

## Annual Preventive Maintenance (AMC)

Annual preventive maintenance is robot model specific for recommended time interval. For robots with DX100 controller this service is recommended at 6,000 servo-on hours. Dependent on harshness of environment/ recommended interval might be sooner. The Motoman annual preventive maintenance package includes a full inspection of the drive train, lubrication of the robot and inspection of the main wire harness inside the robot arm. Additionally, this annual preventive maintenance is to determine if there are any immediate service problems ensuring they be addressed before affecting production downtime.

### 1. A) PREVENTIVE MAINTENANCE CHECK LIST:

S. No.	Inspection Item	Method	General PM	Special PM
1	Backup data	Compact flash	<input type="radio"/>	<input type="radio"/>
2	Replenishment and exchange of grease for speed reducer and bearing	Grease pump	<input type="radio"/>	<input type="radio"/>
3	Inspection of manipulator harness	Physical/Visually	<input type="radio"/>	<input type="radio"/>
4	Waveform measuring torque and speed feedback of the servo motor for all axis	Oscilloscope	-	<input type="radio"/>
5	Measurement of the concentration of iron powder in the grease	Dust meter	-	<input type="radio"/>
6	Check the tension of the timing belt	Tension meter	-	<input type="radio"/>
7	Measurement of backlash	Dial Gauge	-	<input type="radio"/>
8	Home position verification and calibration(If Required)	-	<input type="radio"/>	<input type="radio"/>
9	Checking all cooling fans of Controller	Visually	<input type="radio"/>	<input type="radio"/>
10	Confirmation of abnormal noise and vibration	-	<input type="radio"/>	<input type="radio"/>
11	Incoming supply verification	Multimeter	<input type="radio"/>	<input type="radio"/>
12	Voltage measurement of batteries	Multimeter	<input type="radio"/>	<input type="radio"/>
13	Check the Physical condition of Robot & Controller	Visually	<input type="radio"/>	<input type="radio"/>
14	Cleaning the Controller and Robot	-	<input type="radio"/>	<input type="radio"/>
15	Depressurizing after refueling.(Dry run)	-	<input type="radio"/>	<input type="radio"/>
16	Inspection of all terminals/Connectors inside and outside controller	Physical/Visually	<input type="radio"/>	<input type="radio"/>
17	Inspection of teach pendant and related functions	Physical/Visually	<input type="radio"/>	<input type="radio"/>
18	Cleaning and checking of welding source(If any)		<input type="radio"/>	<input type="radio"/>
19	Create and Submission of report	-	<input type="radio"/>	<input type="radio"/>

## Robot diagnosis check Sheet



Yaskawa Robotics India Ltd.

Company name :		Date :	15/11/2012
MOTOMAN No. :	A-servo- S/F Robot	YRI Engineer's :	WATANABE, SATHYAMURTHY, AGIN, DHILIP, SAIITH, ARUN
Detail			
MOTOMAN: EPH4000-J10	Ver. : NT3.87.00A(JP/US)-00	Initialize Date:	09/03/2010
CONTROLLER: NX100	ORDER: S6P065-1-1	Control power :	15970:22
Application: HAND	M/ser: S6P065-1-1	Servo Time :	5906:33:00
DATE: 3-10	C/ser: S6R065-2-1	Play Time :	5863:39:00

Axis	Parts	Inspection	method	Result	Judg	
JT1	Cr.Bearing	Backlash	Dial Gauge	<input type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure	○	
		Backlash	Dial Gauge	0.7min <input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure		
	Reducer Gear	Vibration	Palpation	<input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure		
		Sound	Auscultation	<input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure		
		Waveform	Oscilloscope	Exhibit <input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure		
		Grease	Dust meter	0.029%wt <input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure		
JT2	Cr.Bearing	Sound	Auscultation	<input type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure	○	
		Backlash	Dial Gauge	0.8min <input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure		
	Reducer Gear	Vibration	Palpation	<input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure		
		Sound	Auscultation	<input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure		
		Waveform	Oscilloscope	Exhibit <input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure		
		Grease	Dust meter	0.023%wt <input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure		
JT3	Link.Bearing	Grease	Dust meter	<input type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure	○	
		Supporting Br	Grease	Dust meter		<input type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure
	Reducer Gear		Backlash	Dial Gauge		0.6min <input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure
			Vibration	Palpation		<input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure
			Sound	Auscultation		<input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure
		Waveform	Oscilloscope	Exhibit <input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure		
JT4	Reducer Gear	Grease	Dust meter	0.021%wt <input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure	○	
		Backlash	Dial Gauge	0.4min <input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure		
		Vibration	Palpation	<input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure		
		Sound	Auscultation	<input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure		
		Waveform	Oscilloscope	Exhibit <input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure		
		Grease	Dust meter	0.011%wt <input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure		
JT5	Reducer Gear	Backlash	Dial Gauge	0.1min <input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure	○	
		Vibration	Palpation	<input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure		
		Sound	Auscultation	<input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure		
		Waveform	Oscilloscope	Exhibit <input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure		
		Grease	Dust meter	0.010%wt <input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure		
		JT6	Reducer Gear	Backlash		Dial Gauge
Vibration	Palpation			<input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure		
Sound	Auscultation			<input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure		
Waveform	Oscilloscope			Exhibit <input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure		
Grease	Dust meter			0.019%wt <input checked="" type="checkbox"/> Good <input type="checkbox"/> Caution <input type="checkbox"/> Failure		



