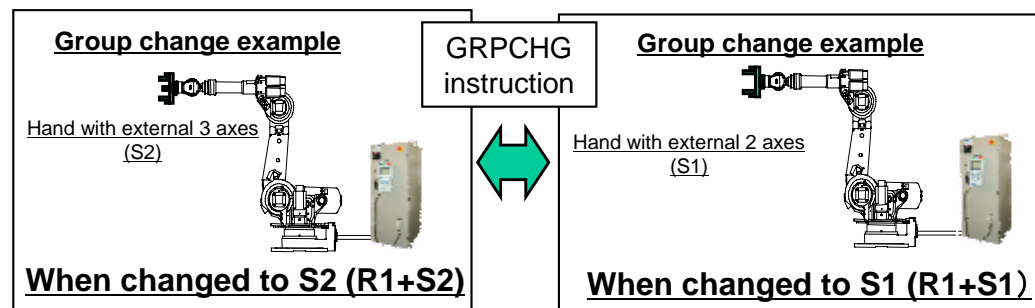
Hand with 2 external axes is defined as group S1, and hand with 3 external axes is defined as group S2.  
 When the robot operates with S1 hand, the job control group is defined as R1 + S1.  
 When the robot operates with S2 hand, the job control group is defined as R1 + S2.

### <Overview>

This function changes (CHUCK/UNCHUCK) more than one tool (such as gripper) with external axes.

### <Merits>

1. Diversified robot work  
Using one robot with more than one tool changed allows works to be performed for various types of work pieces.
2. Improved work efficiency  
In combination with ATC (Auto Tool Changer), the tool can be quickly changed by one instruction ("GRPCHG" instruction) to improve working efficiency.



## Necessary equipment

Hardware

Nothing

Software

Group change function

## Related document

DX100 OPTIONS INSTRUCTIONS FOR GROUP CHANGE FUNCTION(in preparation)



# Concurrent I/O function

## Overview and Merits

### <Overview>

This function is the input/output control function that processes the control related to DX100 independent of (or in parallel with) the manipulator operation.

### <Merits>

1. Terminals and connectors that connect I/O signals can be effectively utilized.
2. Instructions related to I/O (robot programming language: INFORMⅢ) can be simplified to smooth the manipulator movement.
3. Reserved signals or others can be accepted during the manipulator operation.

The Concurrent I/O consists of the following two blocks.

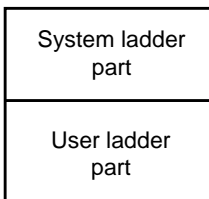
\* System ladder part:

Standard ladder for each application is factory-prepared. This standard ladder program cannot be edited.

\* User ladder part:

Signal designation and interface signals to system ladder is factory-prepared.

Ladder program can be edited, including those signals.



### <Concurrent I/O specifications>

Item	Contents
Control Method	Scan control by stored program
Programming	Relay ladder program symbology
Scan Time	4 msec
Memory Capacity	20000 steps
Number of Instructions	33 types
General Input Port	2048 points (Concurrent I/O → Manipulator Control Section)
General Output Port	2048 points (Concurrent I/O ← Manipulator Control Section)
Specific Input Port	1280 points including unspecified signals (Concurrent I/O → Manipulator Control Section)
Specific Output Port	1600 points including unspecified signals (Concurrent I/O ← Manipulator Control Section)
Hardware Status Signal Points	512 points (Concurrent I/O → Manipulator Control Section)
Auxiliary Relays	7992 points
External Inputs	2048 points
External Outputs	2048 points
Register (Numeric Data)	General Register 560 points (0-65535) System Register 360 points (0-65535) Analog output register 40 points (0-65535) Analog input register 40 points (0-65535)
Pseudo Input Signal Points	160 points (Concurrent I/O ← System Parameter)
Power Failure Protective Function	Ladder Program (Battery Back-Up) Output status is reset.
Diagnostic Functions	Error Detection of CPU, system program and ladder programs. Ladder programming error detection as follows: Double Use of Output Relay No END Instruction Circuit Error Format Error Exceeded Program Capacity
Monitor Function	Monitor each signal status in concurrent I/O on CRT window.

### <Classification of I/O signal>

Logic Name	Classification	Description	Range
0 xxxx	General Input	Referenced with input instruction of the job	00010 - 02567 (2048 signals)
1 xxxx	General Output	Referenced with output instruction of the job	10010 - 12567 (2048 signals)
2 xxxx	External Input	Signal No. corresponding to the input terminal	20010 - 22567 (2048 signals)
3 xxxx	External Output	Signal No. corresponding to the output terminal	30010 - 32567 (2048 signals)
4 xxxx	Specific Input	Signal to change the operating condition of the robot	40010 - 41607 (1280 signals)
5 xxxx	Specific Output	Signal notifying the operating condition of the robot	50010 - 52007 (1600 signals)
6 xxxx	Interface Panel Input	Signal notifying the operating condition of the interface panel	60010 - 60647 (512 signals)
7 xxxx	Auxiliary Relay	Auxiliary relay in the concurrent I/O	70010 - 79997 (7992 signals)
80 xxx	Control Status	Monitoring of the hardware signal status of the robot control section	80010 - 80647 (512 signals)
82 xxx	Pseudo Input	Pseudo input relay reading from the system parameter	82010 - 82207 (160 signals)
25 xxx	Network Input	Input signal from the network device	25010 - 27567 (2048 signals)
35 xxx	Network Output	Input signal to the network device	35010 - 37567 (2048 signals)
M xxx	Register	1 word data (16 bits) General Register: M000 - M559 Analog Output Register: M560 - M599 Analog Input Register: M600 - M639 System Register: M640 - M999	M000 - M999 (1000 signals)

### <Merits>

1. With no PLC added, I/O related control can be performed. I/O can be processed independent of (or in parallel with) manipulator operation.
2. A large number of I/Os allows the construction of a flexible robot system
3. Completed diagnostic function and monitor function support construction of the user system.

## Necessary equipment

Hardware

I/O expansion board (JARCR-YOIO1)

Software

Standard function

## Related document

DX100 Concurrent I/O (RE-CKI-A453)



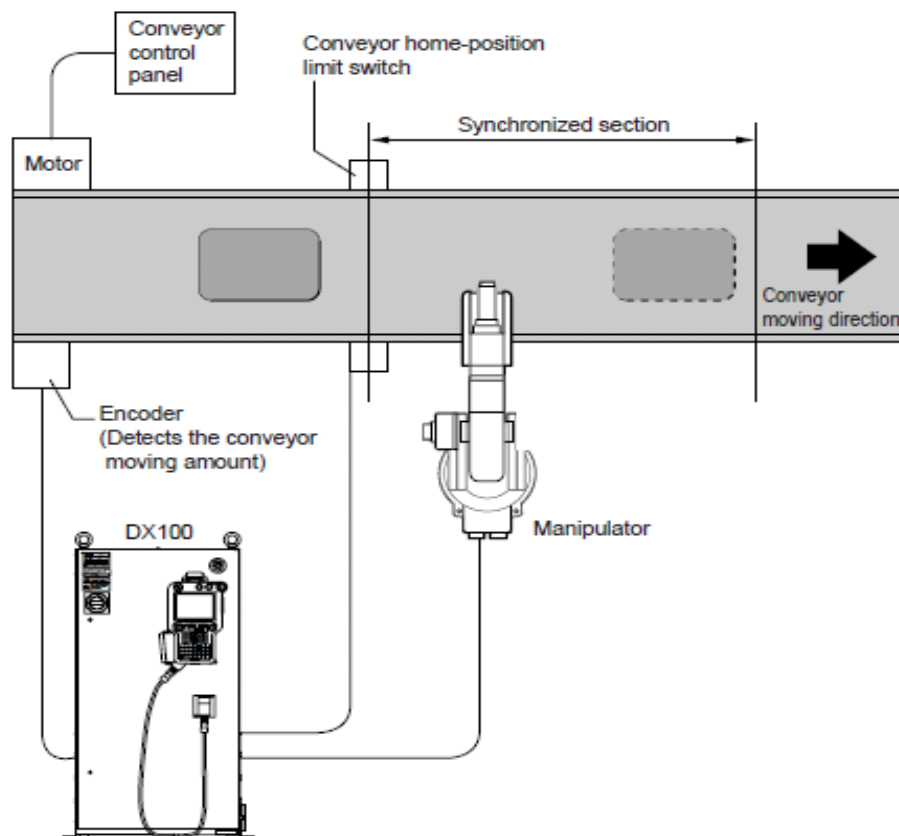
# Conveyor synchronized function

## Overview and Merits

### <Overview>

Conveyor tracking operation function, which is of a position tracking type, uses the travel distance of the conveyor to modify the path as needed taught with the conveyor stopped, so that the manipulator actively track in the advance direction and the relative speed of the manipulator to the work piece is always constant.

An example of basic system configuration is shown below.



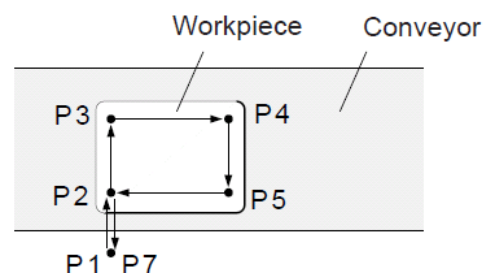
### <Merits>

1. Because manipulator operation can be synchronized with the conveyor, there is no need to stop the conveyor. This can significantly reduce the tact time.
2. It is possible to operate in synchronization with not only the linear conveyor but the circular conveyor or revolving table.

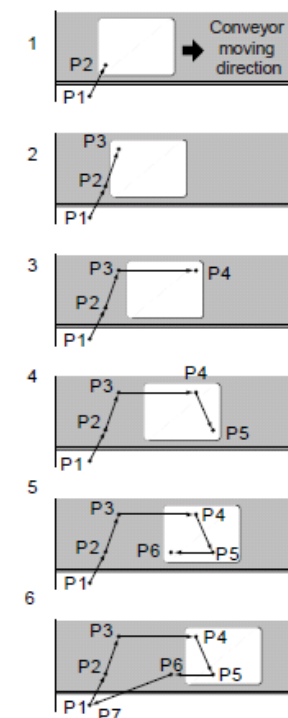
### <Example>

If P1 to P7 (P2 to P6 are synchronized points) are taught when the conveyor is stationary as shown in Fig. 1, the operation track is modified in advance direction of the conveyor in tracking the conveyor (work piece) during playback as shown in Fig. 2.

### <Fig.1 Teaching>



### <Fig.2 Playback>



## Necessary equipment

### Hardware

YCP02 board

### Software

CONVEYOR SYNCHRONIZED FUNCTION

## Related document

DX100 OPTIONS INSTRUCTIONS FOR CONVEYOR SYNCHRONIZED FUNCTION(HW0485517)



# Conveyor synchronized function with shift functions

## Overview and Merits

### <Overview>

This conveyor tracking function temporarily stores information on plural work pieces to enable the tracking process depending on each work piece.

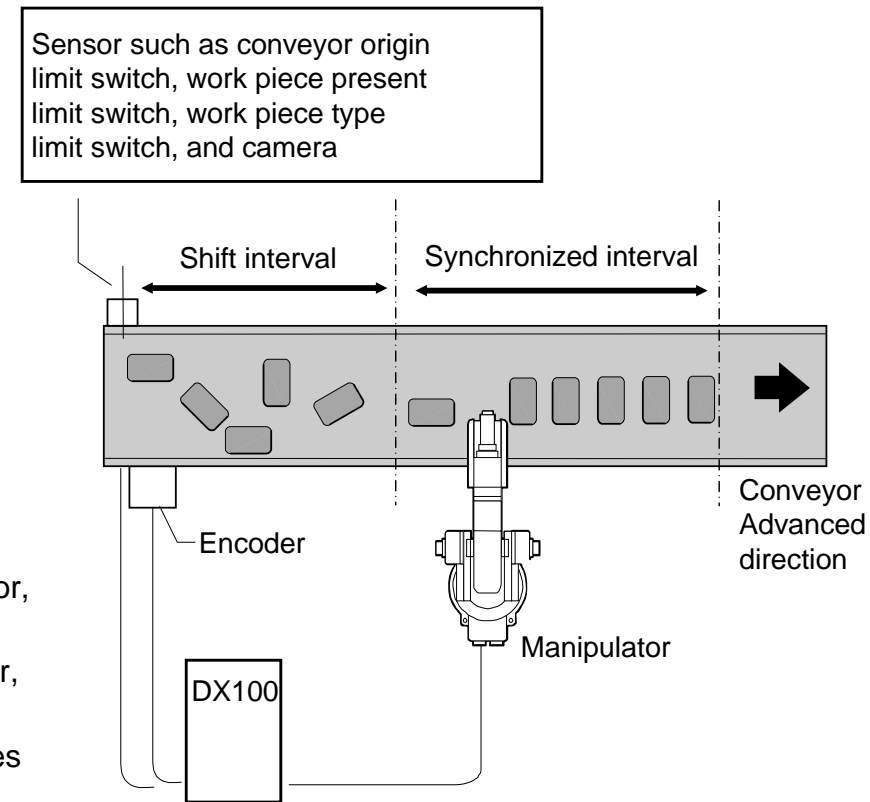
This function is used when a large number of work pieces simultaneously flows between the limit switch and the manipulator such as a case where limit switches including the conveyor origin limit switch, work piece present limit switch, and work piece type limit switch, etc. cannot be installed near the robot.

The conveyor tracking function can processes only one work piece from the input of the limit switch signal to the robot tracking operation.

An example of basic system configuration is shown below.

### <Merits>

1. Because the manipulator operation is synchronized with the conveyor, there is no need to stop the conveyor.
2. The function can be applied to the linear conveyor, circular conveyor, and revolving table.
3. The function can also be applied to the case where plural workpieces flow within the shift interval. (A maximum of 99 pieces)



## Necessary equipment

Hardware

YCP02 board

Software

CONVEYOR SYNCHRONIZED FUNCTION  
CONVEYOR SYNCHRONIZED FUNCTION WITH SHIFT FUNCTIONS

## Related document

DX100 OPTIONS INSTRUCTIONS FOR CONVEYOR SYNCHRONIZED FUNCTION(HW0485517)

DX100 OPTIONS INSTRUCTIONS FOR CONVEYOR SYNCHRONIZED FUNCTION WITH SHIFT FUNCTIONS (HW0485803)

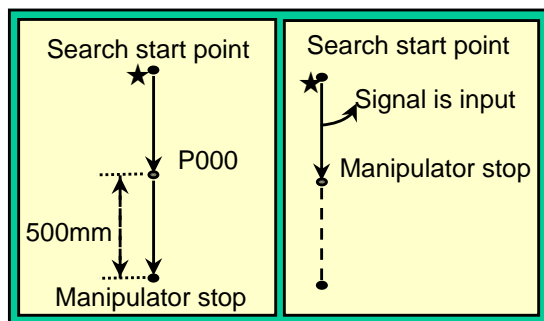
# Search function

## Overview and Merits

### <Overview>

“Search function” uses various general detection sensors to stop the robot by the detection signal of the sensor and to allow the robot to operate the next work. That is to say, this function searches the target to be worked.

### <Robot Operation>



No signal is input

Signal is input

### <Program (job) example>

```

Search instruction
MOVJ VJ=40
★MOVJ VJ=40
MOVL P000 V=10.0 SRCH
RIN#(1)=ON DIS=500.0
MOVL V=100.0
MOVL V=100.0
    
```

### <Description of Search instruction section>

P000; Target point (taught by a variable)  
 RIN#(1); DIRECT IN Input number  
 (Values of 1 to 3 are available)  
 DIS; Distance ahead of the target point  
 (in units of mm)

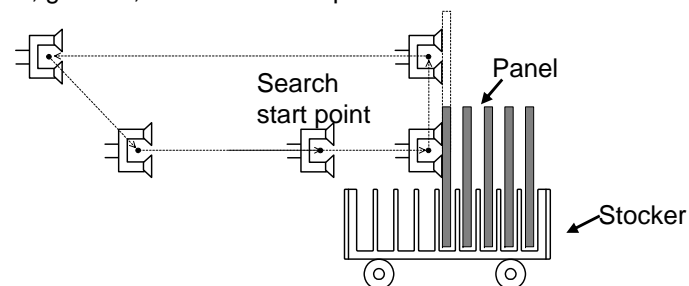
### <Description of Robot Operation>

From the start position (★ mark) to the position defined by the variable P000, the robot operates by linear interpolation at a speed of 10.0 mm/sec. At the same time, after the robot operation starts, the function starts monitoring whether a signal is input to DIRECT IN No.1.

After the operation starts, as soon as there is a signal input, the robot stops. If there is no signal input, the robot stops at a distance of 500 mm ahead of the position defined by P000. In that case, whether the robot stops with or without a signal input can be determined by the value of the system byte status \$B02.

### <Example>

The function can be applied to the case where work pieces such as panels, glasses, or others lined up in stocker are taken out one by one.



In the above example, the approach operation stops when the panel is detected even if there is some deviation, and the next operation (of taking up the work piece) proceeds.

### <Merits>

1. Programs can be simplified.  
 Although normal programs require a teaching procedure for each work piece, this function allows the robot to move in search of work pieces, which simplifies the program. (Refer to the program on the left side of this page.)
2. Various applications are available, such as protection of work piece  
 Because the sensor input stops the approach operation of the robot and starts the next operation, it becomes unlikely that the work piece is excessively pressed and broken or an unreachable work piece causes adsorption failure.  
 Depending on how the robot and sensor are used, the deviation of the work piece position can be detected, such as a case where the sensor input stops the robot and the stop position is stored to calculate the position deviation from the base position.

## Necessary equipment

Hardware	Software
Nothing	SEARCH FUNCTION

## Related document

DX100 OPTIONS INSTRUCTIONS FOR SEARCH FUNCTION (HW0485453)





# Servo float function

## Overview and Merits

### <Overview>

The servo float function controls not only the position of the robot but both the position and force of the robot. Normally, even if an outer force is applied to the robot, the robot tries to maintain the current position and does not move because only the robot position is controlled. In that case, the servo float function provides flexible control on the position and posture of the robot, in response to the force applied from outside.

The servo float function consists of the link servo float function and the linear servo float function.

#### 1. Link Servo Float Function

This function performs the servo float for each axis of the robot. This function is used when a force is applied only to a specific axis or when the servo float is applied to all axes of the robot because the direction in which the force is applied cannot be identified.

#### 2. Linear Servo Float Function

This function performs the servo float for each coordinate axis of coordinate systems such as the robot coordinate, base coordinate, base coordinate, user coordinate, and tool coordinate. This function is used when the force is applied only to the specific direction of each coordinate system.

### <Merits>

1. The robot can operate in response to the external force.

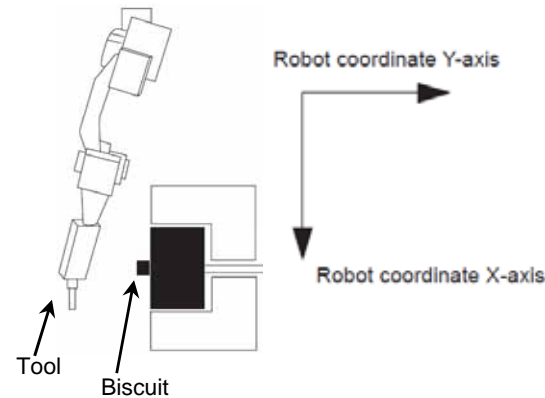
For instance, when the work piece is taken out from the die-casting machine, the work piece is extruded from the extrusion cylinder. At this point, if the robot is gripping the work piece without using the servo float function, the take-out operation does not work well because the robot tries to maintain the taught position against the extruding force. The servo float function allows the robot to flexibly operate in response to the extruding force so that the work piece can be successfully taken out.

2. No additional hardware is required.

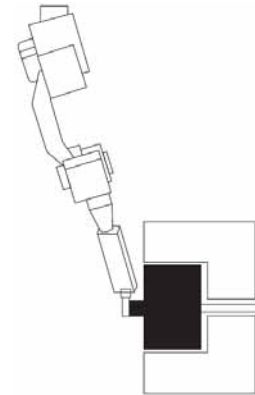
Sensors or others are not required to detect external force because the force is assumed by the software. Therefore, operation with external force applied to the robot can be realized at a lower cost.

### <Example>

1. Moves to the waiting point.

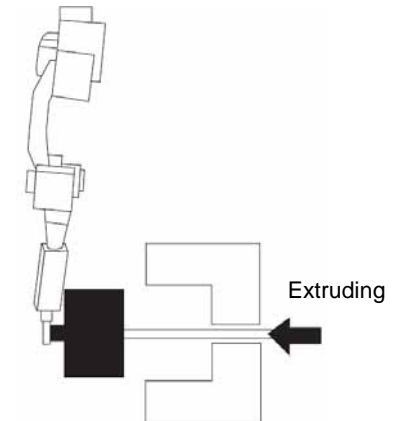


2. Moves to the grasping starting point and performs the TIMER instruction, and then starts the servofloat function. When function enabled, the manipulator grasps a biscuit.

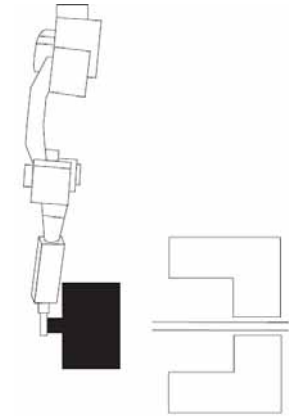


3. After having grasped a work piece, the "start extraction instruction" signal is output, and the manipulator performs an extracting motion.

4. The "start extraction instruction" signal starts the extraction operation of the die-casting machine. Thereby the manipulator performs an extracting motion.  
5. The die-casting machine outputs the "end extraction instruction" signal when the manipulator reaches the completion position. The manipulator ends the servofloat function.



6. The manipulator returns to its normal motion and performs an extraction motion with the work piece. Then, it returns to the home position.



## Necessary equipment

Hardware

Nothing

Software

SERVO FLOAT FUNCTION

\*Quotation base

## Related document

DX100 OPTIONS INSTRUCTIONS FOR SERVOFLOAT FUNCTION (HW0482946)



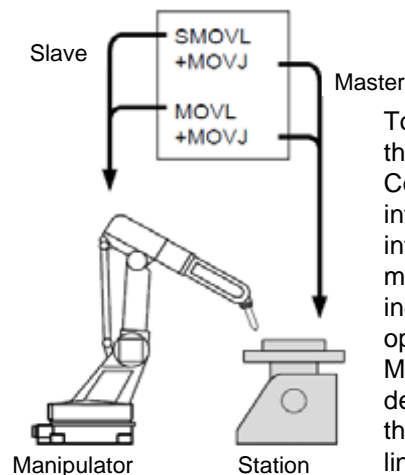
# Station coordinated motion function

## Overview and Merits

### <Overview>

DX100 can control a maximum of 8 robots and a maximum of 24 stations (jig) through one controller.

The "station coordinated function" enables the station to hold the work piece and the robot has the working tool, and both of them work cooperatively.



To operate the station and robot at the same time, the coordinated job must be taught. Coordinated job is available in the coordinated interpolation that performs the relative interpolation with the station and robot related to master and slave, respectively, and in the individual interpolation that performs individual operation.

Move instruction of coordinated job is always described in two lines, and the upper line means the instruction to the slave (robot) and the lower line means the instruction to the master (station).

### <Merits>

1. Improved welding quality + reduced tact time (for welding) when changing jig posture  
Because the counterpart of the welding robot is the freely movable station, the operation with the coordinated operation is possible. Therefore, optimal posture can be taken.

2. Reduced work for wiring and I/O check

Because the robot and station are controlled by only one controller, the interlock wiring is not required. As a result, the system can be easily setup.

3. Easy security for teaching when using two robots

Because the spherical interference area can be set in reference to the tip of the robot tool, the interference between robots is automatically checked. Another function is also available to turn OFF the servo power of unused robot during teaching.

(Unused robot servo power OFF function, optional)

### <Jig less System>

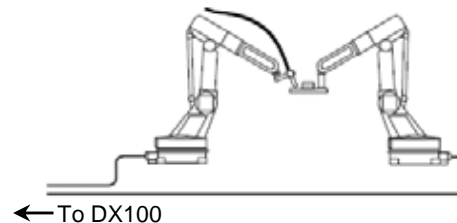
The "jig less system" enables the first robot to hold the work piece and a second robot has the torch, and both of them work cooperatively.

(The concept is the same as the station coordinated.)

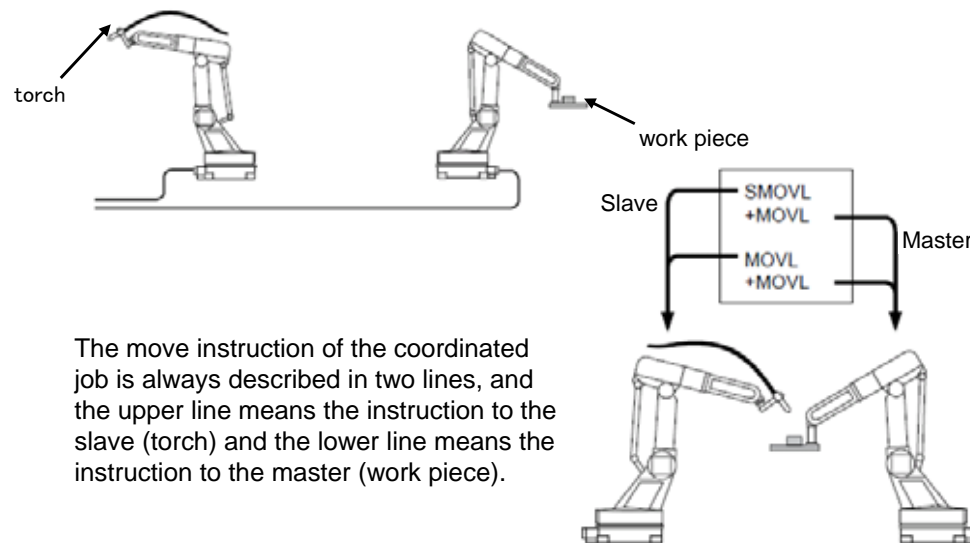
To operate two robots at the same time, the coordinated job must be taught.

Coordinated job is available in the coordinated interpolation that performs the relative interpolation with the station and robot related to master and slave, respectively, and in the individual interpolation that performs individual operation.

### Coordinated operation



### Individual operation



The move instruction of the coordinated job is always described in two lines, and the upper line means the instruction to the slave (torch) and the lower line means the instruction to the master (work piece).

## Necessary equipment

Hardware

Additional box

Software

INDEPENDENT/COORDINATED CONTROL FUNCTION

## Related document

DX100 OPTIONS INSTRUCTIONS FOR INDEPENDENT/COORDINATED CONTROL FUNCTION (RE-CKI-A454)

In addition, this function can be applied to many cases such as the system in which two robots hold the work piece and a robot performs welding. For details, refer to the functional instruction manual.

# Twin coordinated motion function

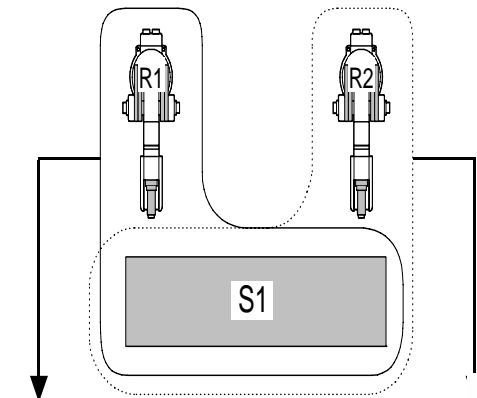
## Overview and Merits

### <Overview>

DX100 can control a maximum of 8 robots and a maximum of 24 stations (jig) through one controller.

