

# DX100 OPTIONS INSTRUCTIONS

FOR HARDWARE LIFE DIAGNOSIS FUNCTION

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Upon receipt of the product and prior to initial operation, read these instructions thoroughly, and retain for future reference.

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## MOTOMAN INSTRUCTIONS

MOTOMAN-□□□ INSTRUCTIONS  
DX100 INSTRUCTIONS  
DX100 OPERATOR'S MANUAL  
DX100 MAINTENANCE MANUAL

The DX100 Operator's manual above corresponds to specific usage.  
Be sure to use the appropriate manual.

Part Number: 165182-1CD  
Revision: 0



## MANDATORY

- This manual explains the Hardware Life Diagnosis Function of the DX100 system and general operations. Read this manual carefully and be sure to understand its contents before handling the DX100.
- General items related to safety are listed in Chapter 1: Safety of the DX100 Instructions. To ensure correct and safe operation, carefully read the DX100 Instructions before reading this manual.



## CAUTION

- Some drawings in this manual are shown with the protective covers or shields removed for clarity. Be sure all covers and shields are replaced before operating this product.
- The drawings and photos in this manual are representative examples and differences may exist between them and the delivered product.
- YASKAWA may modify this model without notice when necessary due to product improvements, modifications, or changes in specifications.
- If such modification is made, the manual number will also be revised.
- If your copy of the manual is damaged or lost, contact a YASKAWA representative to order a new copy. The representatives are listed on the back cover. Be sure to tell the representative the manual number listed on the front cover.
- YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids your product's warranty.

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## Notes for Safe Operation

Read this manual carefully before installation, operation, maintenance, or inspection of the DX100.

In this manual, the Notes for Safe Operation are classified as “WARNING”, “CAUTION”, “MANDATORY”, or “PROHIBITED”.



### WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to personnel.



### CAUTION

Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury to personnel and damage to equipment. It may also be used to alert against unsafe practices.



### MANDATORY

Always be sure to follow explicitly the items listed under this heading.



### PROHIBITED

Must never be performed.

Even items described as “CAUTION” may result in a serious accident in some situations.

At any rate, be sure to follow these important items



To ensure safe and efficient operation at all times, be sure to follow all instructions, even if not designated as “CAUTION” and “WARNING”.



## WARNING

- Before operating the manipulator, check that servo power is turned OFF pressing the emergency stop buttons on the front door of the DX100 and the Programming pendant. When the servo power is turned OFF, the SERVO ON LED on the Programming pendant is turned OFF.

Injury or damage to machinery may result if the emergency stop circuit cannot stop the manipulator during an emergency. The manipulator should not be used if the emergency stop buttons do not function.

*Figure 1: Emergency Stop Button*



- Once the emergency stop button is released, clear the cell of all items which could interfere with the operation of the manipulator. Then turn the servo power ON.

Injury may result from unintentional or unexpected manipulator motion.

*Figure 2: Release of Emergency Stop*



- Observe the following precautions when performing teaching operations within the P-point maximum envelope of the manipulator:
  - View the manipulator from the front whenever possible.
  - Always follow the predetermined operating procedure.
  - Keep in mind the emergency response measures against the manipulator's unexpected motion toward you.
  - Ensure that you have a safe place to retreat in case of emergency.

Improper or unintended manipulator operation may result in injury.

- Confirm that no person is present in the P-point maximum envelope of the manipulator and that you are in a safe location before:
  - Turning ON the power for the DX100.
  - Moving the manipulator with the Programming pendant.
  - Running the system in the check mode.
  - Performing automatic operations.

Injury may result if anyone enters the P-point maximum envelope of the manipulator during operation. Always press an emergency stop button immediately if there is a problem.

The emergency stop buttons are located on the right of front door of the DX100 and the Programming pendant.



## CAUTION

- Perform the following inspection procedures prior to conducting manipulator teaching. If problems are found, repair them immediately, and be sure that all other necessary processing has been performed.
  - Check for problems in manipulator movement.
  - Check for damage to insulation and sheathing of external wires.
- Always return the Programming pendant to the hook on the cabinet of the DX100 after use.

The Programming pendant can be damaged if it is left in the manipulator's work area, on the floor, or near fixtures.

- Read and understand the Explanation of Warning Labels in the DX100 Instructions before operating the manipulator:

## Definition of Terms Used Often in This Manual

The MOTOMAN is the YASKAWA industrial robot product.

The MOTOMAN usually consists of the manipulator, the controller, the Programming pendant, and the manipulator cables.