# Controller diagnosis check Sheet



Yaskawa Robotics India Ltd.

Axis	Insulation resistance				Phase-to-phase resistance			FAN		
	Motor		Brake		R-S	S-T	R-T	○Good	Clean	×Stop
JT1	∞	MΩ	∞	MΩ	0.5 Ω	0.6 Ω	0.5 Ω	MOTOMAN	JT1	○
JT2	∞	MΩ	∞	MΩ	0.6 Ω	0.7 Ω	0.5 Ω		JT2	○
JT3	∞	MΩ	∞	MΩ	0.5 Ω	0.5 Ω	0.5 Ω		JT3	○
JT4	∞	MΩ	∞	MΩ	0.5 Ω	0.6 Ω	0.5 Ω	CONTROLLER	Inside	○
JT5	∞	MΩ	∞	MΩ	1.1 Ω	1.2 Ω	1.1 Ω		Back	○
JT6	∞	MΩ	∞	MΩ	0.9 Ω	1.2 Ω	1.1 Ω		Top	-
Ex-Axis 1	∞	MΩ	∞	MΩ	12.3 Ω	12.3 Ω	12.3 Ω		CPS	○
Ex-Axis 2	∞	MΩ	∞	MΩ	12.3 Ω	12.3 Ω	12.3 Ω		EX-Axis	○

Voltage				Physical STOP			
Controller		Manipulator		Manipulator		Controller	
Input	195.8 V	MOTOMAN(JT1~3)	3.7 V	JT1 Overrun	○	P.P	○
Exclusive Ground	Y phase	MOTOMAN(JT4~6)	3.7 V	JT2 Overrun	○	Controller	○
DC +24V	24.1 V	EX-Axis 1	3.6 V	JT3 Overrun	○	External	○
Battery	3.64 V	EX-Axis 2	3.6 V	Servo Lamp	○		

Physical									
Axis	Connector		Axis	Connector			Cable		Cable
	Power	Encoder		Power	Encoder				
JT1	○	○	JT5	○	○	JT1	○	1BC	○
JT2	○	○	JT6	○	○	JT2	○	2BC	○
JT3	○	○	Ex-Axis 1		○	JT3	○	3BC	○
JT4	○	○	Ex-Axis 2		○	P.P	○	4BC	○

**Comment**

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 Described below the results of the diagnosis.  
 -----  
 1) EXTERNAL AXIS POWER CABLE FOUND INSULATED.  
 -----  
 2) EXTERNAL AXIS POWER AND ENCODER CABLE NOT ROUTED PROPERLY, HENCE DAMAGE MAY HAPPEN.  
 -----  
 3) EXTERNAL AXIS BATTERY WAS NOT REPLACED BECAUSE OF THE BATTERY MISMATCH.  
 -----  
 4) BACKLASH MEASUREMENT OF JT6 AXIS RESULTS CAUTION.  
 -----  
 The above defect has been discovered.  
 -----  
 We've found that the robot is operating normally after the work has been completed.  
 -----  
 -----  
 -----  
 -----