The “station twin coordinated function” enables two robots to simultaneously control the interpolation operation and relative speed that are relative to one station (rotation axis).

This function is suitable for applications such as welding the right and left ends of a lengthy work piece.



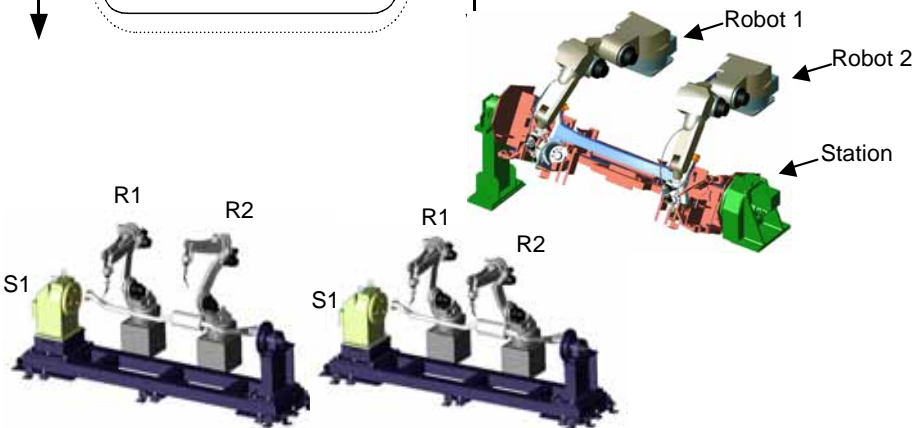
### <About Job Configuration Outline>

Two robots are synchronized with one station. Teaching is performed for each job for the following:

- A. Robot 1 + Station 1 (R1+S1)
- B. Robot 2 + Station 1 (R2+S1)

In the playback, the driven job side is synchronously started.

For instance, the job of (R2+S1) is synchronously started, R2 side operates while checking the position of the station (S1) in (R1+S1).



### <Merits>

#### 1. Improved welding quality + reduced tact time when changing jig posture (for welding)

Because the counterpart of the welding robot is the freely movable station, operation with the coordinated operation is possible. Therefore, optimal posture can be taken. Two-robot operation allows the operation time to be reduced.

#### 2. Reduced teaching time

For a symmetrical work piece, when performing teaching for the first robot, the job of the second robot is easily copied by the mirror copy function. However, a number of position modifications are required.

#### 3. Reduced work for wiring and I/O check

Because the robot and station are controlled by only one controller, the interlock wiring is not required. As a result, the system is easy to setup.

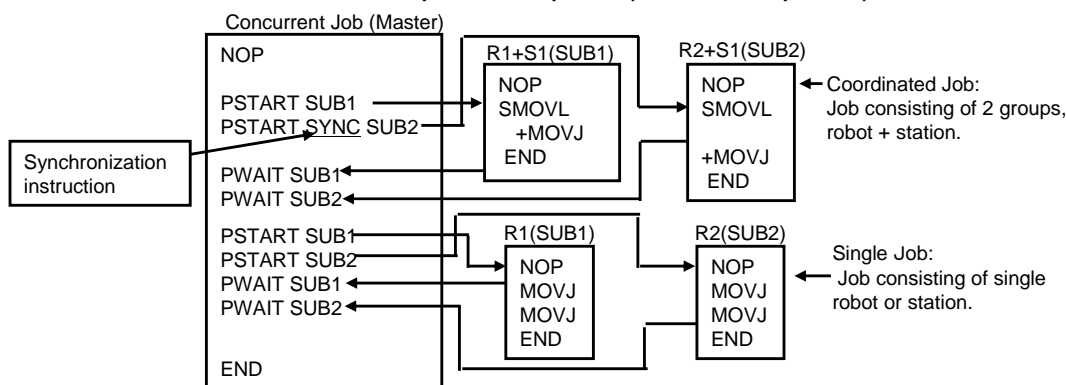
#### 4. Easy security for teaching when using two robots

Because the spherical interference area can be set in reference to the tip of the robot tool, the interference between robots is automatically checked. Another function is also available to turn OFF the servo power of an unused robot during teaching. (Unused robot servo power OFF function, optional)

#### 5. Capable of smartly constructing program using coordinated/independent functions

Just the same as the independent control function, the job configurations as shown in the figure below are available, which reduce the tact time. Because two robots can operate independently and asynchronously, each of them can perform completely different operations.

### 3 Jobs can be processed in parallel (simultaneous operation)



## Necessary equipment

Hardware

Software

Additional box

INDEPENDENT/COORDINATED CONTROL FUNCTION

## Related document

DX100 OPTIONS INSTRUCTIONS FOR INDEPENDENT/COORDINATED CONTROL FUNCTION (RE-CKI-A454)

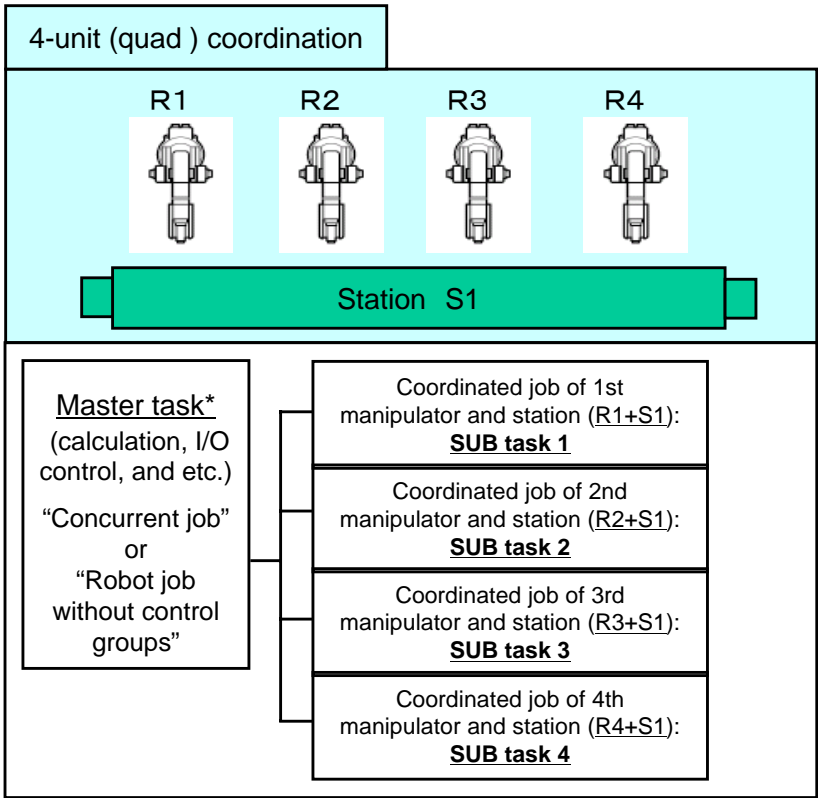
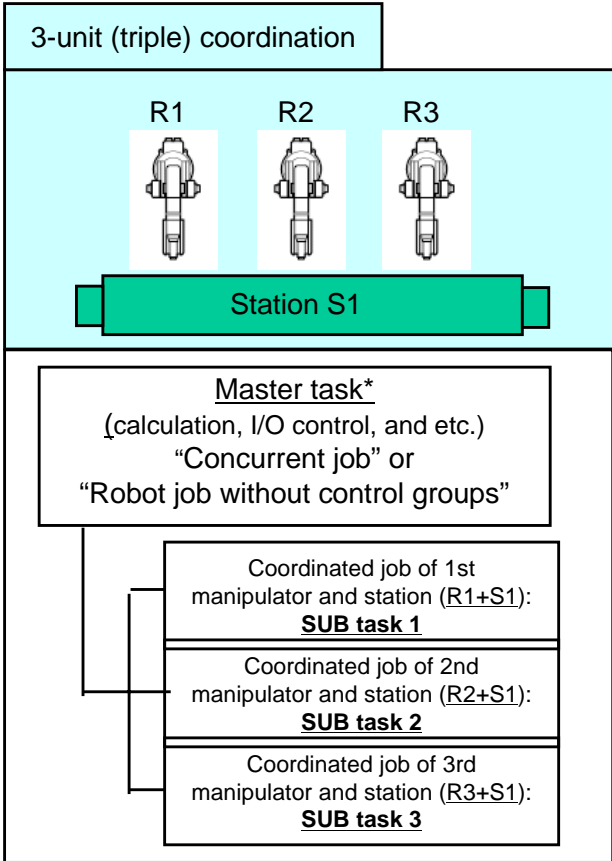
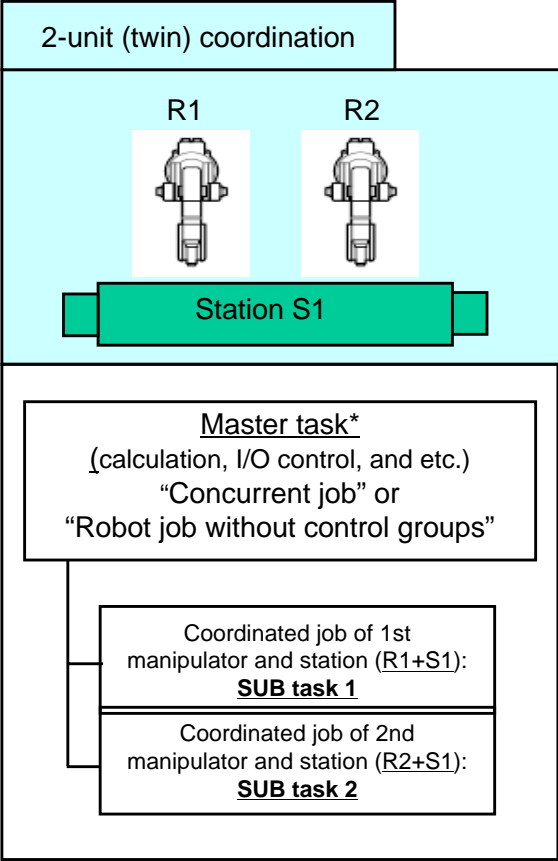
In addition, this function can be applied to many cases such as the system in which two robots hold the work piece and a robot performs welding. For details, refer to the functional instruction manual.



# Coordinated motion (Twin, Triple, Quad) function

## Overview and Merits

System by which 2-unit (twin), 3-unit (triple), or 4-unit (quad) manipulators perform operation in coordination with one station.



\*Master task job utilizes the independent control function that start robot jobs of SUB task 1, SUB task 2, SUB task 3, and SUB task 4.

**Additional note: Each robot job of the SUB task 1, SUB task 2, SUB task 3, and SUB task 4 requires registering of synchronizing instruction TSYNC at the head, and at just before starting and after finishing work.**

## Necessary equipment

- Hardware: Additional box
- Software: INDEPENDENT/COORDINATED CONTROL FUNCTION

## Related document

DX100 OPTIONS INSTRUCTIONS FOR INDEPENDENT/COORDINATED CONTROL FUNCTION (RE-CKI-A454)

In addition, this function can be applied to many cases such as the system in which two robots hold the work piece and a robot performs welding. For details, refer to the functional instruction manual.



# Zeroing function

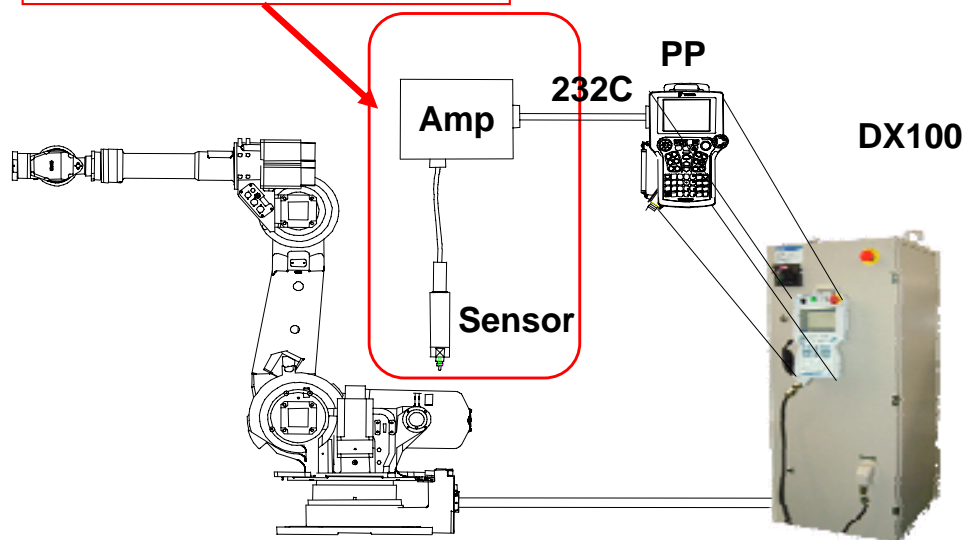
## Details and benefits

Accurate home position can be restored in a short period of time when replacing motor or encoder.

## “Reduced Time for Motor Replacement”

Quick and easy operation (2 minutes per axis)

### Zeroing sensor unit



- <Replacement Procedure>
1. Replace the encoder.  
:Home position is lost.
  2. Operate the manipulator to change its posture so that zeroing can be performed.
  3. Install the zeroing unit to the manipulator.
  4. Press the “zeroing button.”  
:Manipulator automatically operates.  
:Detection and registry of home position are automatically performed.
  5. Remove the zeroing unit from the manipulator.

## Necessary equipment

Hardware

Software

Zeroing sensor unit

ZEROING FUNCTION

\*This function is available only by zeroing spec manipulator.

## Related document

INSTRUCTIONS FOR ZEROING FUNCTION of each manipulator's instruction



# Twin drive function

## Overview and Merits

### <Overview>

If an axis with a large load is controlled by one motor in configuring station axes for welding applications or others, a large-capacity motor must be selected because of lack of motor capacity and torque. In that case, the station axis becomes large, which may cause a problem in installation space.

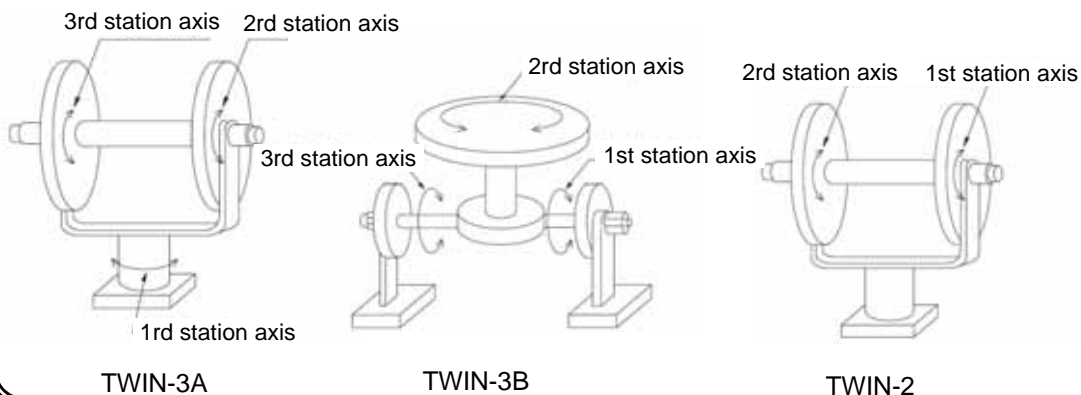
Whereby, the axis with a large load may be controlled by two motors to compensate for lack of motor capacity and torque.

In such a system, however, two motors must be simultaneously operated.

The "Twin drive function" enables the station sub-axis motor to operate simultaneously with the station main-axis motor during teaching in such a case where the station is operated by two motors.

The following three station types can be selected when setting the station axis for the system configuration

Station type	Configuration		
	Number of station axes	Master axis	Slave axis
TWIN -3A (TDT3A)	3 axes	Second axis	Third axis
TWIN -3B (TDT3B)	3 axes	First axis	Third axis
TWIN -2 (TDT2)	2 axes	First axis	Second axis



### <Merits>

1. System space-saving installation.   
 Because a large station axis can be controlled by two motors with relatively low capacity, system installation takes up less space.
2. Teaching time can be reduced.   
 When selecting simultaneous operation mode during teaching, just pressing the control key for the main axis will simultaneously move the sub axis, which can reduce teaching time to half.

### <Operation Modes>

There are two operation modes of the station axis during teaching as follows.

1. Simultaneous operation mode   
 When pressing the main axis key, the sub axis is also operated simultaneously with the same instruction. In this case, pressing the sub axis key does not work.
2. Single operation mode   
 Each of the main axis and the sub axis operate singly.

### <Coordinated Operation with Robot>

1. For coordinated operation of twin- 2 typed station and robot:   
 Coordinated operation is performed for the station 1st axis. At this point, the station 2rd axis operates in twin drive.
2. For coordinated operation of twin- 3A, 3B typed station and robot:   
 Coordinated operation is performed for 2-axis station configured with station 1st and 2nd axes. At this point, station 3rd axis operates in twin drive. Coordinated operation for the station 3rd axis is not possible.

### <Notes>

This function performs the same operation during both teaching and playback. Therefore, the following use requirements must be satisfied.

1. The same motor is used for the twin drive configuration axis.
2. The mechanism specification (reduction ratio, movable range) and motor specification (rotation direction, use rotation speed, acceleration/deceleration time, and inertia ratio) on station axes are set in the same condition.

## Necessary equipment

Hardware

Station types : TWIN-3A, TWIN-3B, TWIN-2

Software

TWIN DRIVE FUNCTION

## Related document

DX100 FOR TWIN DRIVE FUNCTION (HW0485414)

# Data transmission (MOTOCOM32, Ethernet, M-NET, Device NET, CC-Link)



## Overview and Merits

### <Overview>

#### 1. Data transmission function, MOTOCOM32

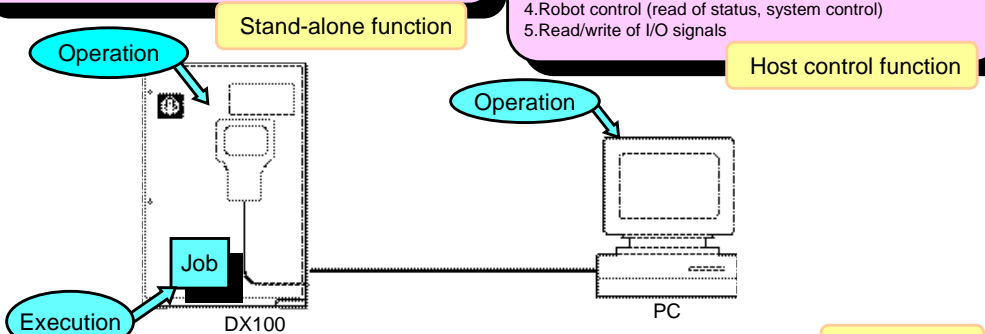
Data can be transmitted between DX100 and PC through serial communication. The possibilities of data transmission are shown below. (DX100 requires data transmission function, and PC requires MOTOCOM32.)

The following data transmission is possible by P.P.

1. Transmission (load, save, and verification) of jobs (single and related jobs)
2. Transmission of condition and general data (tool, weaving, user coordinate, welding-related, variable data)
- Transmission of system information (system info., alarm history)

The following data transmission is possible by PC operation.

1. Transmission of jobs (single and related jobs)
2. Transmission of condition and general data (tool, weaving, user coordinate, welding-related, variable data)
3. Read of system information (system info., alarm history)
4. Robot control (read of status, system control)
5. Read/write of I/O signals



The following data transmission is possible by executing the instruction described in the job.

1. Transmission (load, save, deletion) of jobs (single and related jobs)
2. Automatic work job replacing and transmission of variables (BYTE, INTEGER, DOUBLE, REAL, POSITION)

Users themselves can customize transmission applications between robot and PC. Following items are available for facilitating the customization.

- Data transmission function (Motocom32.dll) between robot and PC
- Application creation procedure with sample programs including the above function.

<Additional Explanation>  
3. Details and differences in Ethernet communication function

Data transmission specification  
Interface: RS-232C conformity (RS/CS method)  
Baud rate: Max. 9600bps (changeable)  
Transmission mode: Half-duplex transmission method  
Synchronization: Start-stop synchronization method  
Transmission code: ASCII, shift JIS

#### 2. Other data transmission

Name	Feature	Specification
<b>Ethernet</b> Function to use Ethernet instead of RS-232C between data transmission function and MOTOCOM32.	1. Because of Ethernet (10/100Mbps) used for transmission media, higher speed transmission is possible than RS-232C (a maximum of 9600bps). 2. Communication unit can be changed by software. 3. With Ethernet connector (RJ-45) for data transmission prepared as standard equipment, Ethernet function can be used with no other hardware added.	Baud rate: 10/100Mbps Transmission connector: RJ-45 Protocol version IP: IPv4 SNTP: SNTP Version3 Transmission cable spec.: Shielded category 5 or more
<b>M-NET</b> Function to exchange I/O data through serial data transmission line between DX100 and sequencer.	1. One transmission cable provides wiring between modules. 2. Transmission cable can be extended to a maximum of 100m (total extended distance). 3. Reduced wiring achieves the system at low cost. 4. The maximum number of transmission I/O points is 112 points for each I/O (in units of 8 points) 5. Only slave unit is supported.	Baud rate: 19.2/38.4Kbps Signal level: Conformity with EIA standard and RS-422 Transmission cable spec.: JKEV-SB 0.75sq x 2p Maximum number of slave unit: 7
<b>Device Net</b> Function to exchange I/O data through serial data transmission line between DX100 and sequencer.	1. One transmission cable provides wiring between modules. 2. Reduced wiring achieves the system at low cost. 3. The maximum number of transmission I/O points is 2000 points for each I/O 4. The maximum total extended distance is 500m (transmission speed: 125 Kbps) 5. Industry standard open network specification is achieved.	Baud rate: 500/250/125Kbps Transmission cable spec.: Dedicated cables such as DCA1-5C10 Maximum number of slave unit: 63
<b>CC-Link</b> Function to exchange I/O data through serial data transmission line between DX100 and sequencer.	1. One transmission cable provides wiring between modules. 2. Reduced wiring achieves the system at low cost. 3. Number of transmission I/O points is maximum of 112 points for each I/O 3. The maximum total extended distance is 1200m (at a transmission speed of 156Kbps). 4. Only slave unit is supported. 5. Compliant with Ver1.10.	Baud rate: 10M/5M/2.5M/625K/156Kbps Transmission method: Broadcast polling method Transmission cable spec.: Dedicated cables such as FANC-SB Maximum number of slave unit: 64

Function	Contents
1. Ethernet Function (YASKAWA original protocol is used)	Communication media of data transmission function (RS232C) is changed to Ethernet, and there is no difference in the function. This is the basic function of Ethernet communication, and is also required when using the following functions.
2. FTP function	FTP Server Function: Sends and receives files to and from the DX100 FTP server according to the instruction from the application of the upper calculator.
	FTP Client Function: Sends and receives files to and from the FTP server of the upper calculator through the DX100 programming pendant operation.
3. Ethernet Server Function (YASKAWA simple protocol is used)	Reads the robot status and controls the system according to the instruction from the application of the upper calculator.

#### Differences among Functions

Functional Classification	DCI	Stand-alone	Host Control		Necessity of MOTOCOM32
			File Transmission/Reception	Status Read/System Control	
Data Transmission Function (RS232C)	○	○	○	○	MOTOCOM32 is highly recommended.
Data Transmission function (Ethernet)	Ethernet Function	○	○	○	MOTOCOM32 is required.
	FTP Server Function	x	x	○	MOTOCOM32 is unavailable.
	FTP Client Function	x	○	x	MOTOCOM32 is unavailable.
Ethernet Server Function	x	x	x	○	MOTOCOM32 is not required.

## Necessary equipment

Function	Hardware	Software	Function	Hardware	Software
Data transmission function	Transmission cable	DX100: Data transmission function	M-NET	JARCR-XFB03 Transmission cable	Nothing
Ethernet	JANCD-YCP01-E Transmission cable	PC:MOTOCOM32	Device Net	JARCR-XFB01B SST-DN3-PCU-1/2 ADPCI-1559 Transmission cable	Nothing
			CC-Link	JARCR-XFB04 SST-CCS-PCU Transmission cable	Nothing

## Related document

DX100 OPTIONS INSTRUCTIONS FOR DATA TRANSMISSION FUNCTION (RE-CKI-A456)  
MOTOCOM SPECIFICATIONS (HW9481971), MOTOCOM32 OPERATION MANUAL (HW9482689)  
DX100 OPTIONS INSTRUCTIONS FOR ETHERNET FUNCTION (HW0485429)  
DX100 OPTIONS INSTRUCTIONS FOR FTP FUNCTION (HW0485556)  
DX100 OPTIONS INSTRUCTIONS FOR ETHERNET SERVER FUNCTION : ADVANCED FEATURE OF NX100 ETHERNET FUNCTION (HW0485560)  
DX100 OPTIONS SST-DN3-PCU BOARD INSTRUCTIONS FOR DeviceNet (RE-CKI-A455)  
DX100 OPTIONS SST-CCS-PCU BOARD INSTRUCTIONS FOR CC-LINK (RE-CKI-A457)



# Bilingual function

## Overview and Merits

This function of the programming pendant allows the display language to be changed. For the pendant for which the bilingual function is set, simultaneously pressing “Shift” and “Area” keys alternates the display between two languages. The initial factory setting of the robot controller is required.

### <Note>

Even if the display language is changed, the display such as registered job name or comment is not changed.

### <Standard Support Languages>

Japanese/English bilingual is supported in all versions.

### <Other Support Languages>

Products supporting the following language have been shipped.

(DS1.2E-00 to DS1.45-00)

For the corresponding version, contact YASKAWA in each case.

	Chinese	Taiwanese	German	French	Polish
Japanese	○	○	○	○	○
English	○	○	○	○	○



### <To be supported language>

Spanish, Italian, Swedish, and Suomi

\*For the support of languages other than the above, consult YASKAWA separately.

## Necessary equipment

Hardware

Nothing

Software

BILINGUAL FUNCTION

## Related document

DX100 OPTIONS INSTRUCTIONS FOR BILINGUAL FUNCTION  
(HW0485528)



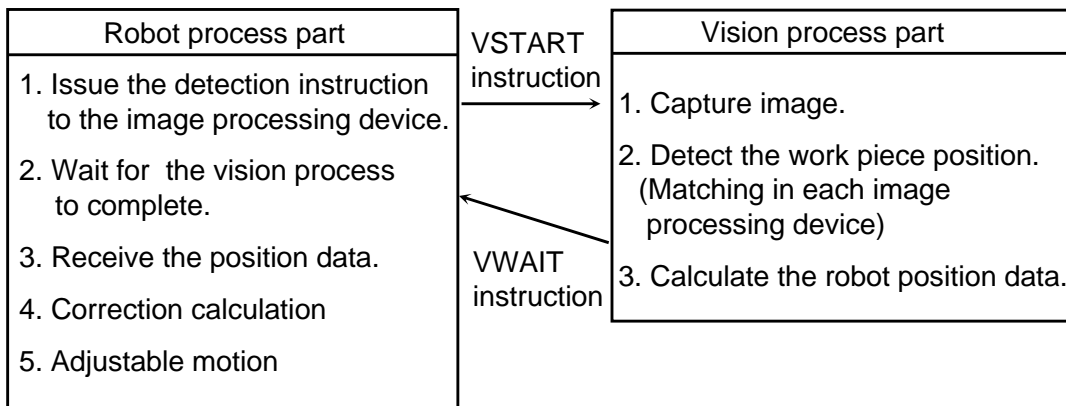


# Vision function

## Overview and Merits

Vision function instantly detects whether or not a work target or position deviation is present by diagnosing image data input from the camera. Based on the analyzed data, the MOTOMAN position is modified.