In this manual, the equipment is designated as follows:

Equipment	Manual Designation
DX100 controller	DX100
DX100 Programming pendant	Programming pendant
Cable between the manipulator and the controller	Manipulator cable

Descriptions of the Programming pendant, buttons, and displays are shown as follows:

## Description of the Operation Procedure

In the explanation of the operation procedure, the expression “Select ●●●” means that the cursor is moved to the object item and the SELECT key is pressed, or that the item is directly selected by touching the screen.

## Registered Trademark

In this manual, names of companies, corporations, or products are trademarks, registered trademarks, or brand names for each company or corporation. The indications of (R) and TM are omitted.

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# 1 Hardware Life Diagnosis Function

This function estimates the life span of the controller components by calculating the consumed amount with considering the usage environment and the load, and outputs general signals to be the reference for the replacement time.

The function overview is described below.

## 1.1 Targeted Components for Diagnosis

Regarding the following, calculations of the consumed amount and outputs of the general signals to be the reference for the replacement time are performed.

- Cooling fan
- Capacitor
- Amplifier IGBT
- Contactor
- Motor (numbers of revolution and reverse revolution are displayed)

## 1.2 Replacement Time Display

### 1.2.1 Stepwise Display of Replacement Time

For each component, a judgement from A to D is displayed, and it can be used as the reference for the replacement time.

Judgement display	Status
A	New - Used about half of its life span
B	Used about half of its life span
C	Used about half of its life span - Time to replace (reference)
D	Time to replace (reference)

### **1.2.2 Signal Output of Replacement Time**

If any of the components is judged as D, ON signal is output from the general output which is set as "Alarm signal" of the file.

However, only one signal for this general signal can be output for one controller.

### **1.2.3 Mask of Signal Output**

The general output signals can be masked for each component.

If any of the components is judged as D, ON signal is output from the general output which is set as "Alarm signal" of the file. This signal is output continuously, so the signal to inform the replacement time of the component cannot output newly.

Therefore, the signal of the replacement time for other components can be output by masking the signal output of the component which is already judged as D and turning OFF the general output signal temporarily.

Even if the masking is performed, D remains to be displayed for the component judged that it should be replaced.

## **1.3 Replacement of Component**

### **1.3.1 Record of Replacement Date of Component**

When the component is replaced, the replacement date (year, month, day) can be recorded. It can be used for the reference for the next replacement time or for the estimation of the failure mode by the failure time.

### **1.3.2 Life Span Setting at Replacement of Component**

A new component or an used one, whichever it is replaced with, the life span setting can be performed.

For the used component, after recording the replacement date, the value 1 - 100% can be set as the leftover life.

## **1.4 Display of the Numbers of Motor Revolution and Reverse Revolution**

The accumulated values are displayed regarding the number of each motor revolution and the number of reverse revolution of positive and negative revolution. They can be used as the reference for the replacement time of the speed reducer or motor.

## 2 Setting of Hardware Life Diagnosis

### 2.1 Setting of Replacement Time Display

1. Select {SETUP} in Main Menu.
  - The sub menu appears.



- \* The operation icons on Main Menu vary depending on the system usage.

2. Select {MAINTENANCE PREVENTION}.

- Alarm signal setting and unit selection window appears.



## 2 Setting of Hardware Life Diagnosis

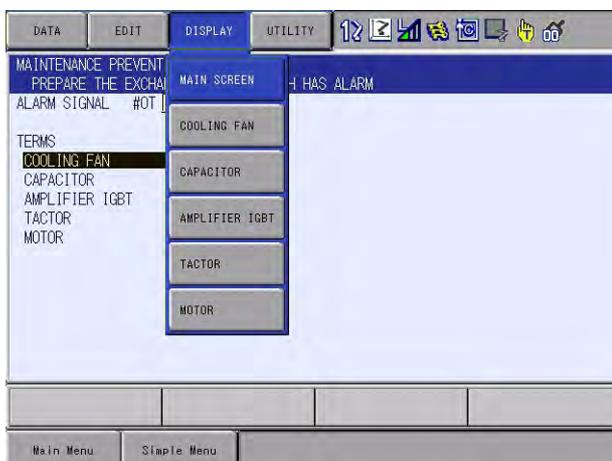
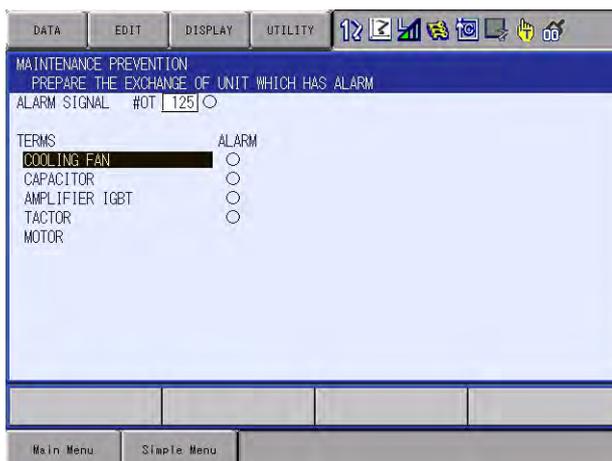
### 2.1 Setting of Replacement Time Display