# <Waveform measurement>



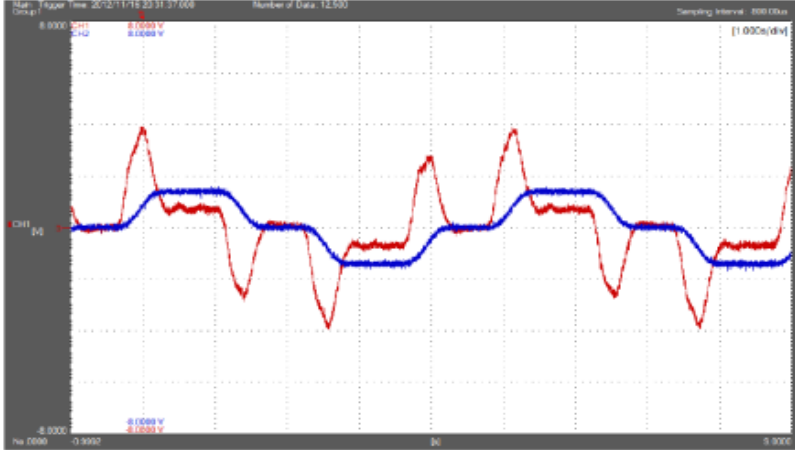
Yaskawa India Ltd. Robotics Division

ROBOT No. : EPH4000-J10  
Speed : 50%

Date : 16/11/2012  
CH1: Torque monitor

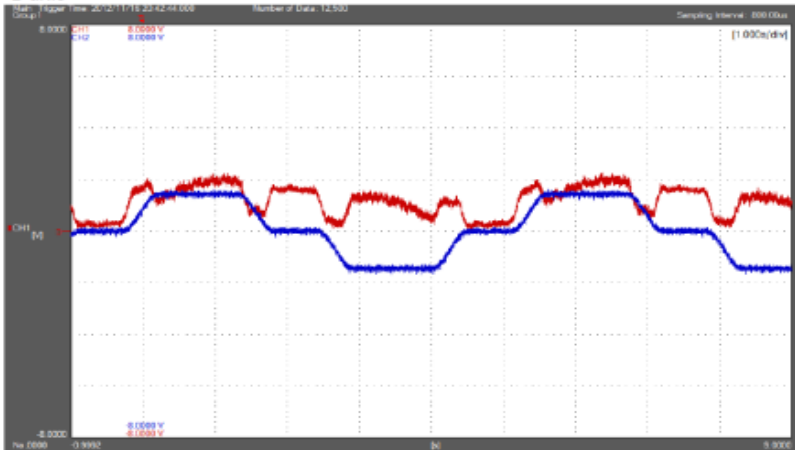
CH2: Speed feedback

## S-axis



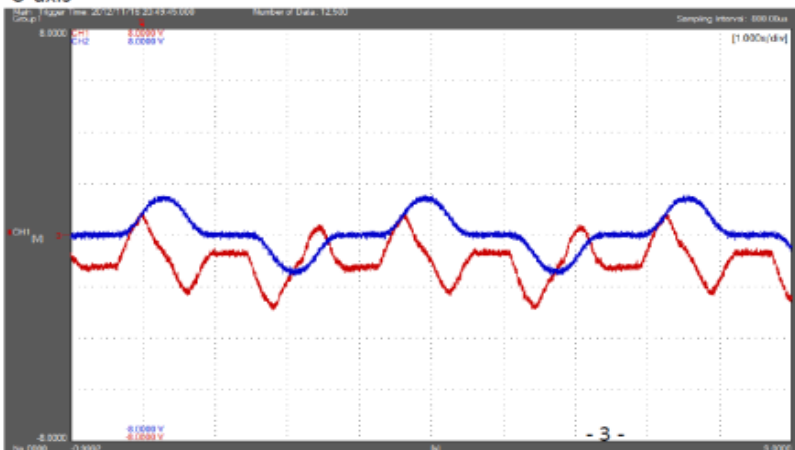
No.	Cursor(1)	Cursor(2)	Cursor(Off)
Relative Time	0.000	12.499	12.499
Measure Set	CH1	CH2	
Max	3.983 V	1.982 V	
Min	-3.972 V	-1.983 V	
Diff	1.592 V	59.516 V	

## L-axis



No.	Cursor(1)	Cursor(2)	Cursor(Off)
Relative Time	0.000	12.499	12.499
Measure Set	CH1	CH2	
Max	2.2738 V	1.982 V	
Min	18.7504 V	-1.983 V	
Diff	1.592 V	1.983 V	

## U-axis



No.	Cursor(1)	Cursor(2)	Cursor(Off)
Relative Time	0.000	12.499	12.499
Measure Set	CH1	CH2	
Max	898.3540	1.982 V	
Min	-2.9203 V	-1.983 V	
Diff	1.2621 V	713.586 V	

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