### <Overview of Vision Functional Process>



### <Merits>

1. Because of the work with the work piece position checked by Vision function, the positioning jig can be simplified and large-scaled equipment is not required, which can reduce equipment investment. It is also possible to flexibly respond to the addition of types.
2. The robot instruction allows easy control of image processing devices.
3. Various matching functions provided by each manufacturers are available, which supports a wide range of shapes of work pieces.

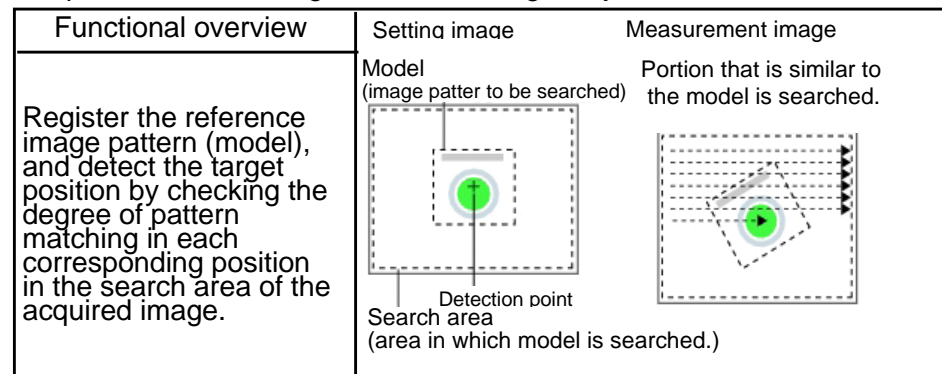
### <Equipment that can be connected>

Image processing devices of the following manufacturer/model can be controlled through RS232C/Ethernet communication by using VSTART instruction. (Instruction manual for connections and settings is being created.)

Manufacturer	Model
OMRON	F210, F250, FZ3
COGNEX	In-sight series
KEYENCE	CV-3000, CV-5000
SHARP	IV-S210X

### <Overview of Detection Function>

In image processing devices of each manufacturer, several types of detection methods are prepared per manufacturer. The following describes the standard matching method to detect change of position/rotation angle/size of the target object.



### <Application Examples>

Installation of glass for automobile, positioning of body for sealing, handling of cylinder block, and others.

## Necessary equipment

### Hardware

- \*Image processing device
- \* Communication cable (RS232C or Ethernet)
- \* Camera, lens and camera cable (the number of cameras to be connected depends on the manufacturer or model)
- \* Power supply, monitor/controller (the monitor integrated type is available in some manufacturers.)
- \*Lighting equipment (this is selected depending on the environment.)

### Software

Vision function software

## Related document

DX100 VISION FUNCTION (in preparation)



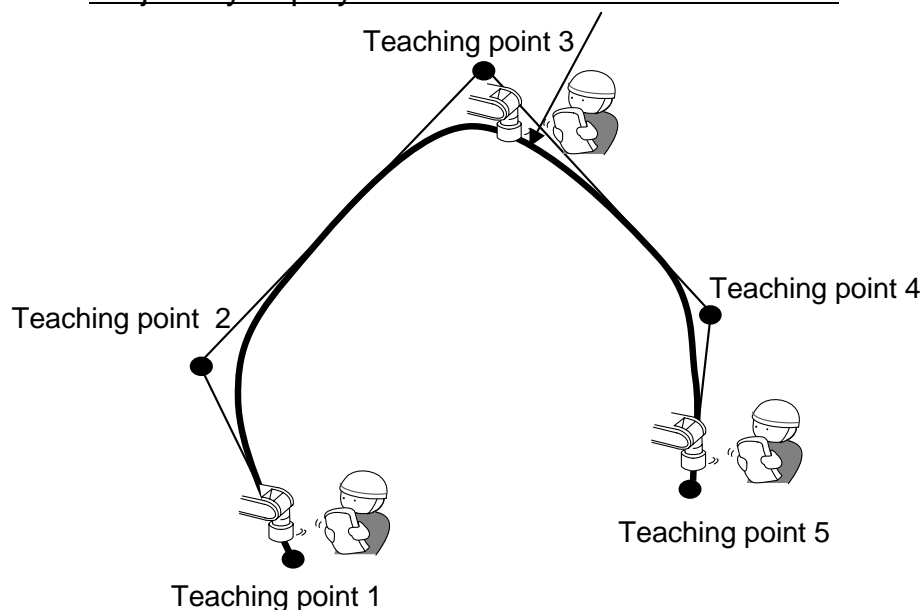
# Playback trajectory check function

## Overview and Merits

### <Overview>

This function restores the trajectory of robot control points during playback by the test run operation. This simplifies checking the playback trajectory.

Trajectory of playback can be checked in test run



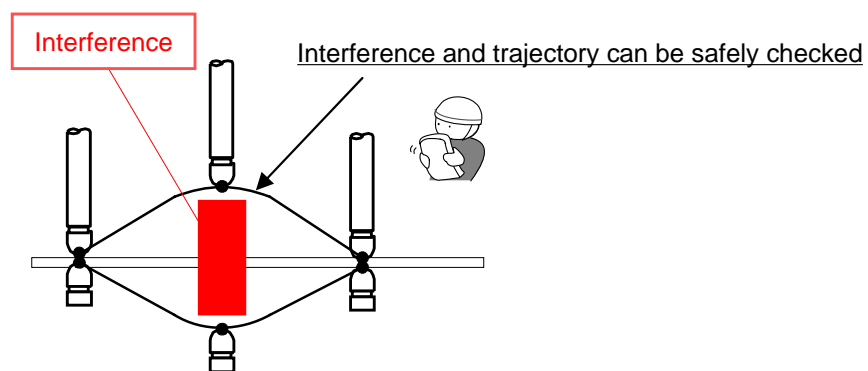
### <Merits>

1. Teaching time can be reduced.

Up to now, the operation trajectory was checked by gradually increasing the playback speed. In the test run during teaching, this function can restore the operation trajectory during playback, which can significantly reduce the teaching checking time.

2. Operation trajectory can be safely checked.

Because of operation in the test run, the operation trajectory during playback can be restored at a low speed of robot operation. Therefore, interference among the operation trajectory, work piece, and jig can be safely checked.



## Necessary equipment

Hardware

Nothing

Software

Standard function

## Related document

- DX100 OPERATOR'S MANUAL FOR MATERIAL HANDLING, PRESS TENDING, CUTTING, AND OTHER APPLICATIONS (RE-CSO-A037)
- DX100 OPERATOR'S MANUAL FOR ARC WELDING(RE-CSO-A038)
- DX100 OPERATOR'S MANUAL FOR SPOT WELDING USING MOTOR GUN(RE-CSO-A040)
- DX100 OPERATOR'S MANUAL FOR SPOT WELDING USING AIR GUN(RE-CSO-A041)



# Edit function during play mode

## Overview and Merits

**“Even when the line is in operation, Job edit is possible !”**

Because a job can be edited even when in production or line is in operation, fine adjustment such as **changing signal number, operating condition, and work condition** without stopping robot work.

- Editing operations possible during playback**
1. Editing existing job (changing and adding teaching points or editing INST)
  2. Creating new job.

<Example>

Change of interlock condition	
( Before change )	( After change )
NOP	NOP
:	:
MOVJ VJ=50.00	MOVJ VJ=50.00
<b>WAIT IN#(1)=ON</b>	<b>WAIT N#(10)=ON</b>
MOVJ VJ=50.00	<b>TIMER T=0.5</b>
MOVJ VJ=50.00	MOVJ VJ=50.00
:	:
END	END

**Operating condition can be changed without stopping robot work.**

Change of welding condition number	
( Before change )	( After change )
NOP	NOP
:	:
MOVJ VJ=50.00	MOVJ VJ=50.00
<b>ARCON ASF#(1)</b>	<b>ARCON ASF#(2)</b>
MOVJ VJ=50.00	MOVJ VJ=50.00
:	:
END	END

**Welding condition can be changed without stopping robot work.**

## Necessary equipment

Hardware	Software
Nothing	Standard function

## Related document

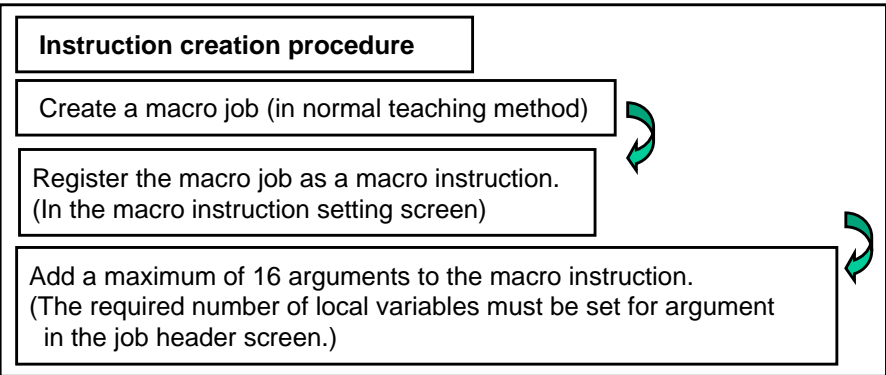
DX100 INSTRUCTIONS FOR EDIT FUNCTION DURING PLAY MODE (in preparation)



# Macro command function

## Overview and Merits

Macro instruction is the function for creating, registering, and executing one instruction from plural INFORM. Content created as work job can be created, registered, and executed as one instruction.



**Instruction to obtain argument for macro instruction (GETARG):**  
 When macro instruction is executed, argument data added to the macro instruction is obtained, and stored into the specified local variable to use the data in the macro job.

A      B

**GETARG** LB000 IARG#(1) : Store 1st argument data into the local variable LB000.

A. Specify the local variable to which argument data is stored:  
 each local variable of BYTE, INTEGER, DOUBLE, REAL, ROBOT POSITION, BASE AXIS POSITION, and STATION AXIS POSITION local variables.

B. Specify the argument data: Specify the number of the argument to be obtained.

Example of macro instruction registry: SEALON

```

Line Step
000    NOP
001    MOVJ  VJ=100.0
002    WAIT  IN#(1)=ON
003    MOVJ  VJ=50.0
004    SEALON WIDTH=8
005    MOVL  V=125
006    MOVL  V=95
.....
  
```

Example of macro job registry: SEALON

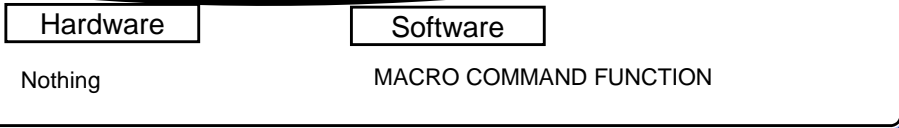
```

Line Step
000    NOP
001    GETARG LI000 IARG#(1) : Store 1st argument data '8' to LI000.
002    DOUT  OT#(10) ON      : Turn ON general output 10.
003    MUL   LI000 10        : Multiply the number of LI000 by 10. (8 x 10→80)
004    WAIT  IN#(10)=ON     : Wait for general input 10 to be ON.
005    AOUT  AO#(1) LI000   : Output '80' to the analog output 1.
006    END
  
```

**<Setting of Interruption macro job>**  
 In addition to macro job, set and register the interruption macro job for the macro job.  
 In the macro instruction setting screen, the interruption macro job for the macro job can be set.

Note: For macro job, executive commands such as "JUMP", "CALL", and "PSTART" cannot be registered. Also, for interruption macro job, TIMER instruction and WAIT instruction is not executed.

## Necessary equipment



## Related document

DX100 OPTIONS INSTRUCTIONS FOR MACRO COMMAND FUNCTION (HW0485673)

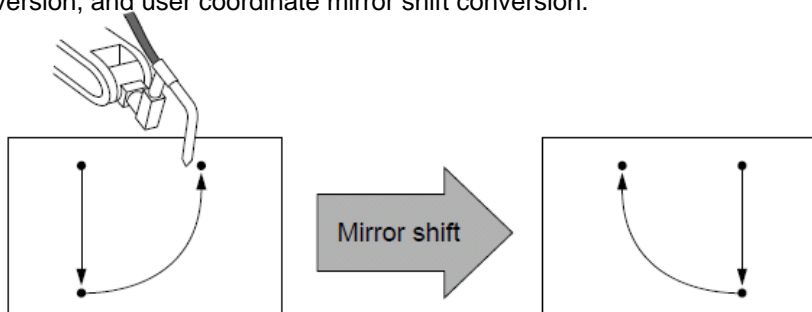
# Pulse mirror-shift function

## Overview and Merits

### <Overview>

The "mirror shift conversion function" performs mirror shift for the specified plane (XY, YZ, and ZX planes) in any coordinate (robot coordinate and user coordinate) in addition to the mirror shift conversion that accommodates symmetrical work.

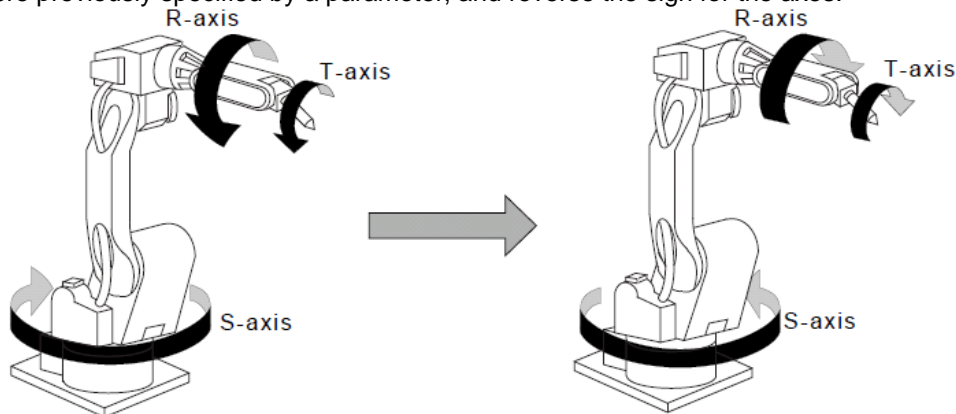
Mirror shift conversion includes the pulse mirror shift conversion, robot coordinate mirror shift conversion, and user coordinate mirror shift conversion.



The original path before the mirror shift

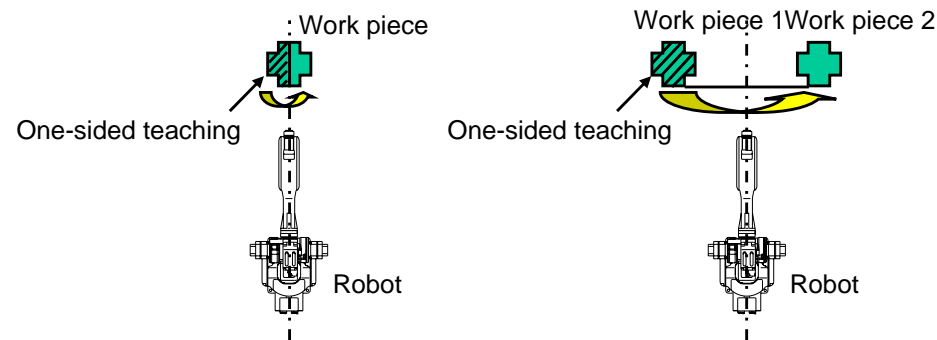
The converted path after the mirror shift

Out of the above conversions, "pulse mirror shift conversion" specifies the axes that were previously specified by a parameter, and reverse the sign for the axes.

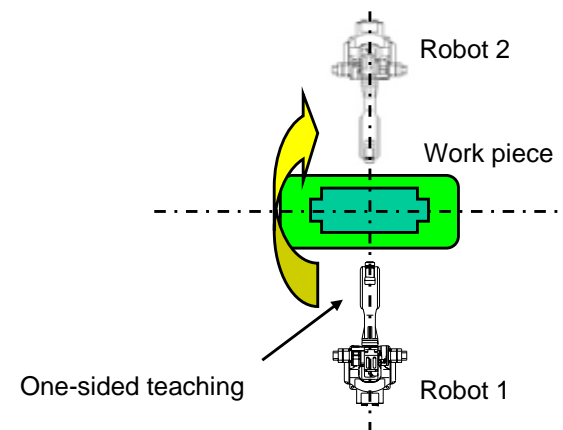


### <Merits>

1. Lightened teaching work in symmetrical layout of work piece.  
When work pieces are symmetrically laid out about the robot, teaching work is required for only one side, which can reduce the teaching work.



2. Lightened teaching work in symmetrical layout of robot.  
When robots are symmetrically laid out about the work piece, teaching work is required for only one side, which can reduce the teaching work.



## Necessary equipment

Hardware	Software
Nothing	Standard function

## Related document

- DX100 OPERATOR'S MANUAL FOR MATERIAL HANDLING, PRESS TENDING, CUTTING, AND OTHER APPLICATIONS (RE-CSO-A037)
- DX100 OPERATOR'S MANUAL FOR ARC WELDING(RE-CSO-A038)
- DX100 OPERATOR'S MANUAL FOR SPOT WELDING USING MOTOR GUN(RE-CSO-A040)
- DX100 OPERATOR'S MANUAL FOR SPOT WELDING USING AIR GUN(RE-CSO-A041)



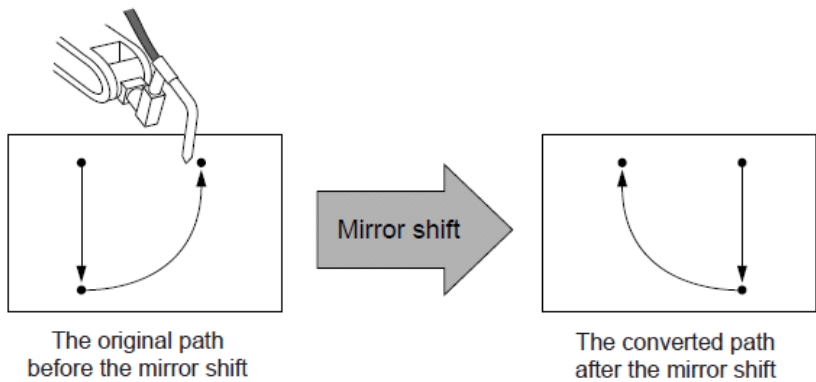
# Robot/user coordinates mirror-shift function

## Overview and Merits

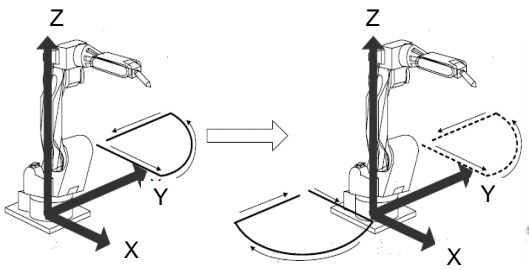
### <Overview>

The "mirror shift conversion function" performs mirror shift for the specified plane (XY, YZ, and ZX planes) in any coordinate (robot coordinate and user coordinate) in addition to the mirror conversion that accommodates symmetrical work.

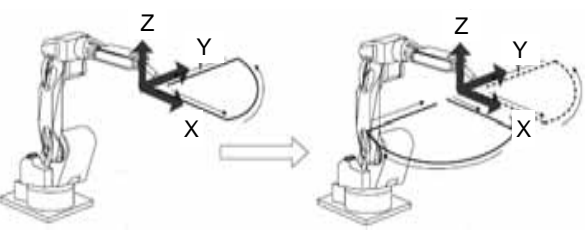
Mirror shift conversion includes the pulse mirror shift conversion, robot coordinate mirror shift conversion, and user coordinate mirror shift conversion.



Out of the above conversions, "robot axis mirror shift conversion" performs the mirror shift for the planes (XY, YZ, ZX) specified in the robot coordinate.



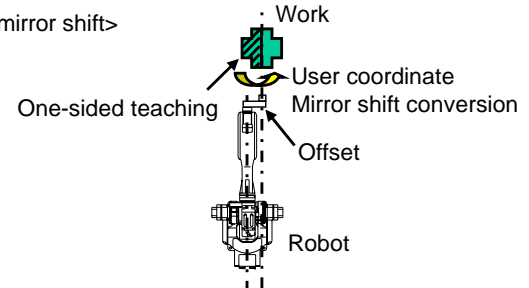
Out of the above conversions, "user axis mirror shift conversion" performs the mirror shift for the planes (XY, YZ, ZX) specified in the user coordinate.



### <Merits>

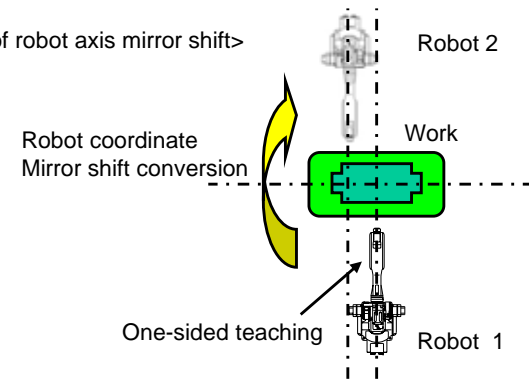
1. Lightened teaching work when the hand is offset from the center of the robot. Even when the hand is offset laid out about the center of the robot, teaching work is required for only one side, which can lighten the teaching work.

<Example of user axis mirror shift>



2. Lightened teaching work when the robot is asymmetrically laid out. Even when the robot is asymmetrically laid out about the work piece, teaching work is required for only one side, which can lighten the teaching work.

<Example of robot axis mirror shift>



## Necessary equipment

Hardware	Software
Nothing	Standard function

## Related document

- DX100 OPERATOR'S MANUAL FOR MATERIAL HANDLING, PRESS TENDING, CUTTING, AND OTHER APPLICATIONS (RE-CSO-A037)
- DX100 OPERATOR'S MANUAL FOR ARC WELDING(RE-CSO-A038)
- DX100 OPERATOR'S MANUAL FOR SPOT WELDING USING MOTOR GUN(RE-CSO-A040)
- DX100 OPERATOR'S MANUAL FOR SPOT WELDING USING AIR GUN(RE-CSO-A041)



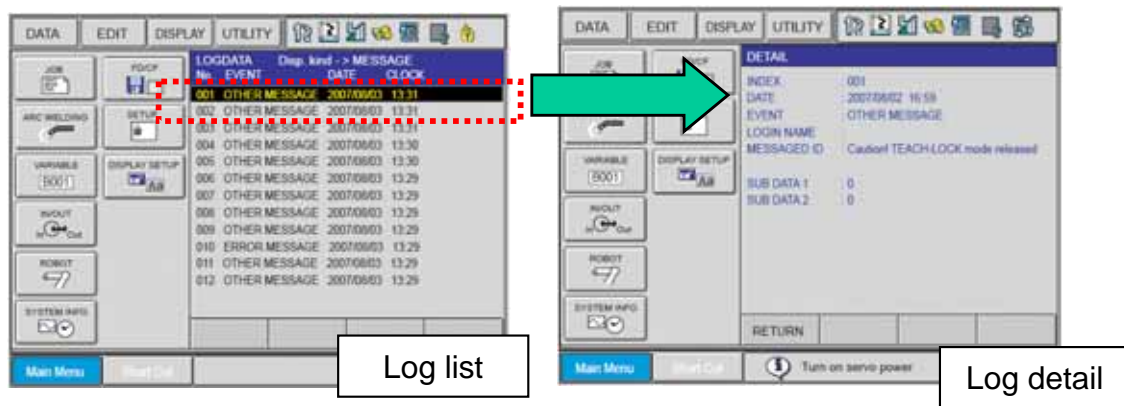
# Logging function

## Overview and Merits

**“History of programming pendant operation can be checked!”**

This function stores and displays the data edit such as editing data of the robot controller program (job) and welding condition, and the history (log) of programming pendant operation such as job execution.

This function also facilitate troubleshooting by ensuring the data traceability.



- Logging target
- Data edit (200)
    - Job
    - Concurrent IO ladder
    - Various condition files
    - Edit of parameters, variables, and others
  - Pendant operation (100)
    - Job start, hold, emergency stop,
    - external memory (load and save), and others

It is also possible to extract and display only the log of data edit or pendant operation.

## Necessary equipment

### Hardware

I/F memory expansion board(4MB)  
(JANCD-YIF01-2E)

### Software

LOGGING FUNCTION

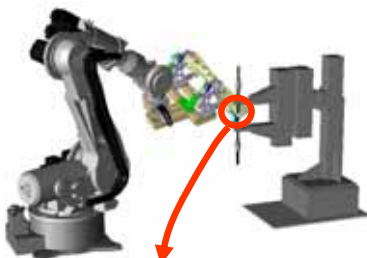
## Related document

DX100 INSTRUCTIONS FOR LOGGING FUNCTION (in preparation)



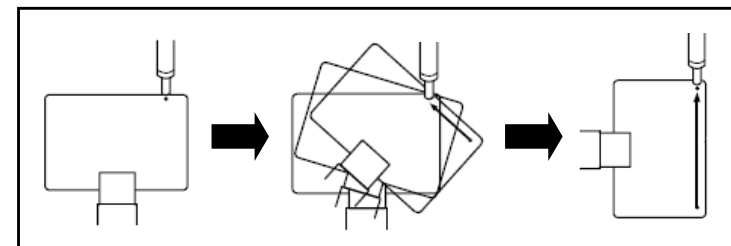
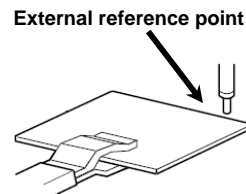
# External reference point control function

## Overview and Merits



<Overview>  
 The external reference point control function performs teaching and playback, regarding one point in space as the control point of the manipulator. This one point in space is called the external reference point. Specifically, the point is used in the cases where sealing in the work piece supporting work or spot welding with the stationary gun is performed. In this case, operation such as changing the posture of a work piece can be easily carried out by setting the tip of nozzle or gun to the reference point. Naturally, during playback, interpolation is performed by controlling the relative speed and relative position between the external reference point and the work piece.

B. With external reference point control  
 Interpolation is performed, setting the control point for not the control point of the robot main body but the external point.

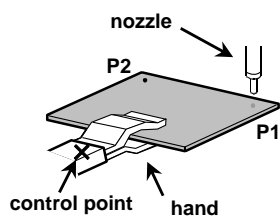


As a result of the above, there are only 2 teaching points. (This means that fewer teaching points are acceptable.)

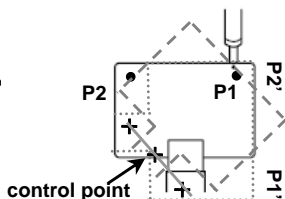
<Difference between Using External Reference Point and not Using it>  
 In the case of linear interpolation teaching only for the operation start point and end point:

A. Without external reference point control (normal control)

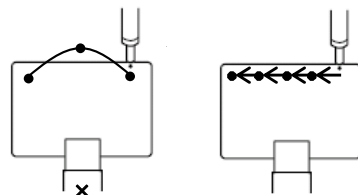
1. Teaching points



2. If linear teaching is performed for the start point and end point, the nozzle tip describes an arc.



3. Because linear operation is impossible, more points must be taught to form quasi linear.



### <Merits>

**1. Quality is improved even for work piece supporting work with a fixed tool.**

Because any point in space can be registered as a control point and linear and circular interpolation can be performed for the reference point, the bead form becomes stable and quality is improved during sealing or others.