- Input the numerical value of the alarm signal.  
When any of components in this controller comes to the replacement time, the general output signal which is already set turns ON.



– \* For example, 125 is input.

- Select the unit.  
Or select the unit from {DISPLAY} in the menu.



– \* For example, {COOLING FAN} is selected.

## 2 Setting of Hardware Life Diagnosis

### 2.1 Setting of Replacement Time Display

5. The following information is displayed:

Starting from the left,

- (1) "●" is displayed when the replacement time is judged as D.
- (2) Component name
- (3) General output signal valid/invalid
- (4) The first day of use
- (5) Leftover life judgement

– When {COOLING FAN} is selected:

COOLING FAN		SV#1		
PREPARE THE EXCHANGE OF FAN WHICH JUDGEMENT IS 'D'				
	OUTPUT	BEGINNING	JUDGE	
<input checked="" type="radio"/>	CONTROL BOX FAN	VALID	2012/06/17	B
<input type="radio"/>	MANIPULATOR FAN	VALID	2012/12/17	A
<input type="radio"/>	CPS FAN	VALID	2012/12/17	A
<input type="radio"/>	REGENERATIVE FAN	VALID	2012/12/17	A

Arrows point to: (1) checked radio button, (2) CONTROL BOX FAN, (3) VALID, (4) 2012/06/17, (5) B.

– When {CAPACITOR} is selected:

CAPACITOR		SV#1		
PREPARE THE EXCHANGE OF CAPACITOR WHICH JUDGEMENT IS 'D'				
	OUTPUT	BEGINNING	JUDGE	
<input checked="" type="radio"/>	CAPACITOR 1	VALID	2012/12/17	A

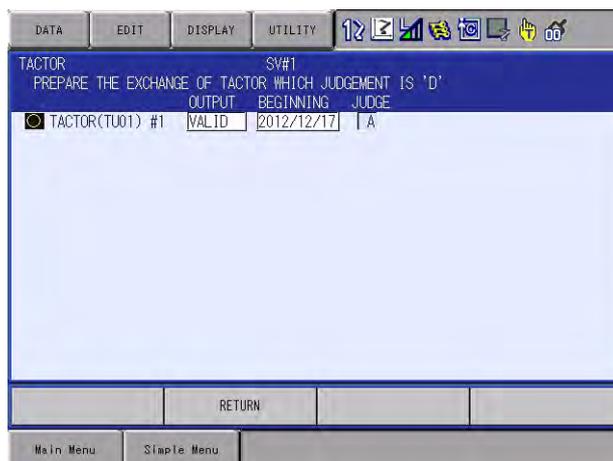
– When {AMPLIFIER IGBT} is selected:

AMPLIFIER IGBT		SV#1		
PREPARE THE EXCHANGE OF AMPLIFIER WHICH JUDGEMENT IS 'D'				
	OUTPUT	BEGINNING	JUDGE	
<input checked="" type="radio"/>	AMPLIFIER R1 :S	VALID	2012/12/17	A
<input type="radio"/>	AMPLIFIER R1 :L	VALID	2012/12/17	A
<input type="radio"/>	AMPLIFIER R1 :U	VALID	2012/12/17	A
<input type="radio"/>	AMPLIFIER R1 :R	VALID	2012/12/17	A
<input type="radio"/>	AMPLIFIER R1 :B	VALID	2012/12/17	A
<input type="radio"/>	AMPLIFIER R1 :T	VALID	2012/12/17	A
<input type="radio"/>	AMPLIFIER S1 :1	VALID	2012/12/17	A

## 2 Setting of Hardware Life Diagnosis

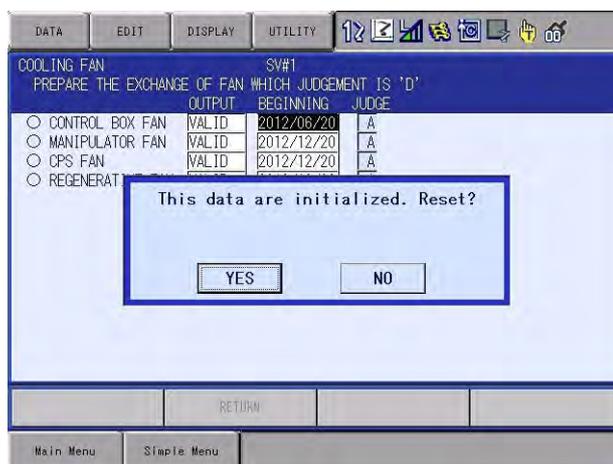
### 2.1 Setting of Replacement Time Display

- When {CONTACTOR} is selected:



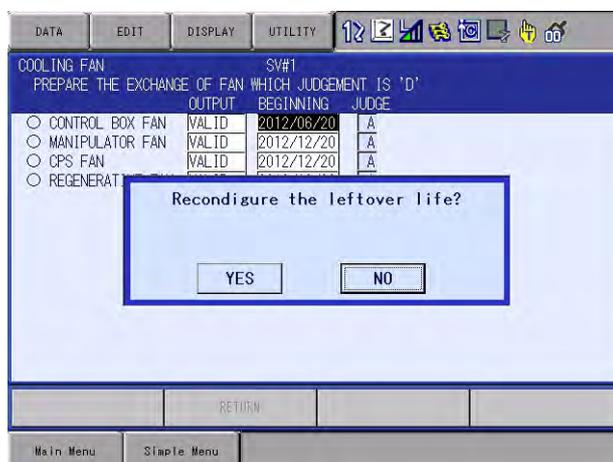
- When replaced with a new component, select "O".

- A confirmation dialog box appears. When replaced with a new component, select "YES".



- When replaced with an used component, select {BEGINNING}.

- A window to input the numerical value appears. Input the replacement date using half-width characters like {2009.3.14}. After that, a following confirmation dialog box appears. When replaced with an used component, select "YES".



## 2 Setting of Hardware Life Diagnosis

### 2.1 Setting of Replacement Time Display

8. When manually setting the approximate value to the leftover life, input the numerical value "0 - 100%".



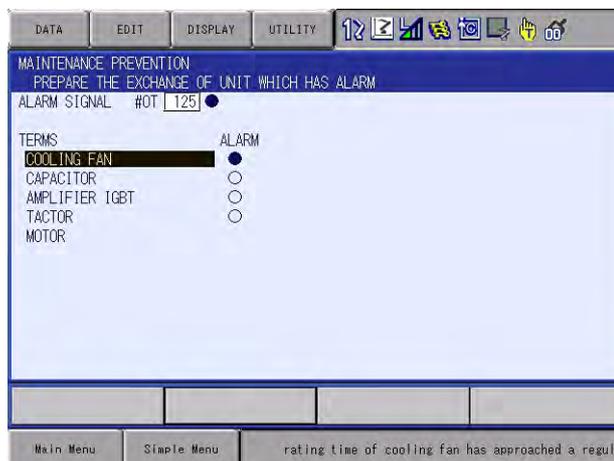
9. When the numerical value displayed in the confirmation dialog box is correct, select "YES".



## 2.2 Mask of Replacement Time Display (Signal Display)

Perform the masking of the replacement time display according to the following procedures:

1. When any of the components comes to the replacement time, the message is displayed per unit.



2. The message is also displayed per component.  
 Invalidate the output.
  - After checking the components, invalidate the output.



## 2 Setting of Hardware Life Diagnosis

### 2.2 Mask of Replacement Time Display (Signal Display)

3. The general output signal turns OFF, and the message turns to be hidden. However, the stepwise display remains D.



- \* Before the replacement, perform the above operation in order to detect the multiple components because only one general output of life diagnosis can be output for one controller. That is, "Replacement time of component → Turn ON the general output → Check the component and invalidate the output → Turn OFF the general output → Replacement time of other component → Turn ON the general output".