**2. Teaching time can be reduced.**

If the external reference point control is not used, more points must be taught. Using this function requires fewer teaching points, which significantly reduces the teaching time.

**3. Applicable to more than one gun or nozzle.**

A maximum of 63 external reference points can be used because the control point is taught at origin in the user coordinate. Therefore, the external reference point can be easily changed and used even if there are more than one gun or nozzle.

## Necessary equipment

Hardware

Software

Nothing

EXTERNAL REFERENCE POINT CONTROL FUNCTION

## Related document

DX100 EXTERNAL REFERENCE POINT CONTROL FUNCTION  
 (HW0485442)



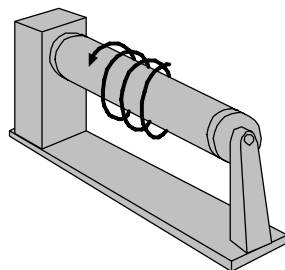
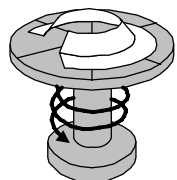


# External axis endless function

## Overview and Merits

### <Overview>

This function continuously rotates the external axis a plural number of turns. Although the rotation angle of the external axis is generally limited within  $\pm 360$  degrees, this function allows it to rotate endlessly. When executing the move instruction MOVJ with the “number of rotations of the external axis” specified, the external axis rotates the “specified rotating amount + teaching position pulses” during the movement to the target position. One move command can specify up to  $\pm 100$  turns.



### <Merits>

1. Teaching time can be reduced.  
Even for a step that usually must be registered with the positioner manually rotated 100 turns, using the external axis endless function requires only adding the tag “MTE=100 (rotation of 100 turns)” to the move instruction. This eliminates the work for actually rotating the positioner, which can reduce the teaching time.

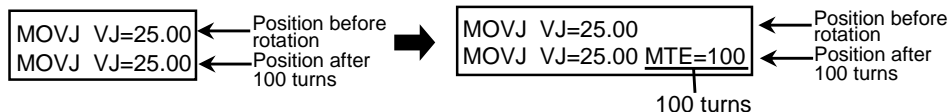
2. Tact time can be reduced.  
After the positioner rotates plural turns in a step, it reversely rotates to the original position before executing the next step. The greater the number of rotations, the greater the number of reverse rotations before the next step, which takes longer.

‘MRESET ST’ instruction of the external axis endless function resets the rotating amount to less than one turn without reversely the rotating positioner. This eliminates wasteful movement to reduce the tact time.

Registry of job for rotating external axis 100 turns



When using external axis endless function



Rotation reset → `MOVJ VJ=25.00 MTE=100`  
`MRESET ST (100 turns)`

3. Product quality can be improved.  
Rotating the positioner axis while painting the work piece allows the paint to be uniformly and evenly applied.

## Necessary equipment

Hardware

Software

Nothing

EXTERNAL AXIS ENDLESS FUNCTION

## Related document

DX100 OPTIONS INSTRUCTIONS FOR EXTERNAL AXIS ENDLESS FUNCTION (HW0485391)



# Coordinated function

## Overview and Merits

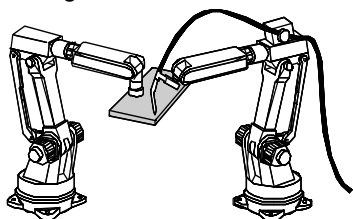
A maximum of 4 units can be controlled by one controller in the NX controller, whereas a maximum of 8 robots and plural stations (jigs) can be controlled in the DX controller.

The "coordinated control function" controls the relative interpolation operation and the relative speed between two robots or between the robot and jig.

The following systems can be constructed using the coordinated function.

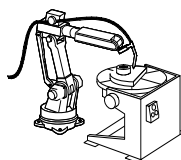
### A. Jigless coordinated system

System in which the welding robot and handling robot are coordinated.



### B. Station coordinated system

System in which the robot and station are coordinated.



For applicable coordinated systems, the number of axes and groups to be simultaneously controlled are limited to 72 axes (36 axes for NX) and 32 axes (16 groups for NX). Group refers to one unit of the robot or jig (station).

(Independent of the number of axes.)

		Number of groups				Number of axes			
Robot	6-axis	1	1	1	...	2	2	3	4
		6	6	6	...	12	12	18	24
Station	1-axis	7	0	4	...	6	0	3	4
	2-axis	0	6	12	...	0	6	12	4
total		8	7	8	...	8	6	8	10
		13	18	16	...	18	24	25	32

32 groups or less

72 axes or less

For instance, a system that meets the above condition can be constructed. A system with traverse axis is also applicable.

### <Merits>

- Improved welding quality + reduced tact time when changing the jig posture (for welding application). Because the counterpart of the welding robot is the freely movable robot or jig, the operation with the coordinated operation is possible. Therefore, optimal posture can be taken.
- Reduced work for wiring and I/O check  
Because two robots are controlled by one controller, the interlock signal is not required. As a result, the system is easy to setup.
- Easy security for teaching when using two robots  
Because the spherical interference area can be set in reference to the tip of the robot tool, the interference between robots is automatically checked. Another function is also available to turn OFF the servo power of an unused robot during teaching. (Unused robot servo power OFF function, optional)
- Capable of smartly constructing programs using coordinated/independent functions. Because of the capability to work with the independent control function, the job configurations as shown below are available. Therefore, the following advantages can be achieved.

#### A. Reduced tact time

Because two robots can operate independently and asynchronously, each of them can perform completely different operation.

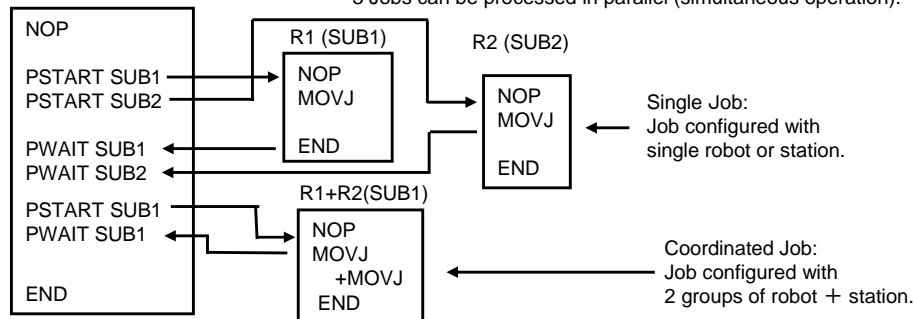
#### B. Reduced waiting time of robot

When performing complicated calculations, etc., the robot's waiting time for calculations is not required because the calculation job can be processed in parallel with the robot operation job.

\*A maximum-scaled groups for one job: 4 robots, 4 bases, 4 stations

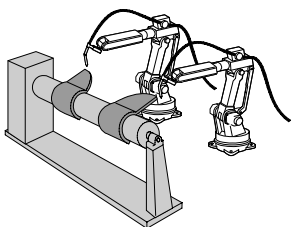
<Job Configuration Example>

3 Jobs can be processed in parallel (simultaneous operation).



### C. Station coordinated system

System in which two robots simultaneously coordinate to 1-axis station.



## Necessary equipment

Hardware

Software

Additional box

INDEPENDENT/COORDINATED CONTROL FUNCTION

## Related document

DX100 OPTIONS INSTRUCTIONS FOR INDEPENDENT/COORDINATED CONTROL FUNCTION (RE-CKI-A454)

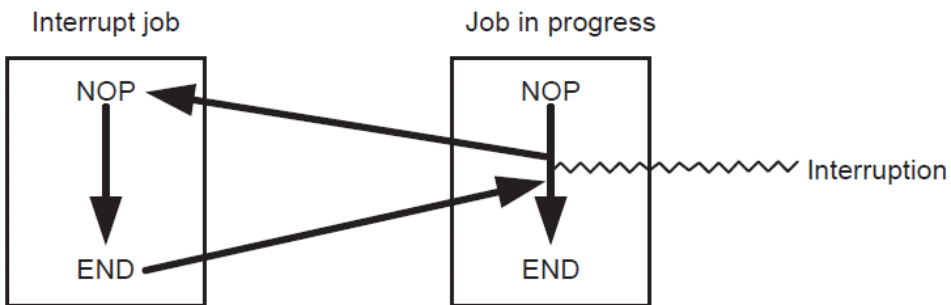


# Interrupt job function

## Overview and Merits

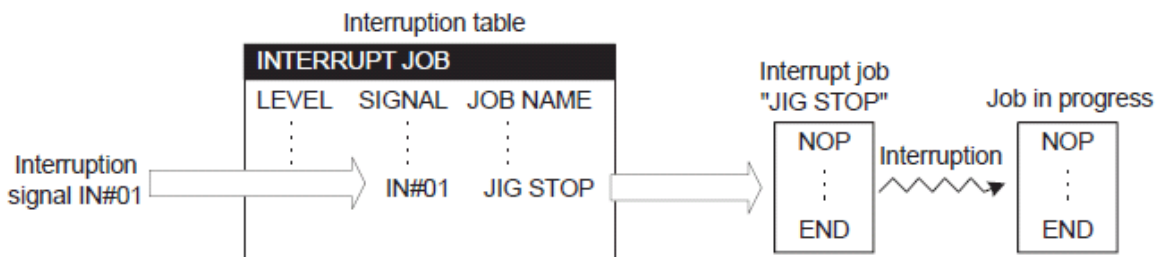
### <Overview>

The interrupt job function, a kind of job call, aborts the running job by the interrupt signal from peripheral device or other systems, and temporally executes the job corresponding to the interrupt signal.



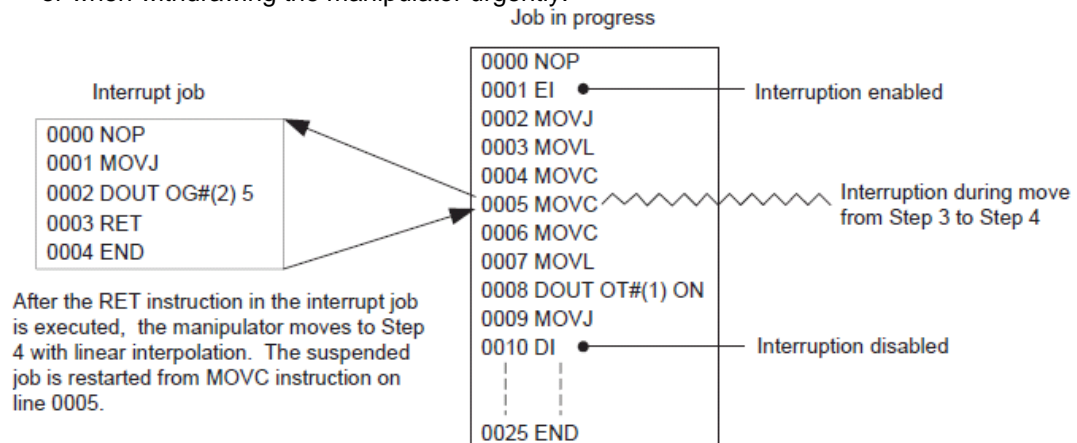
The table in which the relationship among interrupt levels (priority of interrupt signals), interrupt signals, and interrupt jobs are set is called the interrupt table.

When the general input signal set in the interrupt table is input, the interrupt job corresponding to the signal is called. After the interrupt job is processed, the original job is restored, and the instruction is executed from the point where the cursor was located at the time of the interrupt.

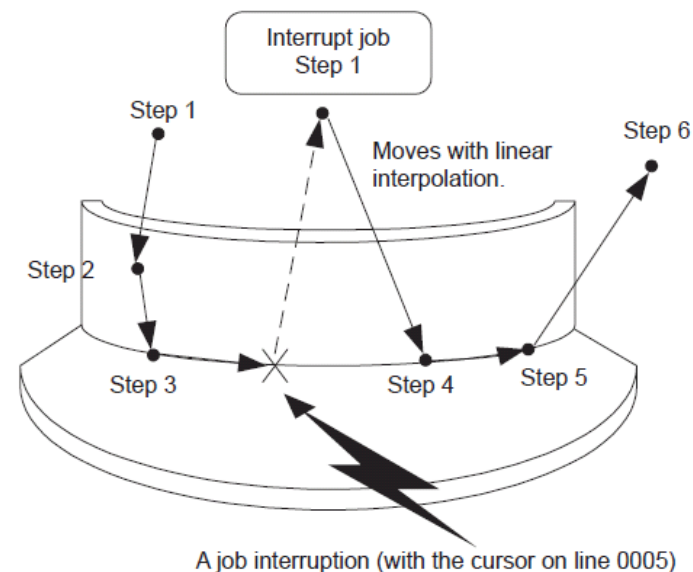


### <Merits>

Effective for cases such as failures in peripheral device or other systems, or when withdrawing the manipulator urgently.



After the RET instruction in the interrupt job is executed, the manipulator moves to Step 4 with linear interpolation. The suspended job is restarted from MOVC instruction on line 0005.



## Necessary equipment

Hardware

Nothing

Software

INTERRUPT JOB FUNCTION

## Related document

DX100 OPTIONS INSTRUCTIONS FOR THE INTERRUPT JOB FUNCTION (HW0486049)



# Basic operation of starting point detecting function

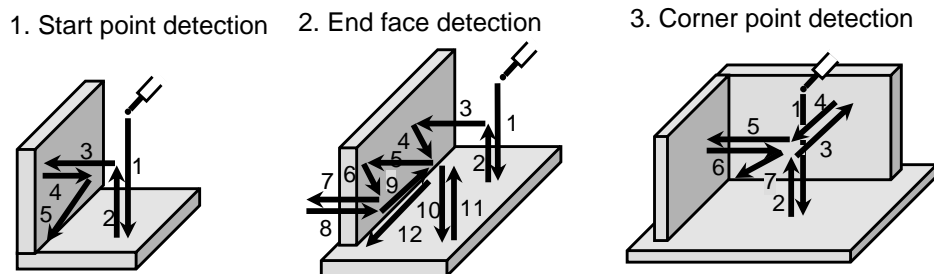
## Overview and Merits

### <Overview>

The "Starting Point Detecting Function" detects the deviation amount of taught points (start point, middle point, and end point, etc.) and compensates (shifts) each weld line even if there is a deviation in the taught weld line when welding the work piece. This function is used by connecting the starting point detection unit that operates according to the principle that applying a voltage between the welding wire supplied to the welding torch and the welding member (base metal) will decrease the voltage. This function is suitable when there is a variation in work piece accuracy or when the welding start point is deviated because of work piece setting variation, etc. A functional overview is described below.

### <Start Point Detection Operation>

The following patterns of start point detection are available.



Point 5 is calculated from positions of points 2 and 3.

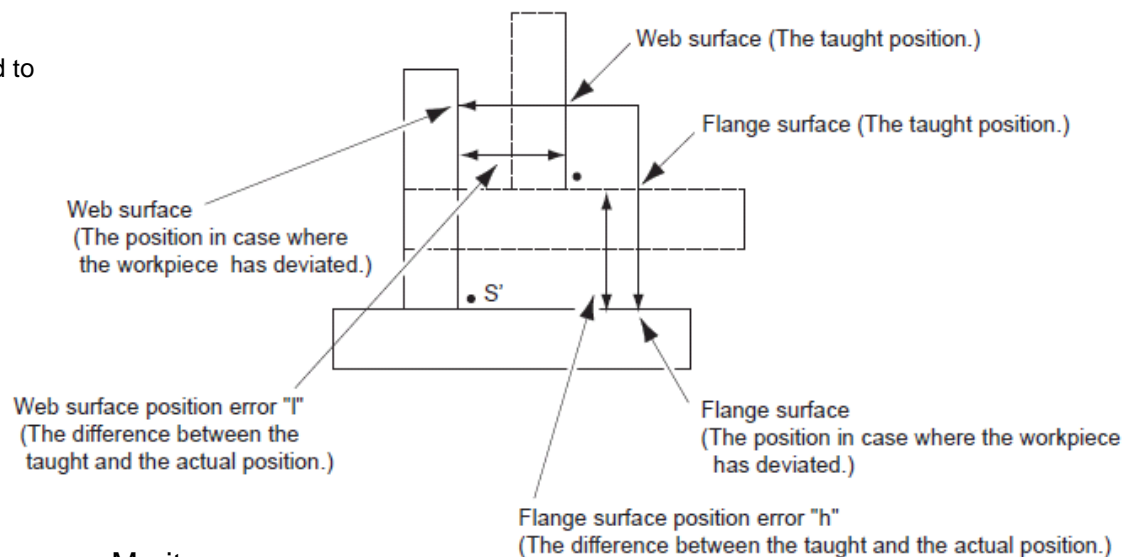
Go to the detection face and go in the opposite away direction and end face is detected when going past the length of a distance to the detection face+ thickness. The start point 12 is calculated from the end face.

Corner point 7 is calculated from wall positions 1, 3, and 5.

In addition to the above, detection patterns are available such as inner diameter center of circle detection, external diameter center of circle detection, and inner diameter center of circle detection (with height compensation). Also, other detection patterns can be created by INFORM in reference to the above patterns.

### <How to Determine Welding Start Point Information>

The right figure shows that the welding start point S' is determined by using the position deviation amount (F, W) of the flange face/web face.



### <Merits>

- 1. Deviation of the welding start point is automatically detected.**  
When the welding start point is deviated because of the variation of the work piece itself and the deviation in setting the work piece to the jig, the robot automatically detects the welding start point and starts welding.
- 2. Detection time for the welding start point is more reduced:**  
**The same specification as NX100**  
Using the high-speed starting point detecting function allows rapid detection. Approximately 5.7 times faster than the standard function (0.8m/min in standard start point detecting ⇒ 4.5m/min in high-speed start point detecting)  
\*High-speed start point detecting is applied to the specific models of robots. For applicable models, contact YASKAWA.

## Necessary equipment

### Hardware

MOTOWELD: Add the starting point detecting function to the welding source  
Products except MOTOWELD: Starting point detecting unit

### Software

SEARCH FUNCTION  
Concurrent I/O function  
Application job

## Related document

DX100 OPTIONS INSTRUCTIONS FOR BASIC OPERATION OF STARTING POINT DETECTING FUNCTION (in preparation)



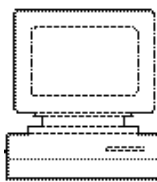
# Teaching point adjustment function

## Overview and Merits

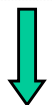
### <Overview>

The "teaching point adjustment function" modifies the taught position data by entering the numeric number on the programming pendant without operating the manipulator.

This function allows simplified offline teaching with CAD data or others, and allows fine adjustment of position data in any coordinate system without operating the manipulator.



Check the position data with offline software.



Correct teaching by entering numeric values on programming pendant.



Robot does not operate.



### <Merits>

Teaching modification time is significantly reduced.

It is not required to operate the robot in the teaching modification because position modification is performed by entering numeric values on the programming pendant.

### <Operating Method>

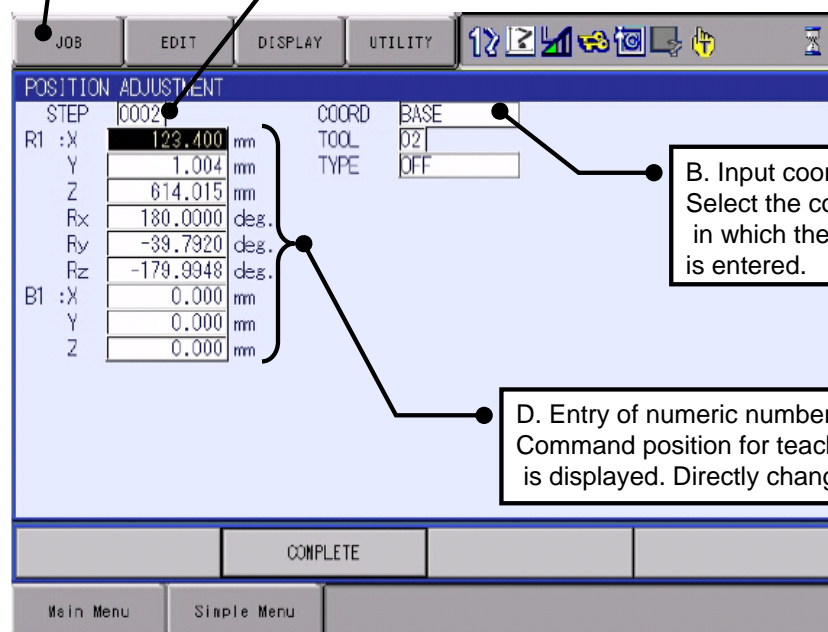
Position can be easily corrected in the following window.

A. Display of operation window  
Select the job with teaching points to be modified and select "POSITION ADJUSTMENT" from "UTILITY" to display the operation window.

C. Step number  
Set the step number to be modified.

B. Input coordinate  
Select the coordinate system in which the numeric number is entered.

D. Entry of numeric number  
Command position for teaching position is displayed. Directly change the values.



## Necessary equipment

Hardware

Nothing

Software

TEACHING POINT ADJUSTMENT FUNCTION

## Related document

DX100 OPTIONS INSTRUCTIONS FOR TEACHING POINT ADJUSTMENT FUNCTION WITH PROGRAMMING PENDANT (HW0485569)



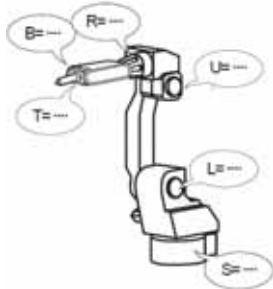
# Relative job function

## Overview and Merits

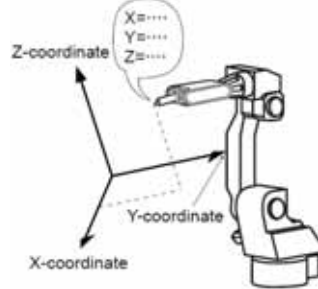
### <Overview>

The robot usually stores position data for operation in the form of pulse-type data (motor rotation pulse amount of each axis). The job (program) consisting of the pulse-type data is called standard job. In contrast to the standard job, the job consisting of position data in the direction of X, Y, and Z, in reference to the origin in a coordinate system (such as base coordinate and user coordinate) is called relative job. The relative job is created by converting the standard job. Those two jobs are shown in the figure below.

<Standard job>  
(Pulse type position data)

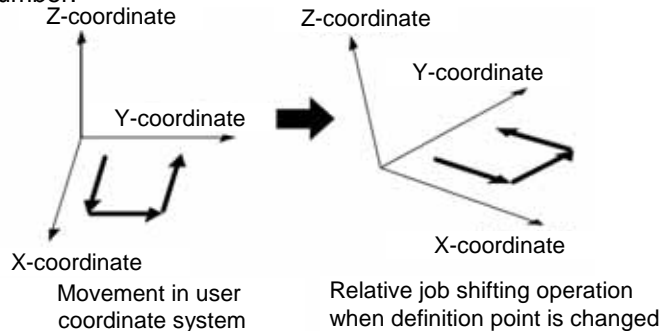


<Relative job>  
(XYZ-type position data)



### <Relative Job Shift Function>

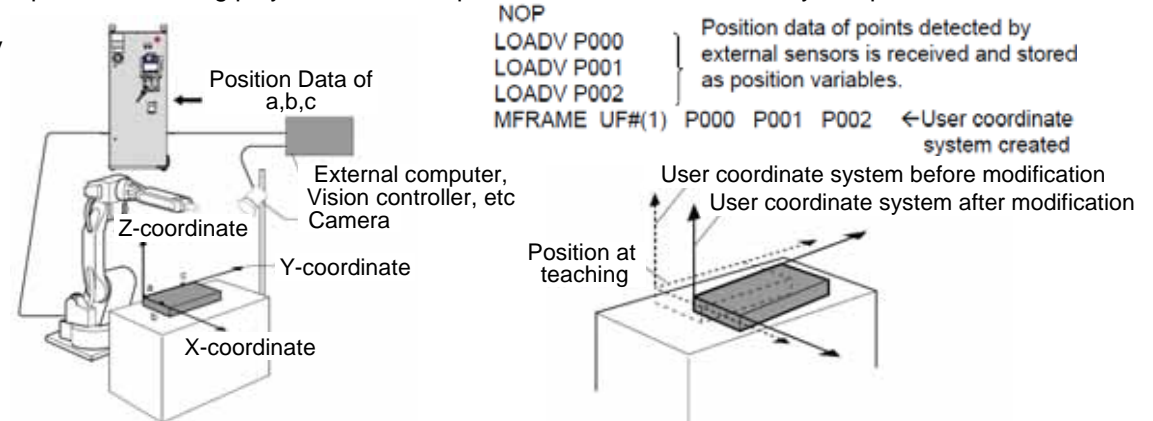
Although movement of the relative job itself is no different from the standard job, the relative job has a useful function called "relative job shift" to shift the same movement in another coordinate as shown in the figure below. In the relative job in the user coordinate system, when a user coordinate is created by changing defined points (coordinate origin, X-axis line, and 3 points on XY plane) that constitute the used user coordinate system, the movement shifted to the changed coordinate can be performed in the execution of the instruction. Also, 63 coordinates can be set as user coordinates, and the movement in alignment with the specified coordinate system can be performed by specifying the set user coordinate number.



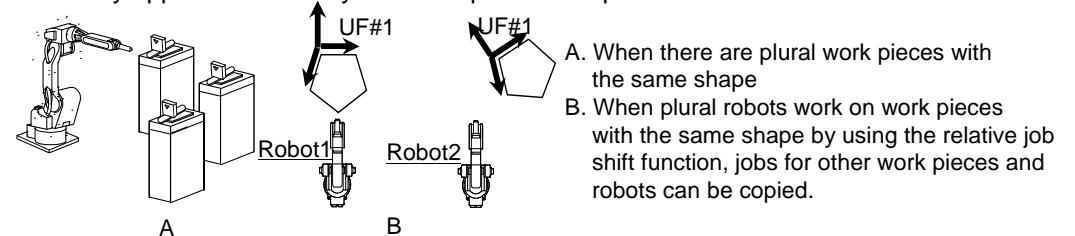
### <Merits>

#### 1. Work piece deviation can be automatically compensated.

When the work piece setting position is deviated, the user coordinate is recreated using position deviation data of 3 defined points (a, b, c) detected by the sensor or others, and the job can be executed in the created user coordinate system. Because this process can be automatically performed during playback, the work piece deviation is automatically compensated.



#### 2. Instantly applicable to the system with plural work pieces and robots.



#### 3. Robot replacement and job copy can be easily performed.

Because the job is XYZ data, the data can be read regardless of the model. Therefore, if the work piece is not changed in replacing the robot, the job need not be taught again, which reduces the working time for replacement. If the same work is processed, the job can be copied to plural robots. Note, however, that the following restrictions are applied.

#### Restrictions

1. Robot models are ERC, ERC II, MRC, XRC, NX100, DX100 → DX100 (nonreversible).
2. Both of the robots to be replaced and the DX100 must be equipped with the relative job function.
3. For ERC, ERC II → MRC, XRC, NX100 and DX100, the job conversion must be performed with MotoSim after the relative job conversion in ERC, ERC II.
4. Only applied to 6-axis standard robot. (Special robot must be under consideration.)
5. Large-sized robot → Small-sized robot is not applicable (because of a problem of the operating area).
6. Some teaching modifications are required.