### 3 Display of the Numbers of Motor Revolution and Reverse Revolution

#### 3.1 Display of the Numbers of Revolution and Reverse Revolution

1. Select {SETUP} in Main Menu → {MAINTENANCE PREVENTION} → {MOTOR}.

MOTOR		SV#1		
	REVOLUTION (1000TIMES)	REVERSE (TIMES)	BEGINNING	
<input checked="" type="radio"/> R1 :S	0	0	2012/12/20	
<input type="radio"/> R1 :L	0	0	2012/12/20	
<input type="radio"/> R1 :U	0	0	2012/12/20	
<input type="radio"/> R1 :R	0	0	2012/12/20	
<input type="radio"/> R1 :B	0	0	2012/12/20	
<input type="radio"/> R1 :T	0	0	2012/12/20	
<input type="radio"/> S1 :1	0	0	2012/12/20	

RETURN

Main Menu Simple Menu

#### 3.2 Percent Display of the Number of Motor Revolution

At the motor rated number of revolution, it displays how many percent it has operated with 100% representing the case it operates 20000 hours.

1. After select {SETUP} in Main Menu → {MAINTENANCE PREVENTION} → {MOTOR}, select {DISPLAY} on the menu → {REVOLUTION(%)}.

MOTOR		REVOLUTION (1000)	BEGINNING
<input checked="" type="radio"/> R1 :S		*REVOLUTION(%)	2012/12/20
<input type="radio"/> R1 :L		MAIN SCREEN	2012/12/20
<input type="radio"/> R1 :U		COOLING FAN	2012/12/20
<input type="radio"/> R1 :R		CAPACITOR	2012/12/20
<input type="radio"/> R1 :B		AMPLIFIER IGBT	2012/12/20
<input type="radio"/> R1 :T		TACTOR	2012/12/20
<input type="radio"/> S1 :1		MOTOR	2012/12/20

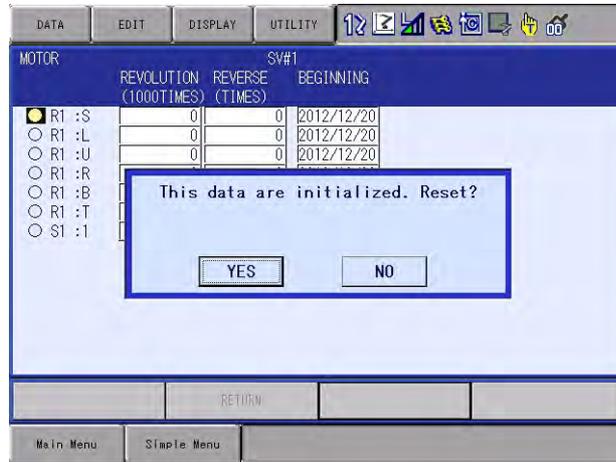
Main Menu Simple Menu

### 3.3 Resetting the Number of Revolution

Used when the motor replaced with a new one.

1. Select "O" of the axis to be reset by moving the cursor to it, and then select "YES" on the dialog box.

The day of the first use (BEGINNING) is automatically changed.



### 3.4 Changing the Numbers of Revolution and Reverse Revolution

Used when the motor replaced with an used one.

- Select the number of the axis to be reset by moving the cursor to it, and then set the number.  
 To set the day of the first use (BEGINNING), select the date of the axis to be reset by moving the cursor to it, and then set the date.

MOTOR				SV#1
	REVOLUTION (1000TIMES)	REVERSE (TIMES)	BEGINNING	
<input type="radio"/> R1 :S	5000	0	2012/12/20	
<input type="radio"/> R1 :L	0	0	2012/12/20	
<input type="radio"/> R1 :U	0	0	2012/12/20	
<input type="radio"/> R1 :R	0	0	2012/12/20	
<input type="radio"/> R1 :B	0	0	2012/12/20	
<input type="radio"/> R1 :T	0	0	2012/12/20	
<input type="radio"/> S1 :1	0	0	2012/12/20	

RETURN

Main Menu Simple Menu

– \* When changing the number of revolution.

MOTOR				SV#1
	REVOLUTION (1000TIMES)	REVERSE (TIMES)	BEGINNING	
<input type="radio"/> R1 :S	5000	5000	2012/12/20	
<input type="radio"/> R1 :L	0	0	2012/12/20	
<input type="radio"/> R1 :U	0	0	2012/12/20	
<input type="radio"/> R1 :R	0	0	2012/12/20	
<input type="radio"/> R1 :B	0	0	2012/12/20	
<input type="radio"/> R1 :T	0	0	2012/12/20	
<input type="radio"/> S1 :1	0	0	2012/12/20	

RETURN

Main Menu Simple Menu

– \* When changing the number of reverse revolution.

# DX100 OPTIONS INSTRUCTIONS

FOR HARDWARE LIFE DIAGNOSIS FUNCTION

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Specifications are subject to change without notice  
for ongoing product modifications and improvements.