## Necessary equipment

Hardware

Nothing

Software

RELATIVE JOB FUNCTION

## Related document

DX100 RELATIVE JOB FUNCTION (HW0482494)

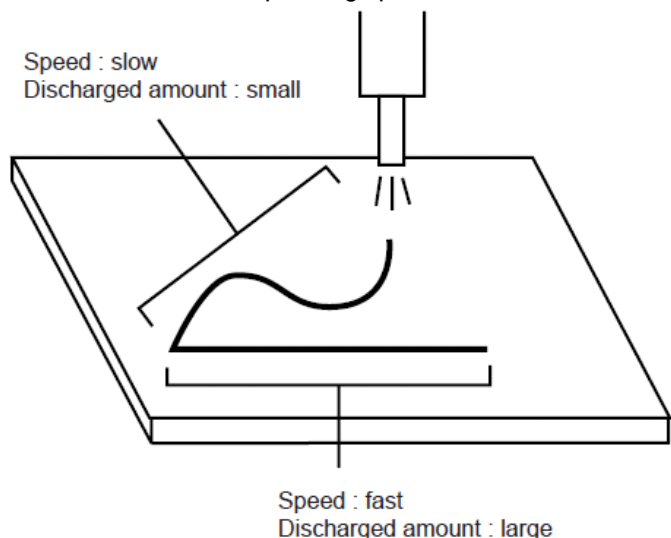


# Analog output function corresponding to speed

## Overview and Merits

### <Overview>

The “analog output function corresponding to speed” automatically changes the analog output value depending on the variation of the manipulator operating speed. This function eliminates the need for setting the analog output value again depending on the variation of the operating speed, which reduces the teaching work for the job.



<Application>  
Sealing, paint, etc.

Paint volume increases as working speed becomes higher, and the former decreases as the latter becomes lower. Paint volume is maintained at a constant amount depending on the operating speed.

### <Merits>

1. Teaching work is reduced.  
It is possible to save labor for setting the paint volume depending on working speed, which allows teaching work to be more efficient.
2. Clear paint path can be draw.  
Maintaining paint volume at a constant value allows drawing of a clear paint path.

### <Example of Output Characteristics>

Instructions of analog output function corresponding to speed include ARATION instruction and ARATIOF instruction. (Valid during the operation of circular interpolation, linear interpolation, and spline interpolation. Executed in playback and next operation and not executed in axis operation.)

```
ARATION AO#(1) BV=10.00 V=200.0 OFV=2.00
```

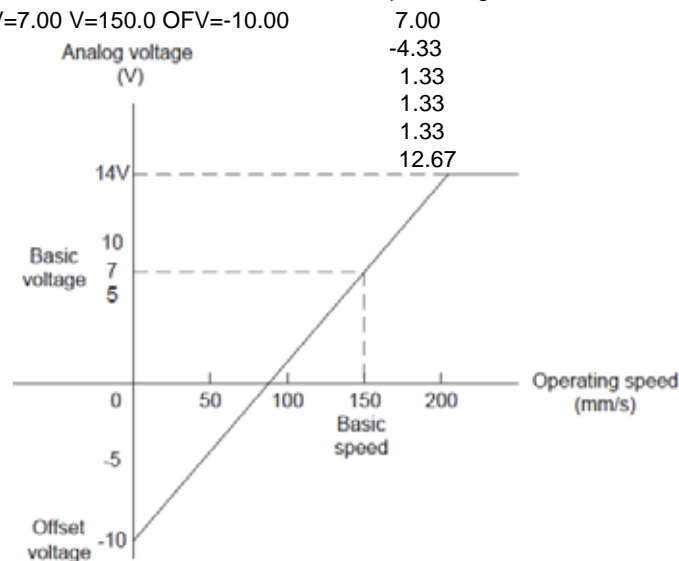
A B C D

- A. Output port number  
General output port on which analog output function corresponding to speed is performed.  
Setting range: 1 to 40
- B. Basic voltage  
A voltage output at a speed set as basic speed.
- C. Basic speed  
Basic motion speed when outputting the setting voltage.
- D. Offset voltage  
Analog voltage at a operating speed of 0.

### <Example of output characteristics>

```
MOVJ VJ=50.00
ARATION AO#(1) BV=7.00 V=150.0 OFV=-10.00
MOVL V=50.0
MOVC V=100.0
MOVC V=100.0
MOVL V=200.0
```

<Output voltage>



## Necessary equipment

### Hardware

Analog output extension board (JANCD-YEW01-E)  
Internal connection cables, External connection cables

### Software

Standard function

## Related document

DX100 OPTIONS INSTRUCTIONS FOR ANALOG OUTPUT FUNCTION  
CORRESPONDING TO SPEED (HW0485867)



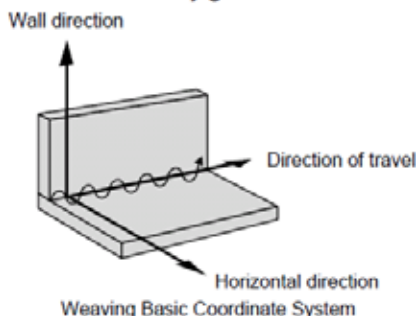
# Pause weaving function

## Overview and Merits

### <Overview>

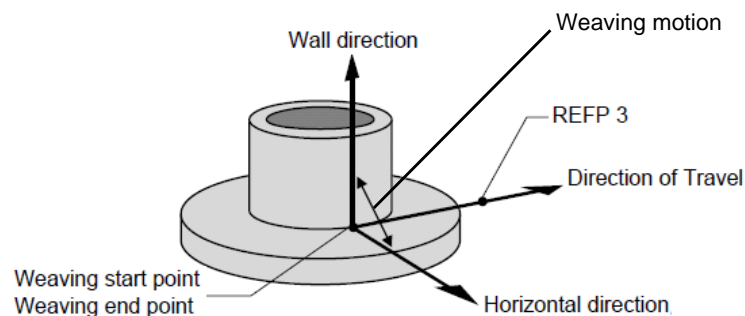
The "pause weaving function" performs only weaving (swing operation) at the same point without moving the robot. For welding application, this function is applied to the case for performing circumferential welding of circular work piece.

Weaving is performed based on the following coordinate system. This coordinate system is automatically generated when weaving is executed.



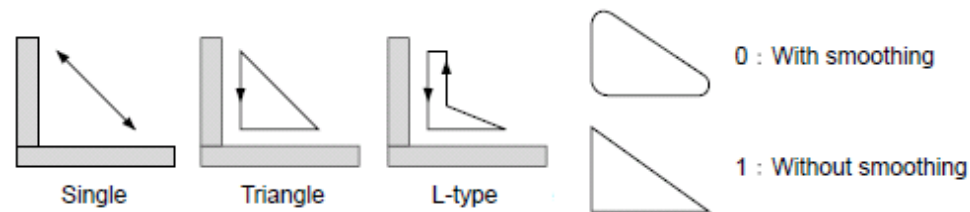
- Wall Direction: Z-direction of the robot axis
- Horizontal Direction: The direction to the approach point from the wall
- Direction of Travel: The direction in which the manipulator moves from the weaving start point to the end point

However, the above advanced direction is not determined and the coordinate system is not determined because pause weaving performs the weaving operation at the same point. Therefore, when using pause weaving, the reference point (REFP3) must be registered to determine the advanced direction.



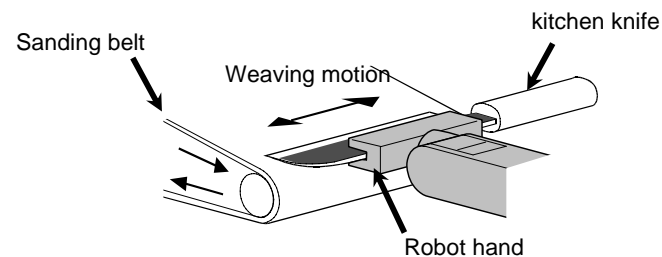
### <Weaving Type>

The following three types of weaving are available, and the optimum weaving pattern can be selected depending on the application. In either pattern, with or without smoothing can be set.



### <Merits>

1. Welding quality is improved. Welding at optimum posture is possible because the torch (robot side) performs the weaving operation at the same point with the workpiece (jig side) operated, which improves welding quality.
2. For a circular work piece, circumferential continuous welding can be easily performed. Only the jig side is operated during welding because the torch side performs the weaving operation at the same Point. For a circular work piece, circumferential continuous welding can be performed without stopping the welding bead.
3. Applicable usage can support various needs. In addition to welding, this function can be applied to a wide range of applications such as the grinding process with grinding machine. The following figure shows an example.



## Necessary equipment

Hardware	Software
Nothing	Pause weaving function

## Related document

DX100 OPERATOR'S MANUAL FOR ARC WELDING (RE-CSO-A038)





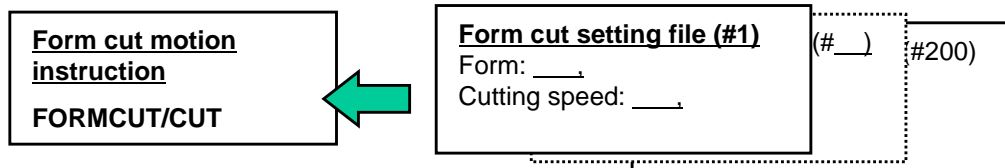
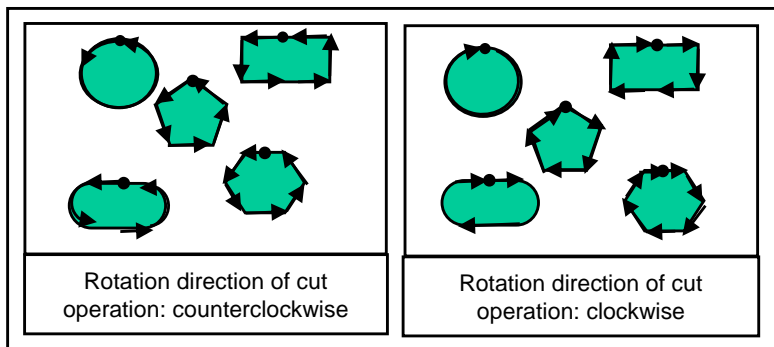
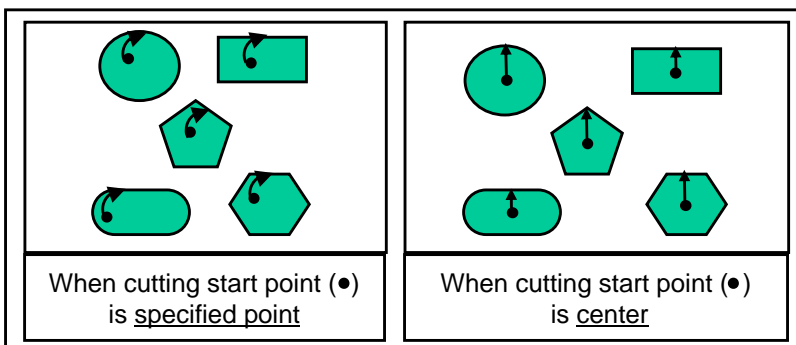
# Form cutting function

## Overview and Merits

### <Overview>

The form cutting function operates the robot in the specified form by executing one dedicated instruction ("FORMCUT"/ "CUT" instruction) according to the condition set in the form cut setting file. This function can be used in the work for cutting the work piece to a form using the laser cutter or others gripped by the manipulator.

Forms applicable to fixed form cut are circle, rectangle, ellipse, pentagon, and hexagon.



### <Merits>

1. Teaching time can be reduced.  
When operating the robot in the specified form by using the normal move instruction, more than one taught position must be registered. This function allows operation in the specified form only by registering one taught position using form cut motion instruction ("FORMCUT"/"CUT" instruction), which can significantly reduce the teaching time.  
Also, only setting a file allows easy change of the form.
2. Path accuracy is improved.  
Because form cut motion applies the dedicated operation control along the operation form, the accuracy of the operation path is improved than when using the normal move instruction.

## Necessary equipment

- |  |   |
|--|---|
| <p><b>Hardware</b></p> <p>For small circle processing equipment:<br/>Model with small circle processing equipment.</p> | <p><b>Software</b></p> <p>FORM CUTTING FUNCTION</p> |
|--|---|

## Related document

DX100 OPTIONS INSTRUCTIONS FORM CUTTING FUNCTION (HW0485368)



# Independent control function

## Overview and Merits

### <Overview>

DX controller can control a maximum of 8 robots and plural stations (jig) through one controller.

The “independent control function” allows two robots or the robot and jig to operate independently with different programs.

The DX controller has a function for decoding and executing a maximum of 4 jobs (extendable up to 8 jobs (optional)) individually. The multitask control performed in this function is called independent control.

For instance, a two-robot system can be constructed that consists of one welding robot welding the work piece and the other robot transferring unwelded work pieces and welded work pieces.

The system can be freely combined with applications for not only Welding + Handling but Spot Welding + Handling, Handling + Handling, and others. (The key sheets are available on the basis of order production.)

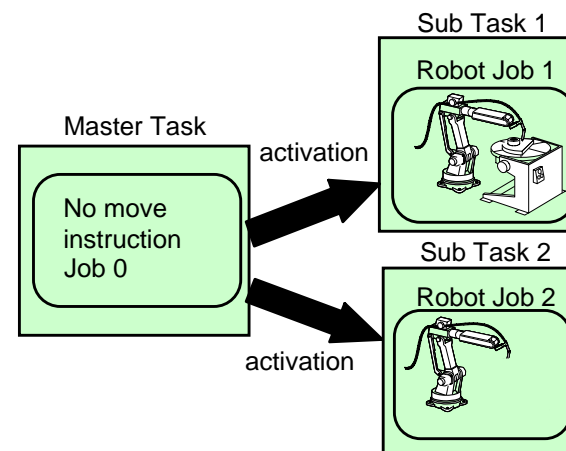
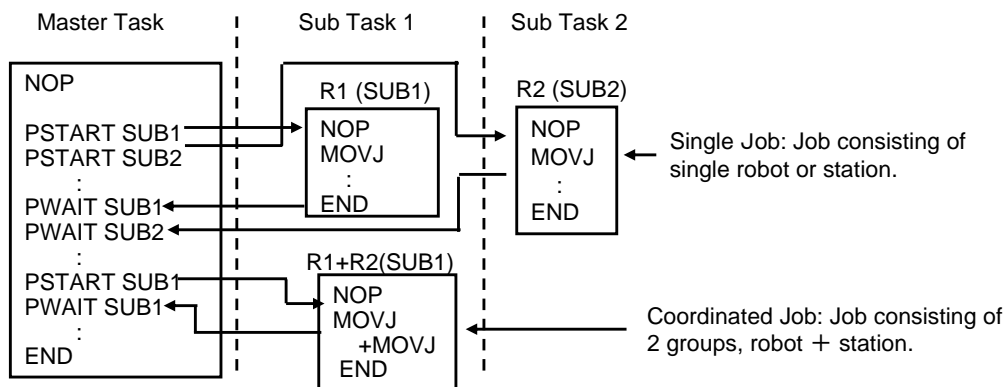
Also, independent operation of the robot and station (external jig) can be performed. As an external axis motor, however, the motor for YASKAWA robot must be used.

### <Merits>

1. Reduced tact time  
Because 8 robots can operate independently and asynchronously, each of them can perform completely different operations in parallel.
2. Reduced work for wiring and I/O check  
Because a maximum of 8 robots are controlled by only one controller, the interlock signal is not required. As a result, the system is easy to setup.
3. Reduced retooling (work piece set) time  
For plural stations (jigs), work pieces can be set in the jigs that are not operated when the other jig and robot are operating.
4. Reduced waiting time of robot  
When performing complicated calculations, etc., the robot’s waiting time for calculations is not required because the calculation job can be processed in parallel with the robot operation job.
5. Capable of smartly constructing programs using coordinated/independent functions Job configuration can be simplified. (Refer to the following figure.)

### <Job configuration example>

**3 Jobs can be processed in parallel (simultaneous operation).**



## Necessary equipment

Hardware

Additional box

Software

INDEPENDENT/COORDINATED CONTROL FUNCTION

## Related document

DX100 OPTIONS INSTRUCTIONS FOR INDEPENDENT/COORDINATED CONTROL FUNCTION (RE-CKI-A454)

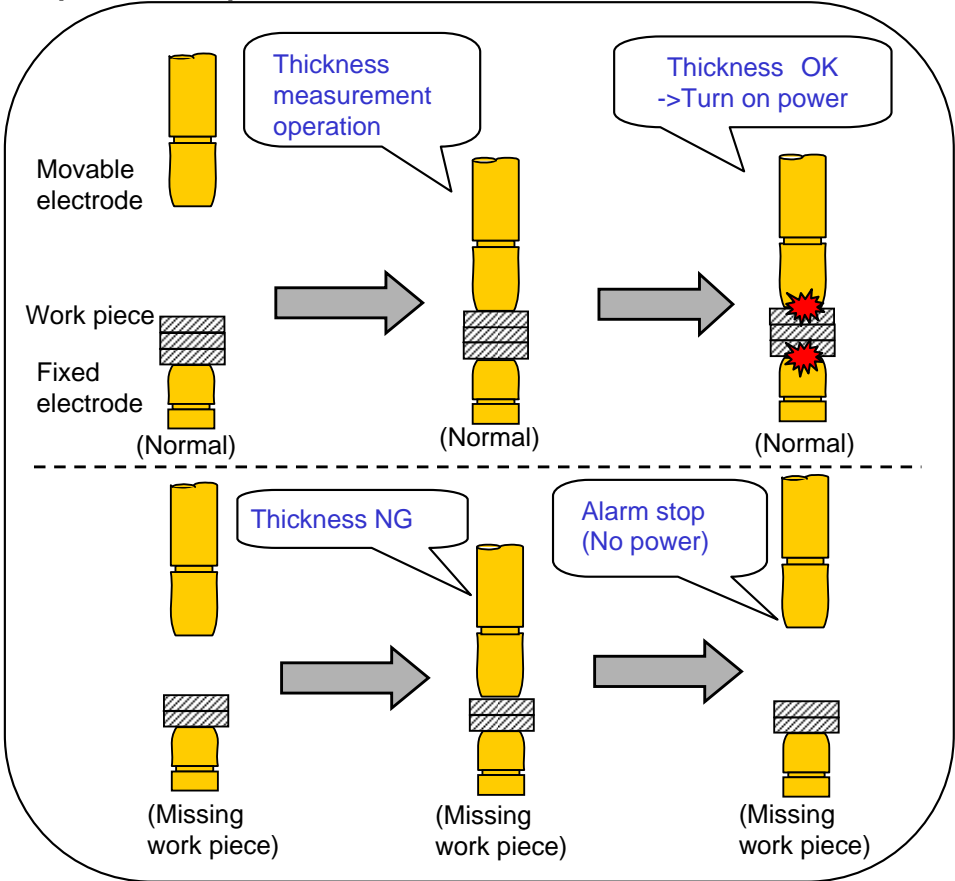


# Work piece thickness detection function

## Overview and Merits

“Motor gun allows detection of not only whether a work piece is present but whether the number or combination of work pieces is incorrect!”

1. Construction of sensor-less spot welding facility.
2. There is no possibility that an incorrect set work piece is welded, which improves the work piece quality and poses no useless work.



**Adding the following items allows the monitoring of thickness!**

SVSPOT GUN#(1)      TH=2.0      THM=1.0  
 Thickness (mm)    Allowable range (mm)

## Necessary equipment

- |          |  |
|----------|--|
| Hardware | Software                               |
| Nothing  | WORKPIECE THICKNESS DETECTION FUNCTION |

## Related document

NX100 OPTIONS INSTRUCTIONS FOR WORKPIECE THICKNESS DETECTION (in preparation)



# Sensor function

## Overview and Merits

### <Overview>

The sensor function corrects the robot path and speed, measures the distance, and detects the position by using the displacement sensor, torque sensor, and others.

The analog signals output from the sensors are connected to the robot controller, and various controls are performed according to the input signals. The sensor function includes the following various control capabilities.

### <Useful Various Functions>

#### Real-time path correction operation function

In the playback operation of the robot, the path can be corrected according to the sensor signals in real time.\*1

Usually, the robot operates along the taught path. However, if the robot still operates along the path for a deformed or positionally deviating work piece, the operation may not be operated appropriately. This function, in this case, can detect the deformation and position deviation of the work piece and correct the robot path in real time.

The correction coordinates for determining the correction direction are available in the following three types.

- A. Direction of tool coordinate axis
- B. Any direction \*2
- C. Advanced direction

Also, during real-time correction of the path, this function monitors whether the sensor signal exceeds the upper or lower limit of the threshold value to prevent the robot from dramatically deviating from the path.

Should the limit be exceeded, the operation is performed under the operating condition set in the sensor monitoring condition file.

\*1 Combination with the external reference point control and coordinated operation is not allowed.

\*2 Combination with the weaving operation is not allowed.

#### Real-time speed correction function

In the playback operation of the robot, the speed can be corrected according to the sensor signals in real time.

Usually, the robot operates according to the speed specified in the job. If the operating time varies depending on individual difference of work pieces, using this function allows the detection of operation proceeding and allows the robot to operate at an appropriate speed.

### <Merits>

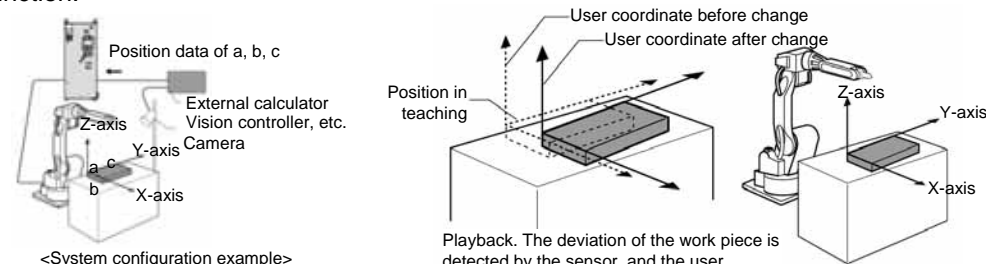
Direct connection of signals from the sensor to the robot controller eliminates the need for an external sequencer or others, which enables easy construction of the system.

Additionally, the delay from the sensor signals can be reduced.

#### Shift value creation function

The distance to the target work piece can be calculated by using the input signal from the displacement sensor.

Measurement of plural positions allows the 3D shift using the relative job conversion function.



<System configuration example>

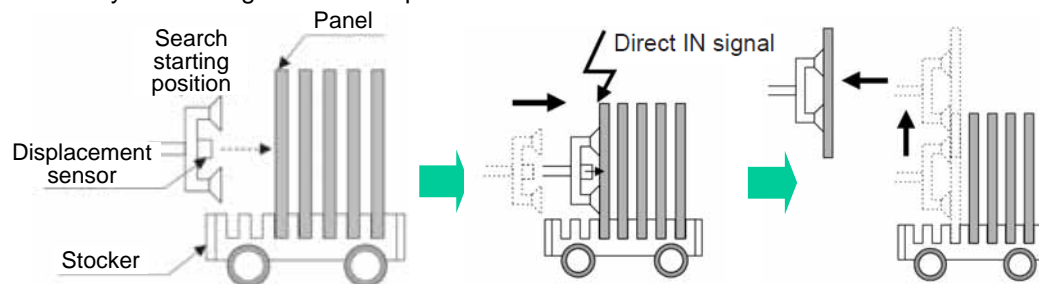
Playback. The deviation of the work piece is detected by the sensor, and the user coordinate with the deviation shifted is created. The processed job of the work piece is executed in the created user coordinate.

#### Search function

The robot operates while monitoring the input signal from the sensor, and stops when the input signal reaches the specified level.

The robot can be stopped when the operation is completed by monitoring the completion of the robot operation by the sensor.

### <System configuration example>



## Necessary equipment

Hardware

YCP02 board

Software

SEBSOR FUNCTION

## Related document

DX100 OPTIONS INSTRUCTION FOR SENSOR FUNCTION (HW0485819)

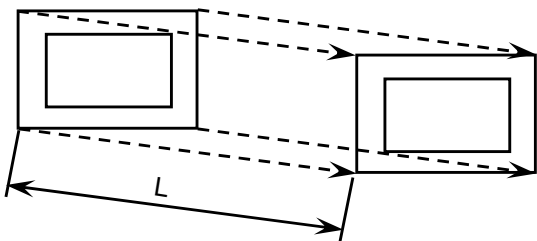


# Parallel shift function

## Overview and Merits

### <Overview>

The "parallel shift function" shifts each point of the target the same distance when the target shifts (moves) from a preset position as shown in the figure below.



In the left figure, the value of distance L is defined as "shift value".  
(in effect 3-dimensional coordinate displacement:  $\Delta X, \Delta Y, \Delta Z$ )

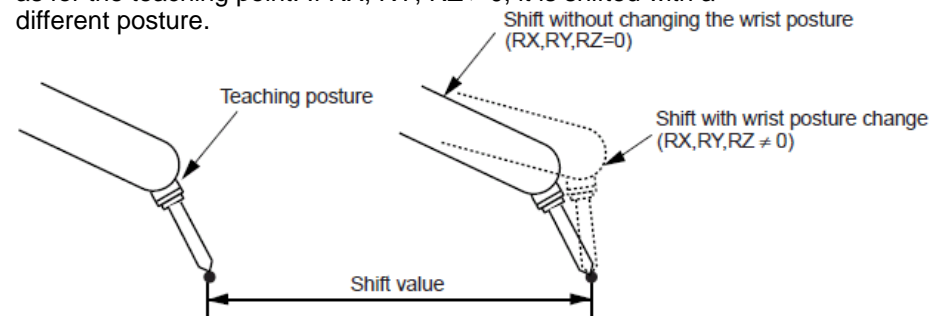
### <Coordinate System>

The shift value of parallel shift corresponds to incremental values of X, Y, and Z in each coordinate system. The coordinate system is available in the following 4 types.

**\*Base coordinate, robot coordinate, tool coordinate, and user coordinate**  
Parallel shift function can be used in each of the above coordinate systems.

### <Wrist Posture>

Wrist posture is defined by the angle displacement in the coordinate of wrist axis. Therefore, if the shift value is specified only by X, Y, and Z ( $RX, RY, RZ=0$ ), the wrist is shifted with its posture the same as for the teaching point. If  $RX, RY, RZ \neq 0$ , it is shifted with a different posture.

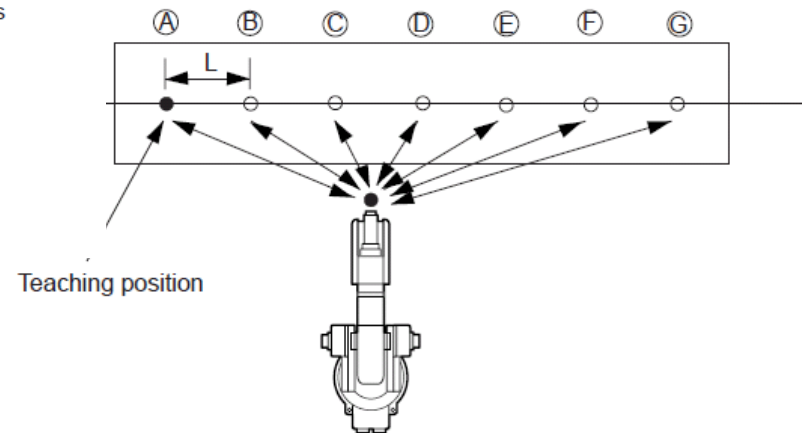
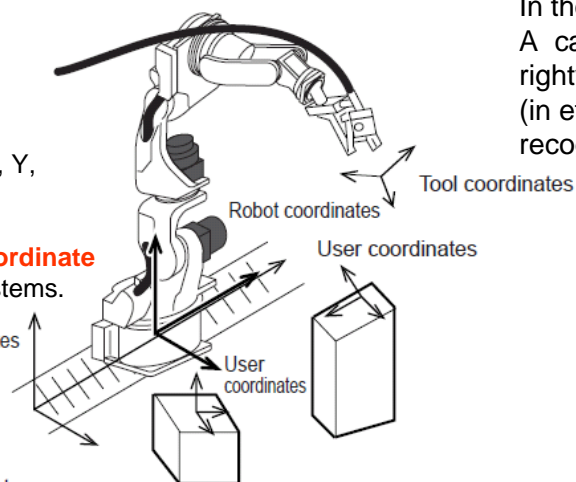


### <Merits>

The teaching time can be reduced by using this function for the case where teaching points and work pieces are located at the same distance.

### <Use Example>

In the following figure, the operation taught at position A can also be performed at positions B to G by shifting rightward the taught position A at a distance of L (in effect 3-dimensional X, Y, Z displacement that can be recognized by the robot).



## Necessary equipment

Hardware

Nothing

Software

Standard function

## Related document

- DX100 OPERATOR'S MANUAL FOR MATERIAL HANDLING, PRESS TENDING, CUTTING, AND OTHER APPLICATIONS (RE-CSO-A037)
- DX100 OPERATOR'S MANUAL FOR ARC WELDING (RE-CSO-A038)
- DX100 OPERATOR'S MANUAL FOR SPOT WELDING USING MOTOR GUN (RE-CSO-A040)
- DX100 OPERATOR'S MANUAL FOR SPOT WELDING USING AIR GUN (RE-CSO-A041)

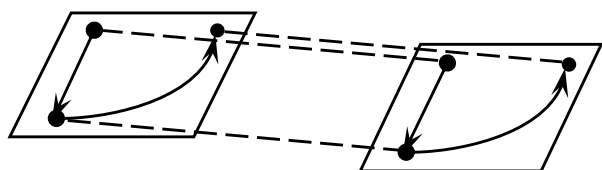


# Parallel shift job conversion function

## Overview and Merits

### <Overview>

If there is a deviation in the position of the robot or workbench, the “parallel shift job conversion function” recreates the job by shifting all or some steps of the job by the same deviation value in order to reduce time. Parallel shift job conversion allows all steps of the job or specified section to be shifted by the same deviation value.



### <Merits>

Easy and accurate correction of position data eliminates the need for the teaching correction, which quickly restores the production line after a problem occurs.

### <Job to be converted>

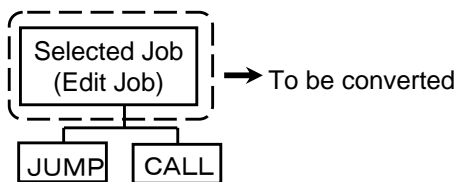
A job to be converted is selected according to either of the following two methods.

#### A. Single job conversion

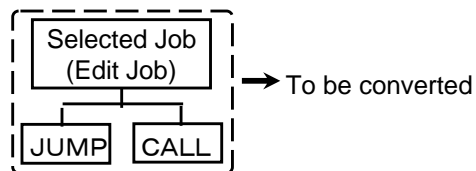
Out of the selected jobs, only the edit job is converted, and the related jobs called by JUMP and CALL instructions are not converted.

#### B. Related job conversion

The related jobs are converted together.



Related Jobs are not converted



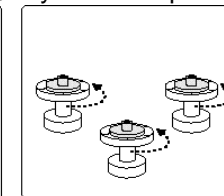
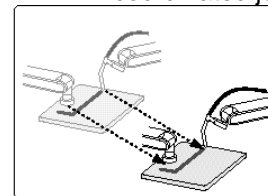
### <Conversion of coordinated Job>

For the coordinated job in two manipulators or related jobs in the system with plural stations, either of the following types can be selected.

1. Common shift: Converted using the same shift value for all manipulators (or all bases or stations).
2. Individual shift: Converted using different shift value for each manipulator (or each base or station).

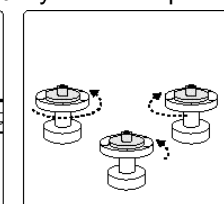
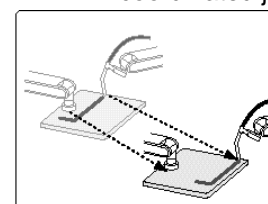
Common shift: Converted using the same shift value.

R1 + R2 coordinated job System with plural station axes



Individual shift: Converted using different shift value for each unit

R1 + R2 coordinated job System with plural station axes



### <Coordinate System>

For parallel shift job conversion, be sure to specify the coordinate system in which the conversion is performed. The coordinate system is selected from the following types.

\*Base coordinate, robot coordinate, tool coordinate, user coordinate (63 pieces), master tool coordinate(R\* + R\* job only), pulse coordinate

## Necessary equipment

Hardware

Software

Nothing

Standard function

## Related document

- DX100 OPERATOR'S MANUAL FOR MATERIAL HANDLING, PRESS TENDING, CUTTING, AND OTHER APPLICATIONS (RE-CSO-A037)
- DX100 OPERATOR'S MANUAL FOR ARC WELDING(RE-CSO-A038)
- DX100 OPERATOR'S MANUAL FOR SPOT WELDING USING MOTOR GUN(RE-CSO-A040)
- DX100 OPERATOR'S MANUAL FOR SPOT WELDING USING AIR GUN(RE-CSO-A041)



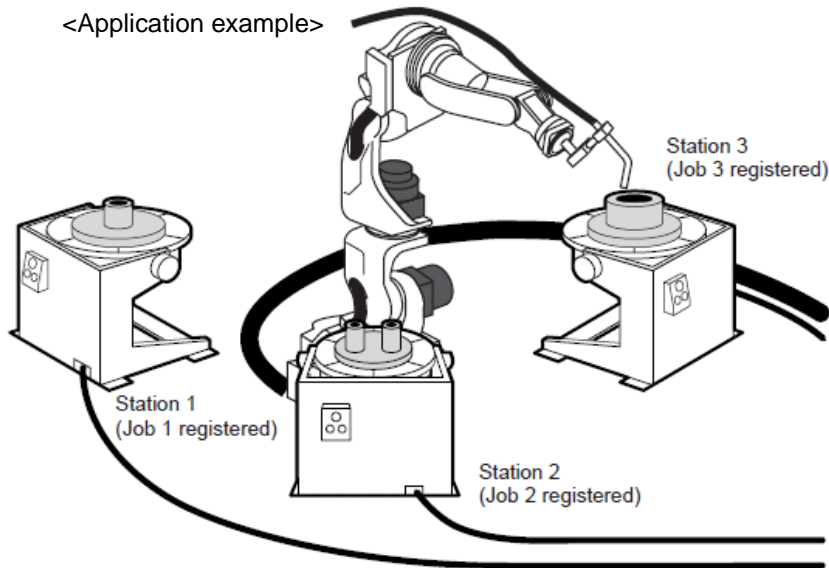
# Playback with reserved start function

## Overview and Merits

### <Overview>

The "reserved start" starts the job registered for each station in the reserved order by the start button on the station

### <Application example>



When different work piece is processed in each of 3 stations:

1. For Station 1, job 1 processing the work piece 1 is registered.
2. For Station 2, job 2 processing the work piece 2 is registered.
3. For Station 3, job 3 processing the work piece 3 is registered.

In the playback, when the start button of Station 1 is pressed after the work piece 1 is prepared, the manipulator executes job 1. During the execution of job 1, the work piece 2 and work piece 3 are prepared, and then the start buttons of Station 2 and Station 3 are pressed in sequence. At that time, even if job 1 is still be executed, the works are reserved in the order that the start button is pressed earlier, and then jobs are executed in the reserved order. In the playback the reservation status, etc. can be viewed in the work reservation window.

### <Merits>

1. Job creation work is significantly reduced.  
Works can be easily reserved for each station just by registering I/O signals of each station and registering jobs to be executed in the reserved order, which will significantly reduce the job creation work.
2. The reservation status can be checked during the playback.

Registering I/O signals  
Register the Start I/O signals for each station in preparing for the start operation from the station.



Registering job to the station  
Register the job launched in each station. The job can be easily registered in the job list window.



## Necessary equipment

Hardware

Nothing

Software

Standard function

## Related document

- DX100 OPERATOR'S MANUAL FOR MATERIAL HANDLING, PRESS TENDING, CUTTING, AND OTHER APPLICATIONS (RE-CSO-A037)
- DX100 OPERATOR'S MANUAL FOR ARC WELDING(RE-CSO-A038)
- DX100 OPERATOR'S MANUAL FOR SPOT WELDING USING MOTOR GUN(RE-CSO-A040)
- DX100 OPERATOR'S MANUAL FOR SPOT WELDING USING AIR GUN(RE-CSO-A041)



# Servo power supply individual control function

## Details and benefits

This function optionally turns the servo power ON/OFF in units of the specified control group in the robot system consisting of plural control groups. This function allows the servo power only in the selected control group that the worker accesses to be turned OFF without stopping the operation of the entire system. Therefore, loading/unloading of the work piece during system operation and maintenance work for the robot tools can be safely performed, which improve the working efficiency.

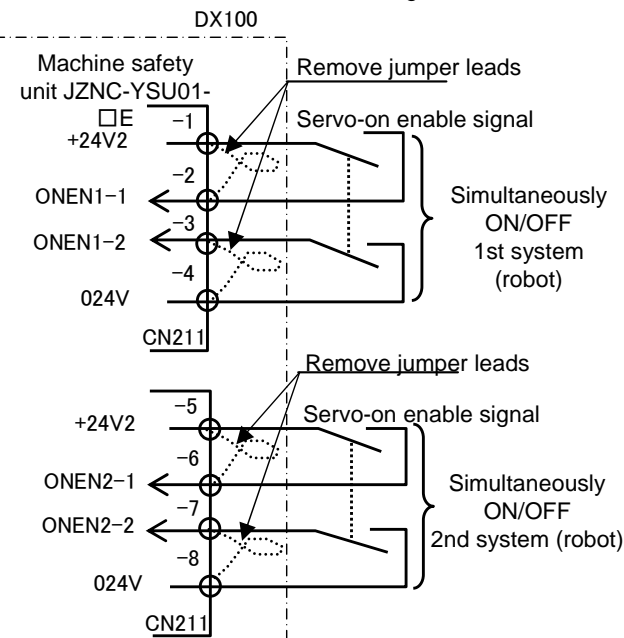
**Important!** Servo power individual control function controls the servo power in units of power supply unit.

Therefore, to use this function, use the power supply unit that is previously separated in units of a control group.

### Signal Connection

Servo power individual control signals must be connected using the following procedure.

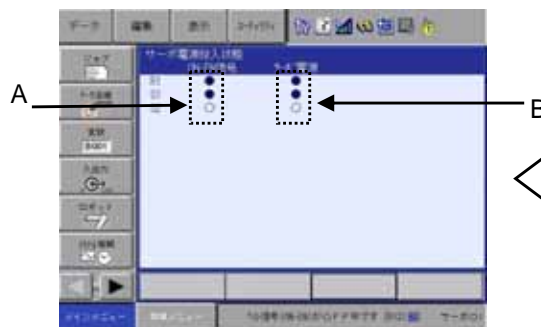
1. Remove the wiring (jumper leads) of the power supply unit. (Refer to the figure below.)
2. Connect output contact such as the area sensor to "ON\_EN" terminal as shown in the figure below.



### Connection Check

Status of "ON\_EN" signal connected to each power supply unit and status of servo power in each control group can be checked in the Servo Power Status window.

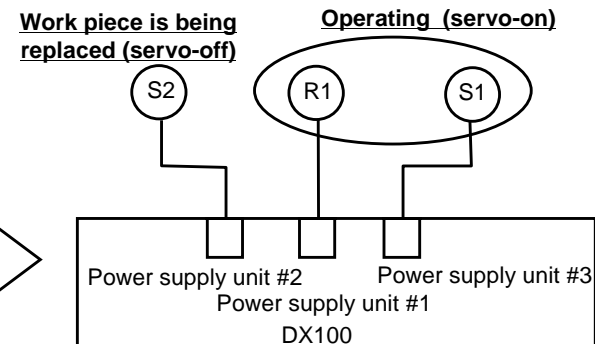
1. Select **[I/O]** in the main menu.
2. Select **[Servo power status]**. The servo power status window is displayed.



- A. ON\_EN signal  
Displays "ON\_EN" signal status of the power supply unit to which each control group is connected.  
○ : Open (OFF) status; Turns the servo power OFF.  
● : Close (ON) status; Turns the servo power ON if the servo-on lamp is lit.
- B. Servo power status  
Displays the servo power status of each control group.  
○ : Servo power OFF status  
● : Servo power ON completion status

### Application Example

The servo power only in the selected control group is turned OFF during playback operation. When the worker access the positioner in the case such as work piece replacement work, the servo power for only the positioner can be turned OFF for the safety of the worker.



The servo power only in the selected control group is turned OFF during playback operation. When the worker access the positioner in the case such as work piece replacement work, the servo power for only the positioner can be turned OFF for the safety of the worker. If "ON\_EN" signal is turned "ON" when the servo-on lamp is lit, the servo power in the corresponding control group is turned ON.

**Important!**  
Before controlling the servo power individually in any control group during playback operation without stopping the entire system operation, the application job must be created using the independent control function.

## Necessary equipment

### Hardware

Individual control unit (Option)

### Software

Standard function

## Related document

DX100 OPTIONS INSTRUCTIONS FOR INDEPENDENT/COORDINATED CONTROL FUNCTION (RE-CKI-A454)

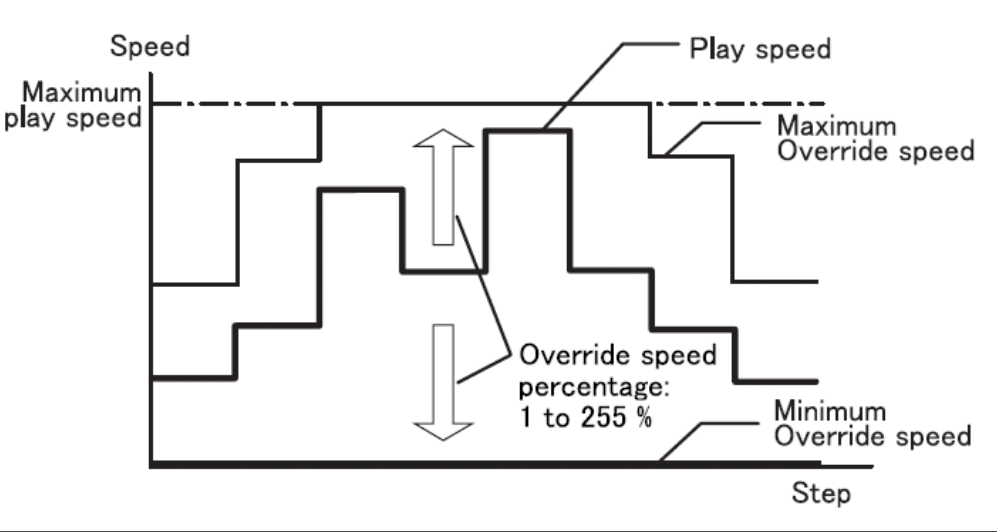




# Speed override function

## Overview and Merits

This function temporally changes the operating speed of the manipulator in the playback by input of the external signal. The operating speed is specified by the override speed ratio (%) to the operating speed (set speed) specified in the job. Setting range of the ratio is 1 to 255% (in units of 1%)



<Parameters>		
Parameter	Description	Setting Value
S2C701	Speed Override setting	1
S4C287	Universal Input Group number setting (signals 1 to 8)	1 to 256
S4C288	Speed percentage (%) Signal 1	0 to 255 0: Disables the Continuous Cycle operation; Enables speed modification (standard spec). 1: Enables the Continuous Cycle operation; Disables speed modification.
S4C289	Speed percentage (%) Signal 2	
S4C290	Speed percentage (%) Signal 3	
S4C291	Speed percentage (%) Signal 4	
S4C292	Speed percentage (%) Signal 5	
S4C293	Speed percentage (%) Signal 6	
S4C294	Speed percentage (%) Signal 7	
S4C295	Speed percentage (%) Signal 8	

Cancel of speed override function: The following operation cancels the speed override.  
 The external override signal is turned OFF.  
 When changed to teaching mode.

Additional explanation:  
The speed override operation continues even in the continuous cycle.  
The set speed data in the job is not changed.  
The set speed after the change by the speed override is limited to a maximum or minimum speed of the manipulator.  
When this function is enabled, the speed override cannot be operated through the programming pendant.

- The speed ratio is set and used for each signal point.  
 The speed ratio is set to 1 to 255. If not used, it is set to '0'. → The override is not performed even if the signal is turned ON.  
 The priority of signals is Signal 1 > Signal 8.  
 The override is performed in the signal with higher priority.
  - Eight signal points are used as the speed ratio data.  
 S4C288 to S4C295 are all set to '0'. The speed override is performed with the signal input status "1-255" as the speed ratio.
- <Example> Signal 5 (16) and Signal 7 (64) are simultaneously turned ON. (16 + 64 → 80):  
 --> The value to which the above number in " " is added is the speed ratio.  
 --> The override is performed with the speed ratio of 80%.

### Necessary equipment

Hardware	Software
Nothing	Standard function

### Related document

DX100 OPTIONS INSTRUCTIONS SUPPLEMENTARY FOR SPEED OVERRIDE FUNCTION (HW0485776)



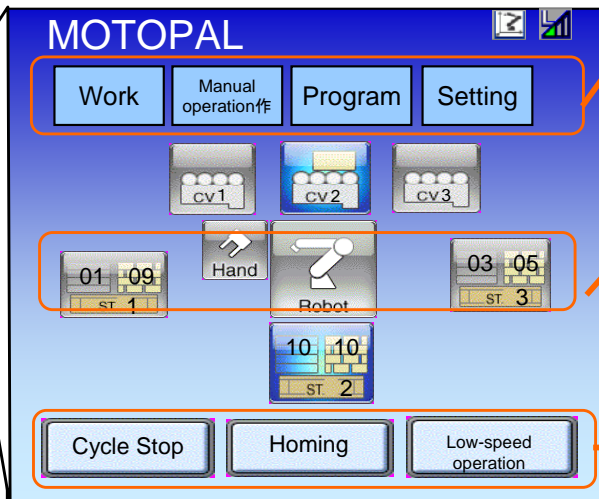
# Palletizing software MOTOPAL

## Overview and Merits

**“MOTOPAL is the application software for palletizing that operates on the pendant.”**

### Merits

- Support from setup to operation
- Automatic creation of palletize jobs
- Easy check of operation status
- Quick and easy teaching operation

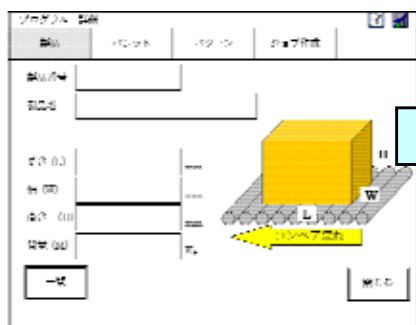


■ Jumps to each operation window.

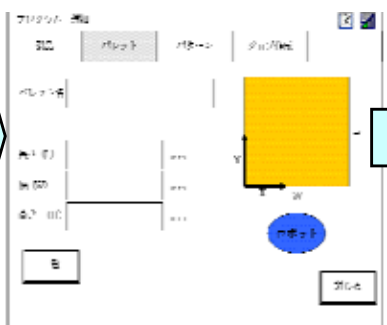
- Easily checks loading status on the pallet.
- Easily checks whether the work piece is present on conveyor.
- Displays abnormal status of the conveyor, station, robot, and hand.

■ Selects the operation method of the robot.

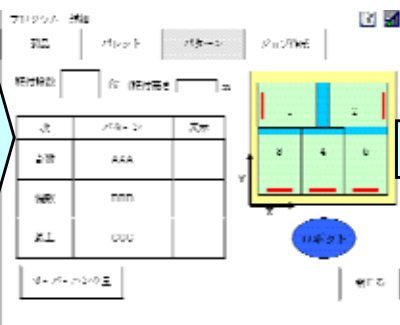
**Reduced setup time and improved operating efficiency are provided!**



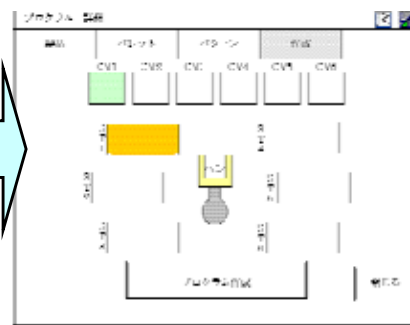
■ Entry of product data



■ Entry of pallet data

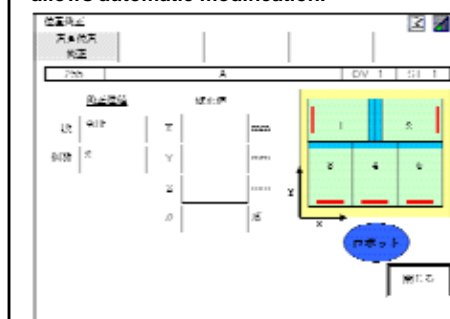


■ Pattern selection



■ Job creation

**Modification of loading position (modification of style of packing)**  
Only entry of numeric values in PP window allows automatic modification.



## Necessary equipment

Hardware

Software

## Related document



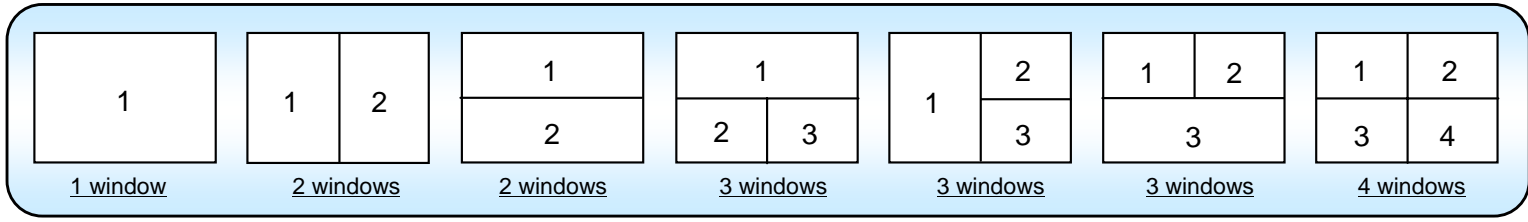
# Multi window function

## Overview and Merits

Multi window function divides the general-purpose display area up to 4 windows and shows simultaneously . There are 7 dividing patterns for the general-purpose display area. Users can choose an arbitrary pattern as necessary.



General-purpose area dividing pattern



### <Merits>

- Job can be taught while editing other files such as condition files and variables without switching screen, which improves teaching efficiency.
- Program operation can be checked while monitoring the status of I/Os and variables, which improves teaching and test run efficiency
- The screens related to robot operation information can be shown simultaneously, enabling the user to monitor the operation status at a glance.

### Necessary equipment

Hardware	Software
Nothing	Standard function

### Related document

- DX100 OPERATOR'S MANUAL FOR MATERIAL HANDLING, PRESS TENDING, CUTTING, AND OTHER APPLICATIONS (RE-CSO-A037)
- DX100 OPERATOR'S MANUAL FOR ARC WELDING(RE-CSO-A038)
- DX100 OPERATOR'S MANUAL FOR SPOT WELDING USING MOTOR GUN(RE-CSO-A040)
- DX100 OPERATOR'S MANUAL FOR SPOT WELDING USING AIR GUN(RE-CSO-A041)

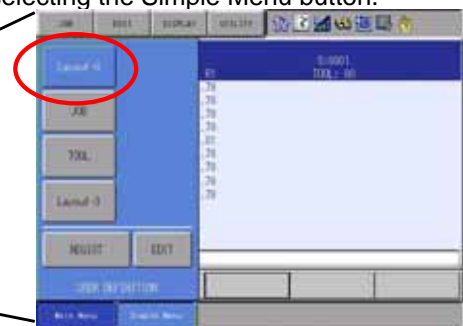


# Simple menu function

## Overview and Merits

Simple Menu Function enables users to create “USER DEFINITION” menu by registering the layouts (window dividing patterns and screens to be displayed) on the general-purpose display area. Up to 8 layouts can be registered to the user definition menu. Registering frequently used screens can simplify the operation procedure, improving operability.

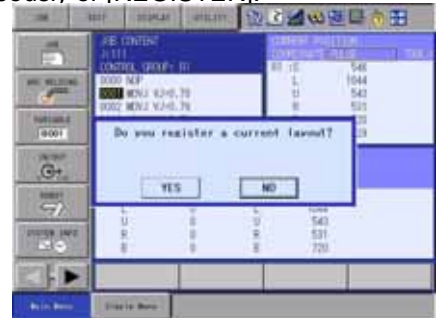
The registered layouts can be called up easily by selecting the Simple Menu button.



Call up a target layout with one touch operation



The layouts can be registered to the USER DEFINITION menu with simple operation: Pressing [SHIFT] + [Multi] simultaneously or [REGISTER].



The names of the registered layouts can be changed and deleted in the “USER DEFINITION” menu.



## Necessary equipment

Hardware  
Nothing

Software  
Standard function

## Related document

- DX100 OPERATOR'S MANUAL FOR MATERIAL HANDLING, PRESS TENDING, CUTTING, AND OTHER APPLICATIONS (RE-CSO-A037)
- DX100 OPERATOR'S MANUAL FOR ARC WELDING(RE-CSO-A038)
- DX100 OPERATOR'S MANUAL FOR SPOT WELDING USING MOTOR GUN(RE-CSO-A040)
- DX100 OPERATOR'S MANUAL FOR SPOT WELDING USING AIR GUN(RE-CSO-A041)



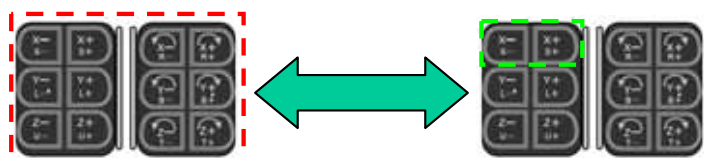
# Jog key allocation for external axis function

## Overview and Merits

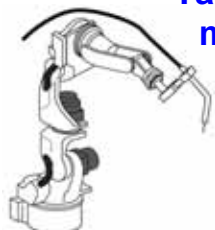
Enable to control external axes by Jog operation, without switching control groups

Enable to control external axes (base axis and station axis) even if the robot is selected as a control group, which is enabled by allocating each external axis to either 7<sup>th</sup>-axis (E+, E-) or 8<sup>th</sup>-axis (8+, 8-) key on the programming pendant.

### ◇NX100



Target control group must be switched

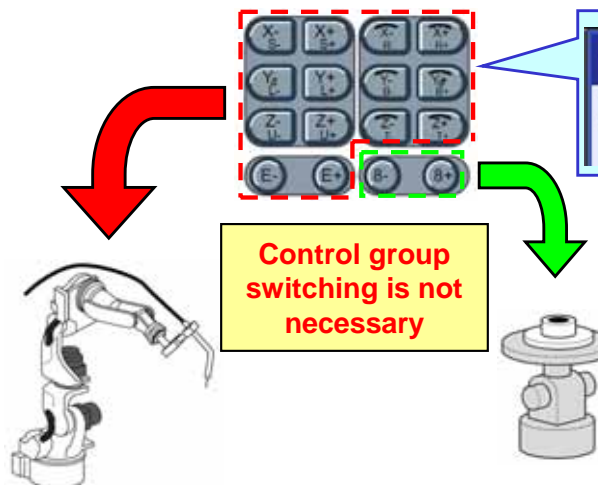


Robot



Station

### ◇DX100



Control group switching is not necessary



Robot



Station

JOG KEY ALLOCATION		
	GROUP	AXIS NO.
7TH(E-, E+)	*****	*****
8TH(8-, 8+)	S1	1

- Different external axes can be set for E-axis and 8<sup>th</sup>-axis, respectively.
- Enable to operate both robot and station simultaneously

## Necessary equipment

Hardware

Nothing

Software

Standard function

## Related document

DX100 OPERATOR'S MANUAL FOR MATERIAL HANDLING, PRESS TENDING, CUTTING, AND OTHER APPLICATIONS (RE-CSO-A037)

DX100 OPERATOR'S MANUAL FOR ARC WELDING(RE-CSO-A038)

DX100 OPERATOR'S MANUAL FOR SPOT WELDING USING MOTOR GUN(RE-CSO-A040)

DX100 OPERATOR'S MANUAL FOR SPOT WELDING USING AIR GUN(RE-CSO-A041)



# IO / variable name alias function

## Overview and Merits

IO / variable name alias function can display the I/Os and variables not only by numbers but also by the registered names. The visibility of the robot motion program has been improved with this function.

【Display by number】

JOB CONTENT  
 J:TEST S:0000  
 CONTROL GROUP: R1 TOOL: \*\*  
 0000 NOP  
 0001 MOVJ VJ=100.00  
 0002 DOUT OT#(1) ON  
 0003 MOVJ VJ=100.00  
 0004 SET B000 128  
 0005 MOVJ VJ=100.00  
 0006 END

Number specification

【Display by name】

JOB CONTENT  
 J:TEST S:0000  
 CONTROL GROUP: R1 TOOL: \*\*  
 0000 NOP  
 0001 MOVJ VJ=100.00  
 0002 DOUT OT#(SENSOR) ON  
 0003 MOVJ VJ=100.00  
 0004 SET WORK\_A 128  
 0005 MOVJ VJ=100.00  
 0006 END

Name specification

Improved the program visibility

GROUP	OG#001	0:DEC.	00:HEX.
OUT#0001	#10010	<input type="checkbox"/>	SENSOR
OUT#0002	#10011	<input type="checkbox"/>	
OUT#0003	#10012	<input type="checkbox"/>	
OUT#0004	#10013	<input type="checkbox"/>	
OUT#0005	#10014	<input type="checkbox"/>	
OUT#0006	#10015	<input type="checkbox"/>	
OUT#0007	#10016	<input type="checkbox"/>	

NO.	CONTENTS	NAME
S000	0 0000_0000	WORK_A
B001	0 0000_0000	
B002	0 0000_0000	
B003	0 0000_0000	
B004	0 0000_0000	
B005	0 0000_0000	
B006	0 0000_0000	

User can specify which is to be used, “Display by Number” or “Display by name”.

### Necessary equipment

- Hardware: Nothing
- Software: Standard function

### Related document

- DX100 OPERATOR'S MANUAL FOR MATERIAL HANDLING, PRESS TENDING, CUTTING, AND OTHER APPLICATIONS (RE-CSO-A037)
- DX100 OPERATOR'S MANUAL FOR ARC WELDING(RE-CSO-A038)
- DX100 OPERATOR'S MANUAL FOR SPOT WELDING USING MOTOR GUN(RE-CSO-A040)
- DX100 OPERATOR'S MANUAL FOR SPOT WELDING USING AIR GUN(RE-CSO-A041)

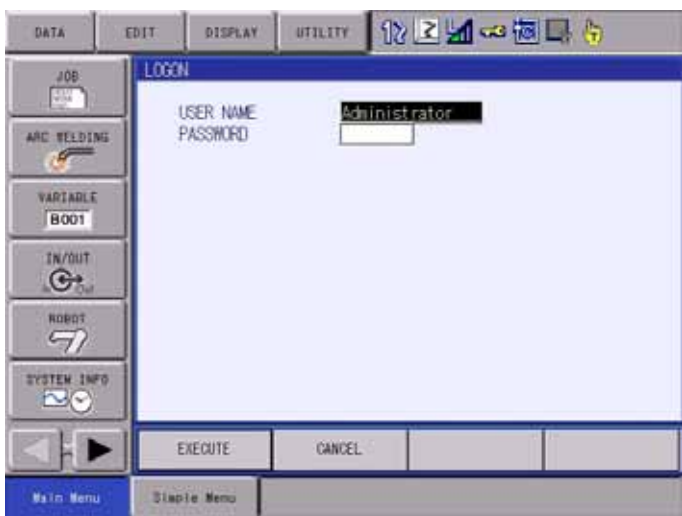


# Password protection function

## Overview and Merits

**Password protection function registers the user account (user name and password) and sets the access right of controller for each user. A maximum of 100 user accounts can be registered. Security of robot systems can be ensured by setting the operation limit to each user.**

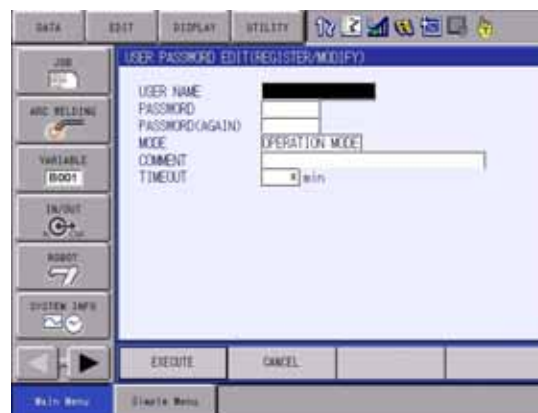
When the power is turned on, "logon" screen is displayed. The pendant cannot be operated before log-on.



### Password protection function allows:

- Operation to be limited for each user.
- Names of users who were logged in when an alarm occurred to be displayed in the alarm history.
- Names of users who performed edit and operation to be recorded in the log (when logging function is enabled).

The user account information can be registered and modified only by Administrator.



The registered user account information can be saved and loaded in external memory.

## Necessary equipment

### Hardware

Nothing

### Software

Password protection function

## Related document

DX100 OPTIONS INSTRUCTIONS FOR PASSWORD PROTECTION FUNCTION (HW0485967)



# Alarm details displaying function

## Overview and Merits

In addition to alarm number and its name, enables to show the alarm contents breakdown including “content”, “cause” and “measure”.

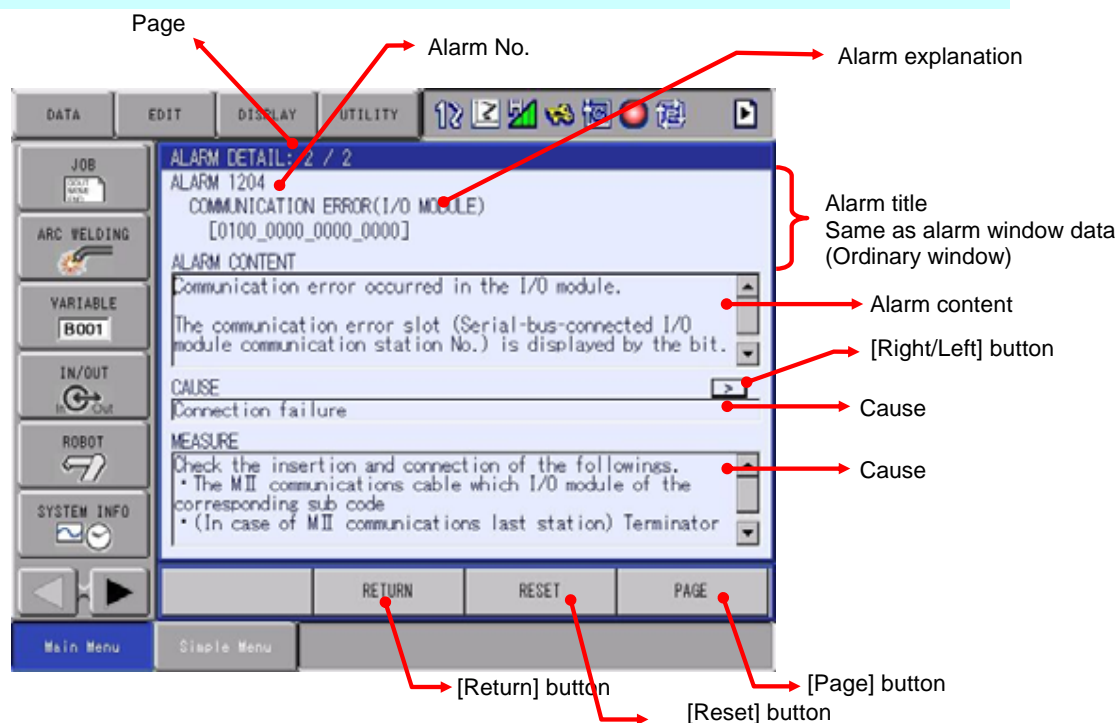
Displays possible causes of the occurring alarm in descending order of frequency to help users find the countermeasure for each cause immediately.

User can specify the window to be shown in case of alarm occurrence;

- ALARM window (standard)
  - ⇒ Press [SELECT] key to show ALARM DETAILS window
- ALARM DETAIL (parameter set)

If there are some possible causes and countermeasures for an alarm, press [Left/Right] buttons or [Left / Right] keys to see next “cause” and “measure”. The “cause” and “measure” are displayed in the order to be executed.

If multiple alarms occur simultaneously, press [Page] button or key to switch to next alarm.



## Necessary equipment

Hardware

Nothing

Software

Standard function

## Related document

DX100 MAINTENANCE MANUAL (RE-CHO-A108)

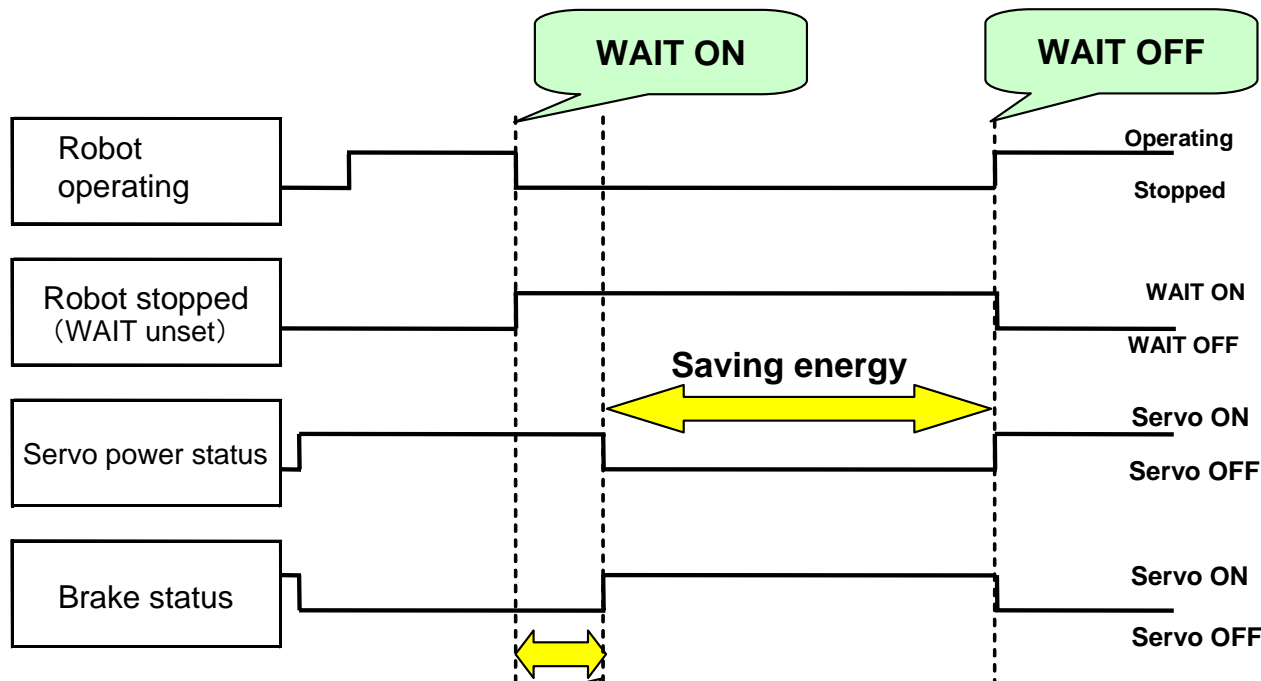




# Energy-saving function

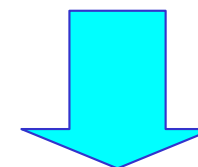
## Overview and Merits

Automatically turns servos OFF if the Robot is stopped for longer than one minute (the time can be specified)



<Condition>

Sixteen-hour operation in which the Robot is operating for 13 hours and on standby for 3 hours



Energy saving:  
Approx. 20 %

## Necessary equipment

Hardware

Nothing

Software

Standard function

## Related document

DX100 OPERATOR'S MANUAL FOR MATERIAL HANDLING, PRESS TENDING, CUTTING, AND OTHER APPLICATIONS (RE-CSO-A037)

DX100 OPERATOR'S MANUAL FOR ARC WELDING(RE-CSO-A038)

DX100 OPERATOR'S MANUAL FOR SPOT WELDING USING MOTOR GUN(RE-CSO-A040)

DX100 OPERATOR'S MANUAL FOR SPOT WELDING USING AIR GUN(RE-CSO-A041)

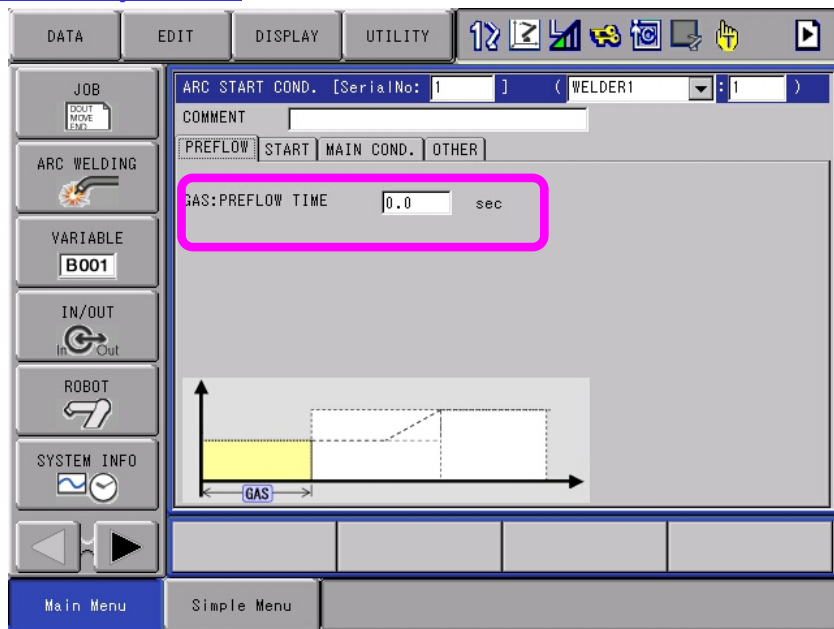


# Gas preflow / afterflow function

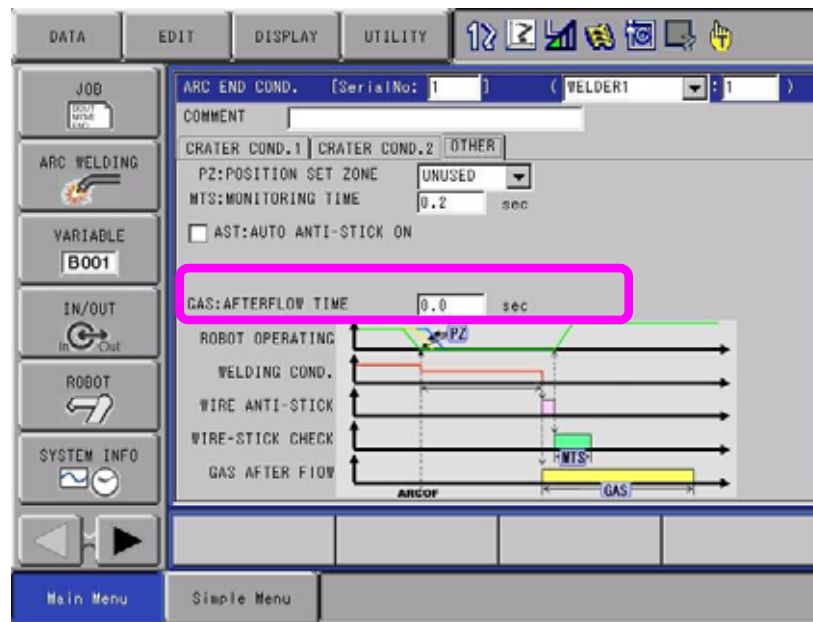
## Overview and Merits

Enable to set gas preflow time and gas afterflow time for Arc start condition and end condition respectively, improving the welding quality at the time of arc start.

### Gas preflow



### Gas afterflow



<Merits> Enable to apply the gas to the tip of the wire at the time of arc start by setting the gas preflow time as an arc start condition.

➡ Assure stable welding quality soon after arc start

Enable to prevent oxidation of wire tip after welding is completed end by setting gas afterflow time as an arc end condition

➡ Assure stable welding quality at the time of next arc start

### Necessary equipment

Hardware

Nothing

Software

Standard function

### Related document

DX100 OPERATOR'S MANUAL FOR ARC WELDING (RE-CSO-A038)

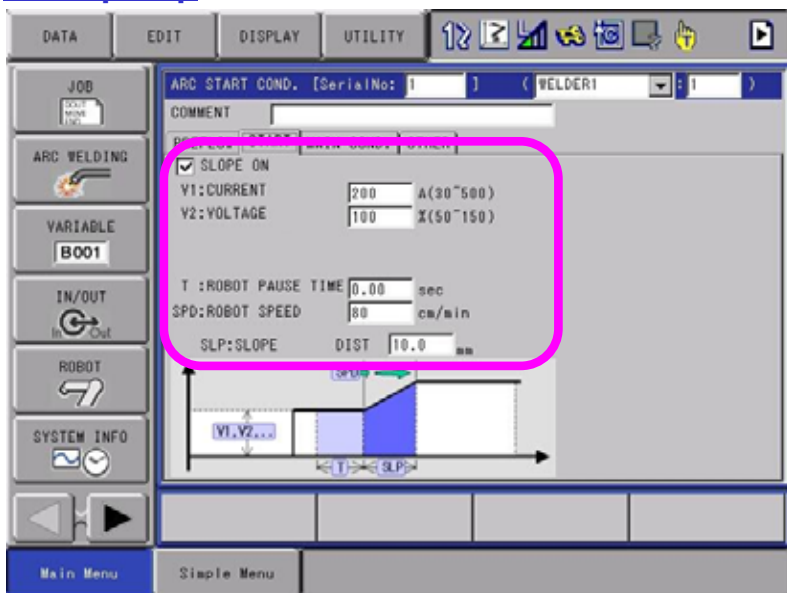


# Weld condition slope up / down function

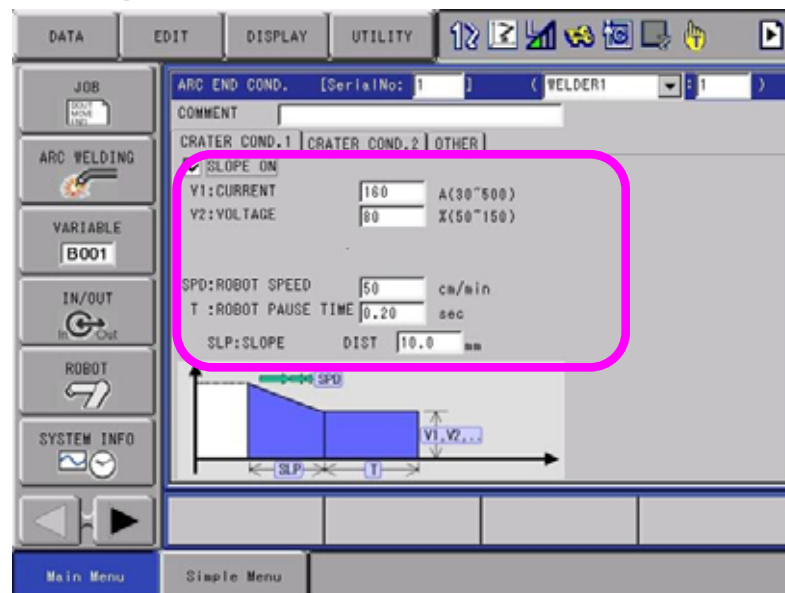
## Overview and Merits


Easy to realize high-speed arc welding by specifying slope up and slope down for Arc start condition and Arc end condition, respectively.

### Slope Up



### Slope Down



<Merits> Enable to specify slope condition for current, voltage and weld speed each as arc start condition. In existing function, if welding speed is simply raised, the bead at the welding start part / end part cannot be stably applied. With this function, the speed can be raised smoothly, enabling to apply the bead at the welding start part / end part stably.  Easy to improve speed with this condition file

### Necessary equipment

- Hardware: Nothing
- Software: Standard function

### Related document

DX100 OPERATOR'S MANUAL FOR ARC WELDING (RE-CSO-A038)



# Graphical arc monitor function

## Overview and Merits

This function graphically displays welding state such as welding current and voltage on the pendant. Variation of welding state can be monitored in real-time on the pendant.

### Supported welding power source

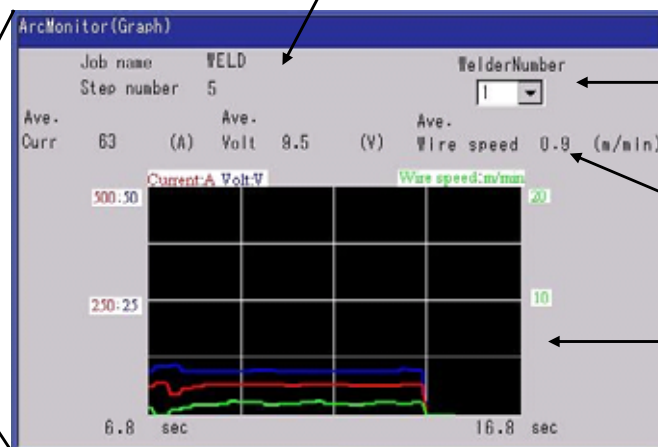
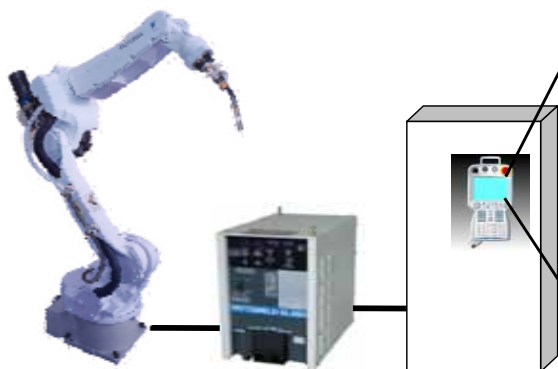
- Yaskawa welding power source MOTOWELD (when using analog communication YEW01, XEW02) : Conventional type
- Yaskawa welding power source MOTOWELD (when using WELDCOM function): EL350-AJ2E
- Fronius-made welding power source (when using WELDCOM): TPS4000, CMT-L

The following data can be displayed on the arc monitor.

Welding machine interface	Display data
When using WELDCOM function	job name/step number/welding current/welding voltage/wire feeding speed
When using YEW01, XEW02 (analog communication)	job name/step number welding current/voltage

Note) WELDCOM function is a digital interface that handles Ethernet communication with arc welding power source.

More information is available in "DX100 WELDCOM functional instructions (Document No. HW0484092)".



The welding machine number can be modified here if multiple welding machines are connected.

Display of welding current/voltage and wire feeding speed (average values are displayed after arc is off).

Drawing of welding current/voltage and wire feeding speed.

## Necessary equipment

Hardware  
Nothing

Software  
Graphical arc monitor function

## Related document

DX100 OPTIONS INSTRUCTIONS FOR Graphical arc monitor function (in preparation)



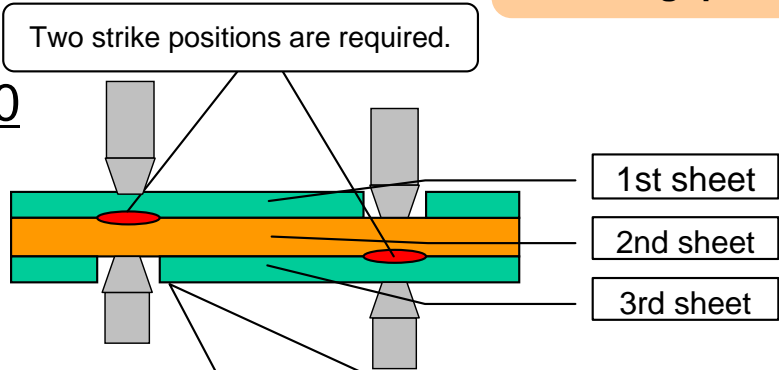
Spot Welding

# Multistep pressure function

## Overview and Merits

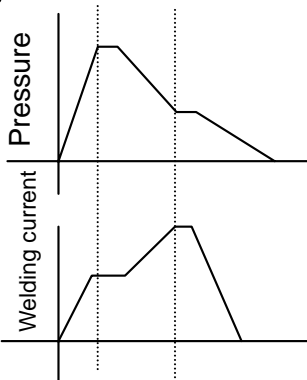
- Triple lap welding with large thickness ratio is allowed.
- Welding quality is improved, such as spatter-less.

NX100

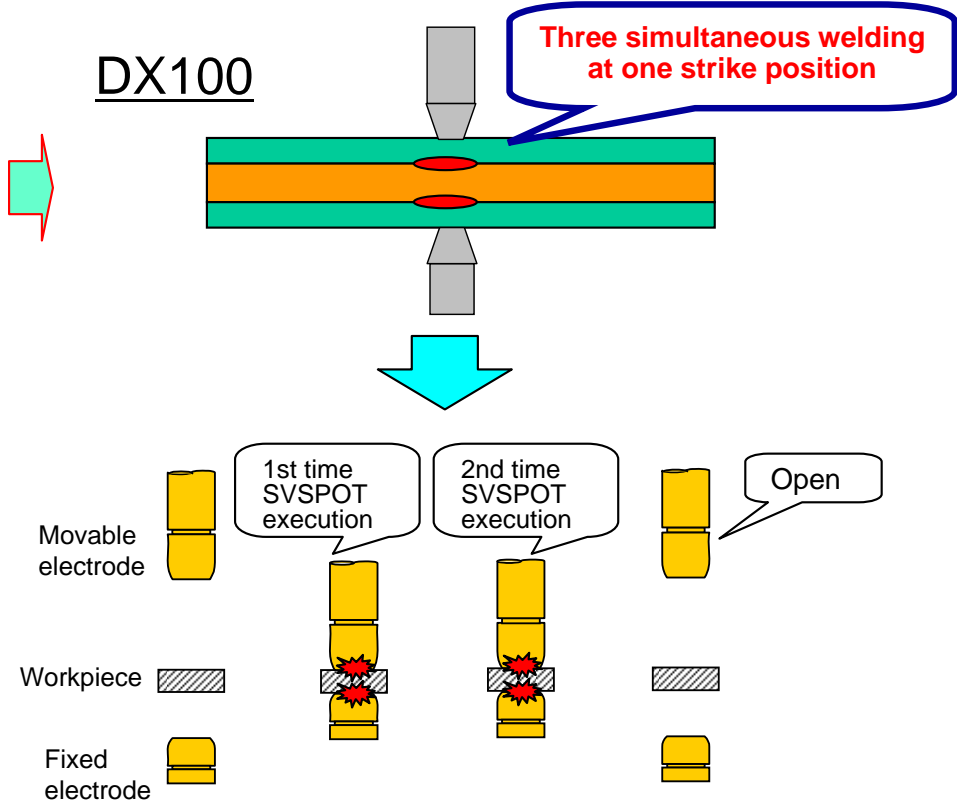


Notch is required.  
(Press form becomes extremely expensive.)

Triple lap welding is achieved by synchronously controlling pressure and welding current.



DX100



## Necessary equipment

Hardware  
Nothing

Software  
Multistep pressure function

## Related document

DX100 OPTIONS INSTRUCTIONS FOR MULTISTEP PRESSURE FUNCTION  
(in preparation)

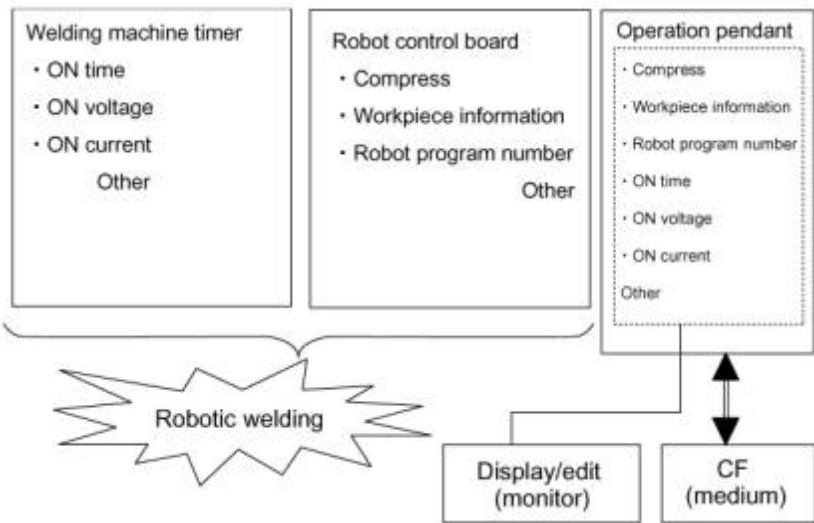


# Spot Welding

## Spot monitor function

### Overview and Merits

- Real-time display of welding conditions enables the construction of a weld quality assurance system
- Integrated management of welding conditions by a robot controller
  - Leverage traceability provided by welding condition information
  - Improved operability



### Spot monitor configuration

### Spot monitor management items

#### Robot onboard data list

- “Timestamp”
- “JOB name”
- “JOB STEP No”
- “Plate thickness at No. 1 pressure (Before compression)”
- “Plate thickness after welding (After compression)”
- “Compression condition number”

Integrated management by **host controller** [software in development]

#### Welding machine timer onboard data list

- “Welding conditions (Start number)”
- “Error number”
- “Avg resistance”

### Necessary equipment

#### Hardware

I/F memory expansion board (4MB)  
(JANCD-YIF01-2E)

#### Software

Spot monitor function

### Related document

DX100 OPTIONS INSTRUCTIONS FOR SPOT MONITOR (in preparation)



# Functional safety function

## Overview and Merits

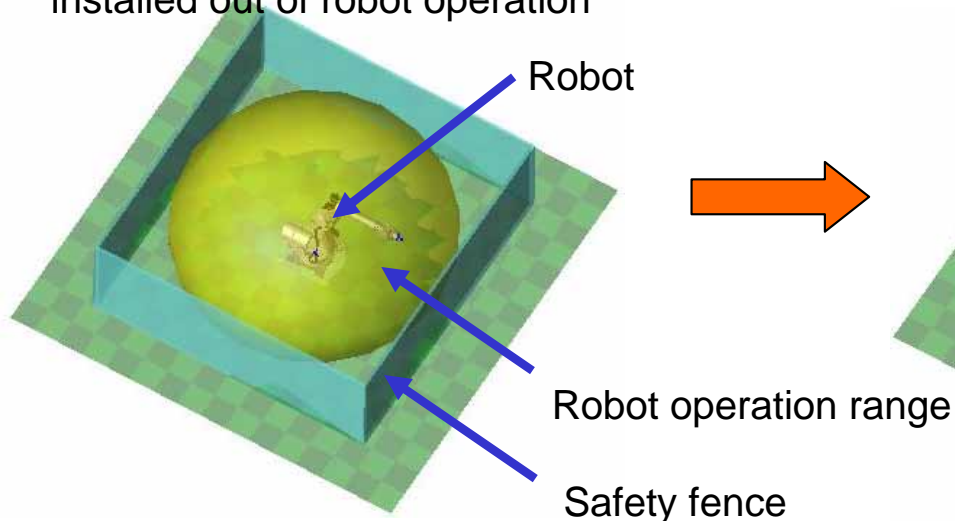
### ● Overview

Monitors the robot arm and tool position so that the robot doesn't exceed the preset safety range. "Functional Safety Unit" with duplicated CPU configuration monitors the robot position, improving safety

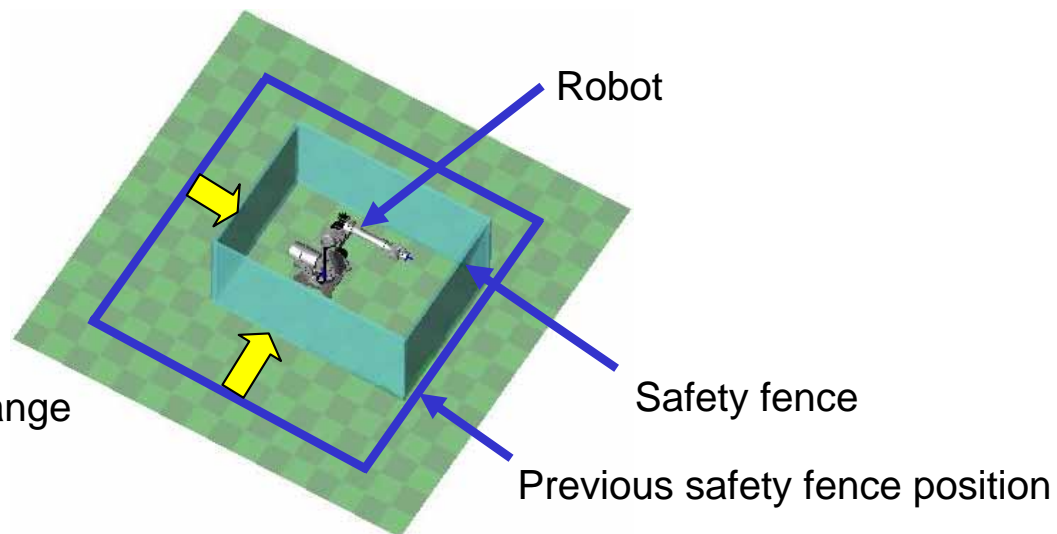
### ● Merit

Save space for facilities: Enable to install a safety fence within the robot operation range.

Conventional: Safety fence must be installed out of robot operation



Space saving



## Necessary equipment

### Hardware

Functional safety unit (JANC-NSU01)  
Communication conversion board (JANCD-YGW01)  
Signal distribution board (JARCR-YCU02)

### Software

Functional safety unit support software

## Related document

DX100 OPTIONS INSTRUCTIONS FOR FUNCTIONAL SAFETY UNIT (NSU01)  
(HW0486052)



# I/O trace function

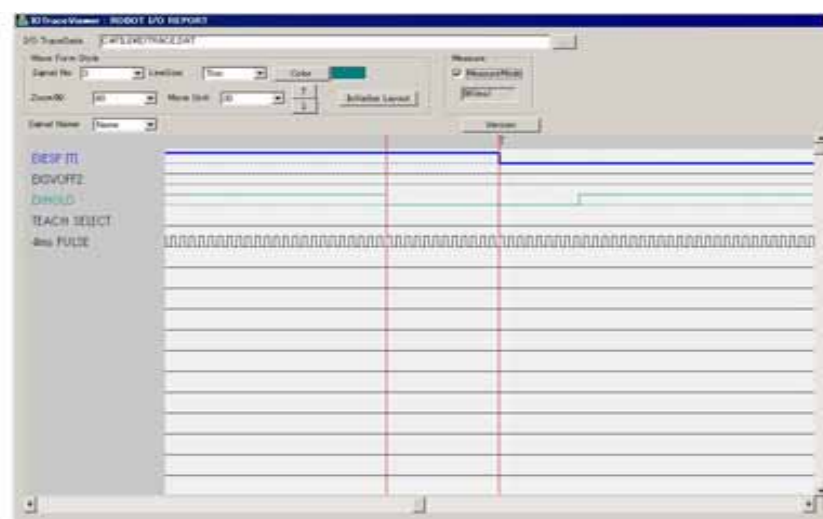
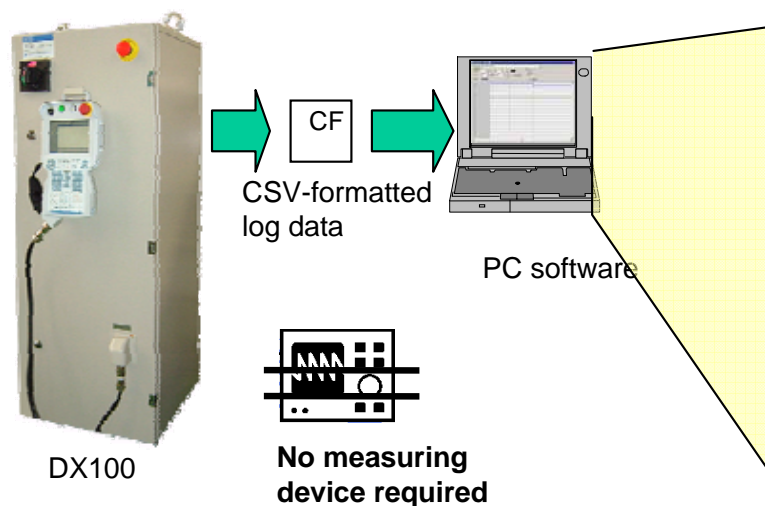
## Overview and Merits

I/O Trace can trace signal status used for robot controller, without using any measuring devices, synchronizing with the concurrent I/O scanning.

For example, when setting up the system or a failure occurred, problems can be easily analyzed to find their solutions by using the log data traced by this function and thus the time to solve the problem is reduced.

[Function list]

- Trigger function (including Pre-trigger)
- Save log data in CSV format → Easy to analyze with IO TraceViewer (PC software)



IO TraceViewer (Optional) **Off-line software**

## Necessary equipment

### Hardware

Hardware key (IO TraceViewer)

### Software

I/O Trace  
IO TraceViewer(PC software)

## Related document

DX100 OPTIONS INSTRUCTIONS FOR I/O TRACE FUNCTION (HW1480091)



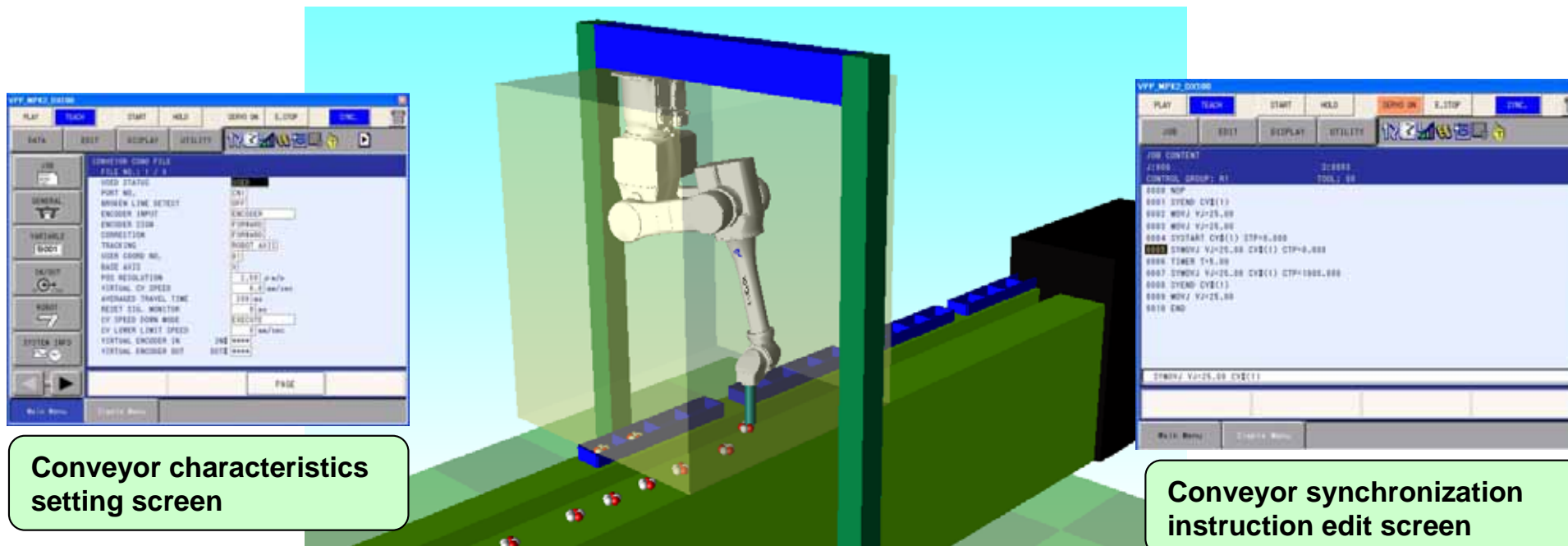


# MotoSimEG-VRC Conveyor tracking function

Off-line software

## Overview and Merits

- Performing emulation of sensor boards allows various simulations of real lines.
- Cycle time and accuracy of operating track are improved.



Conveyor characteristics setting screen

Conveyor synchronization instruction edit screen

\*High-speed picking simulation supported for MPK2 is being developed.

## Necessary equipment

Hardware

Hardware key

Software

MotoSimEG-VRC Standard function

## Related document

MotoSim EG-VRC OPERATION MANUAL (HW0485348)



Off-line software

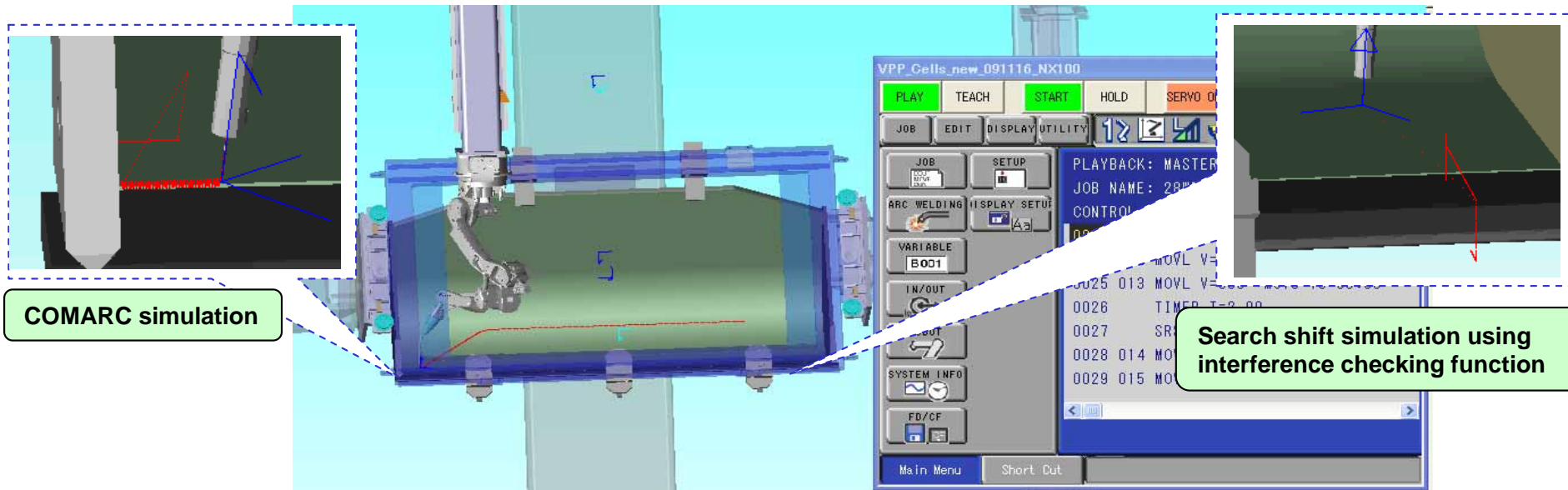
# MotoSimEG-VRC Multi-layer welding function

## Overview and Merits

Enable to simulate the robot controller's Multi-layer Welding Function.  
Enable to simulate the search shift using interference checking function, allowing complete off-line multi-layer system operation.

<Function list>

- Euler angle attitude control
- Edit and execute Point variable (T-variable)
- Search shift function (Macro JOB) \* Detect the interference with a workpiece in off-line to register the position
- Edit and register COMARC instruction and files. No need to adjust positions when executing actual operation
- Edit and register and execute MEMPLY instruction



COMARC simulation

Search shift simulation using interference checking function

## Necessary equipment

Hardware

Hardware key

Software

MotoSimEG-VRC Standard function

## Related document

MotoSim EG-VRC OPERATION MANUAL (HW0485348)



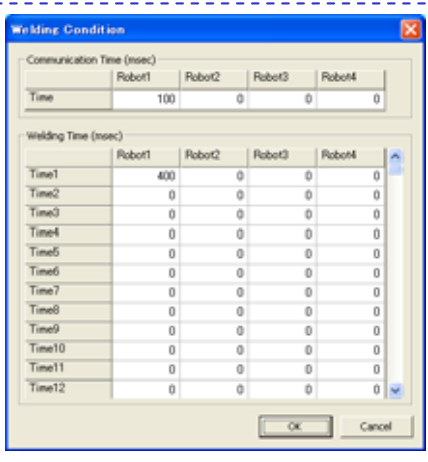
# MotoSimEG-VRC Servo simulation (motor gun application) function

Off-line software

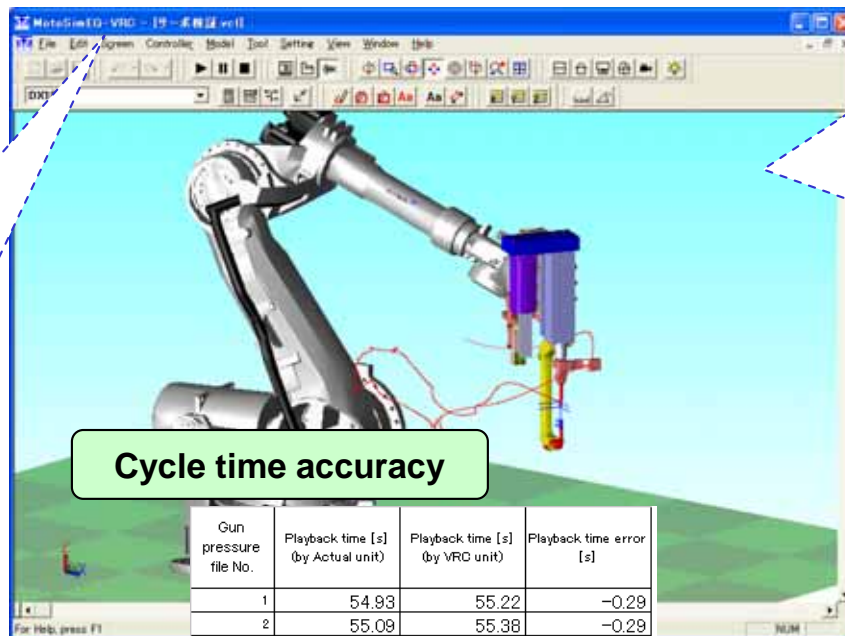
## Overview and Merits

Enable to estimate accurate cycle time for motor gun by the following functions;

- Servo Module Emulation Function
- Welding Condition Setting Function  
(Setting function for communication time with a welder and welding time)
- SVSPOTMOV instruction support

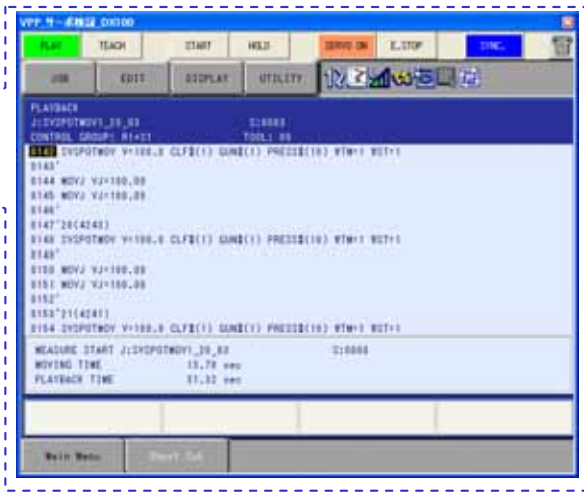


Welding condition setting function



Cycle time accuracy

Gun pressure file No.	Playback time [s] (by Actual unit)	Playback time [s] (by VRC unit)	Playback time error [s]
1	54.93	55.22	-0.29
2	55.09	55.38	-0.29
3	55.62	55.14	0.48
4	55.87	55.16	0.71
5	90.14	89.59	0.55
6	90.16	89.58	0.58



Execution screen for SVSPOTMOV

## Necessary equipment

Hardware

Hardware key

Software

MotoSimEG-VRCStandard function

## Related document

MotoSim EG-VRC OPERATION MANUAL (HW0485348)



# High-sensitivity shock detection function

## Overview and Merits

The shock detection sensitivity has been greatly improved, minimizing the damage of the workpiece and equipment in such cases where wrong program is selected and the workpiece is misset etc...

**Improved detection sensitivity**



Enable to detect the interference with the workpiece faster. Reduce the pressing volume of the robot to minimize the damage to the equipment.



Reduce the deformation volume of the workpiece, equipment and torch at the time of impact.

**High-speed detection**

**Improved stopping method**



Minimize the contact between the workpiece and robot at the time of impact. Prevent the plastic deformation of the workpiece, minimizing the damage.



Reduce recover time after the impact

Concerning the following manipulators specific for Arc welding application, reading tool load information prepared by Yaskawa will enhance the detection sensitivity, minimizing the torch deformation volume.

**Supported manipulator models: MA1400, MA1900, VA1400, MH6, HP20D**

### Necessary equipment

Hardware  
Nothing

Software  
Standard function

### Related document

DX100 INSTRUCTIONS (RE-CTO-A215)



# Program upload and automatic backup

## Overview and Merits

Manual backup of system program and automatic backup of CMOS data allows recovery in a short time from a data crash.

### Manual backup of system program (Program upload function)

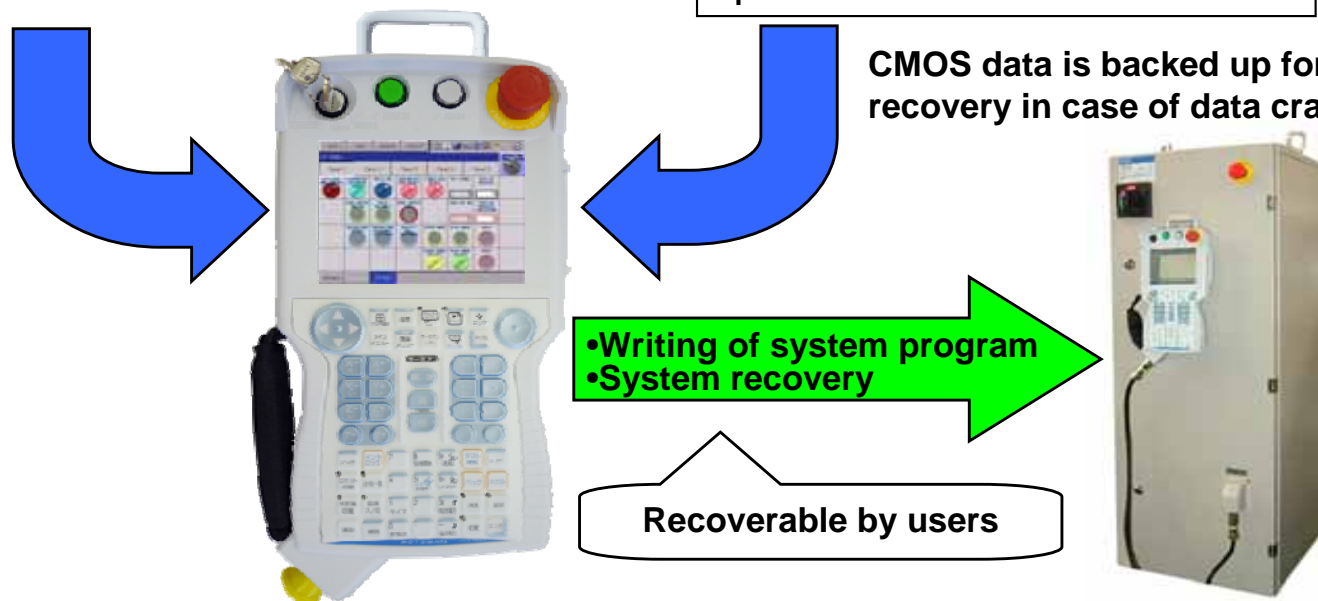
DX system program in DX100 controller is backed up to CF or USB media inserted in the pendant.

System program is backed up for recovery in case of flash-memory failure.

### Automatic backup of CMOS data

CMOS data is automatically backed up to CF inserted in the pendant at the specified time or other time.

CMOS data is backed up for recovery in case of data crash.



## Necessary equipment

Hardware

CF,USB

Software

Standard function

## Related document

Automatic backup → DX100 INSTRUCTIONS (RE-CTO-A215)

Program upload → DX100 OPTIONS INSTRUCTIONS FOR PROGRAM UPLOAD FUNCTION (HW1480066)



# I/O simulation function (signal search, signal list)

## Overview and Merits

The I/O Simulation Function can simulate signal switching for general-purpose inputs, external inputs/outputs, which enables to check the operation without connecting external devices.

Simulating I/O enables users to debug the operation without connecting external devices



Test period and system start-up period will be reduced

UNIVERSAL INPUT				
GROUP	IG#001	33:DEC.	21:HEX.	
IN#0001	#00010	SIM	●	GUN ID No.1
IN#0002	#00011	SIM	○	GUN ID No.2
IN#0003	#00012		○	GUN ID No.3
IN#0004	#00013		○	GUN ID No.4
IN#0005	#00014	SIM	○	WELD Finished
IN#0006	#00015	SIM	●	Flow Switch
IN#0007	#00016		○	reserved_1
IN#0008	#00017		○	reserved_2

IO SIMULATION LIST				
UNIVERSAL INPUT [ 1 / 4 ]				
IN#0001	#00010	SIM	●	GUN ID No.1
IN#0002	#00011	SIM	○	GUN ID No.2
IN#0005	#00014	SIM	○	WELD Finished
IN#0006	#00015	SIM	●	Flow Switch

IO SIMULATION LIST				
EXTERNAL OUTPUT [ 1 / 3 ]				
#30024		SIM	●	SIG 2-4
#30051		SIM	●	SIG. 01
#30053		SIM	○	

- Enable to simulate signal switching
- Enable to set all I/Os such as general-purpose inputs and external inputs/outputs to I/O simulation signals simultaneously
- Enable to release all the signals in I/O simulation mode simultaneously
- Enable to search the signals in I/O simulation mode

Enable to display a list of the signals in I/O simulation mode in IO SIMULATION LIST screen.

## Necessary equipment

Hardware  
Nothing

Software  
Standard function

## Related document

•DX100 Concurrent I/O (RE-CKI-A453)