



# Toshiba TH180 Maintenance Manual

Industrial robot



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MAINTENANCE MANUAL

1.

Make sure that this instruction manual is delivered to the final user of Toshiba Machine's industrial robot.

2.

Before operating the industrial robot, read through and completely understand this manual.

3.

After reading through this manual, keep it nearby for future reference.

## Notice

September 2012

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NUMAZU, JAPAN

STE85390-0

# Industrial Robot

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### [Robotics Toshiba TH Series Instruction Manual](#)

Industrial robot (80 pages)

### [Industrial Equipment Toshiba TH650A Maintenance Manual](#)

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### [Industrial Equipment Toshiba CV-10HB Instruction Manual](#)

High-voltage vacuum contactors 12 13.8 kv-400a-5ka (21 pages)

## Summary of Contents for Toshiba TH180

**Page 1** MAINTENANCE MANUAL Notice Make sure that this instruction manual is delivered to the final user of Toshiba Machine's industrial robot. Before operating the industrial robot, read through and completely understand this manual. After reading through this manual, keep it nearby for future reference.

**Page 2** MAINTENANCE MANUAL Copyright 2012 by Toshiba Machine Co., Ltd. All rights reserved. No part of this document may be reproduced in any form without obtaining prior written permission from Toshiba Machine Co., Ltd. The information contained in this manual is

subject to change without notice to effect improvements.

[Page 3](#) MAINTENANCE MANUAL WARRANTY This machine is delivered to each customer only after it is inspected very carefully to make sure that it satisfies the Toshiba Machine's standard. Should it cause an inconvenience, we will guarantee as described below. Warranty period Toshiba Machine agrees to repair or replace as necessary all defective material or workmanship up to the period shown below, whichever comes first.

[Page 4](#) Please note that the warnings, cautions and other descriptions stipulated in this manual are only those which can be assumed by Toshiba Machine as of now. (\*1) The consumable parts signify the replacement parts for maintenance as listed in Section 4 of this manual.

[Page 5](#) MAINTENANCE MANUAL INTRODUCTION This manual describes the maintenance of the TH series industrial robots and controller. The maintenance and inspection are essential to maintain the robot performance for long years to prevent a trouble and improve the safe work. Before starting an actual operation, it is strongly recommended to read through this manual and draw up a maintenance schedule.

[Page 6](#) MAINTENANCE MANUAL CAUTIONS ON SAFETY This manual contains the important information on the robot and controller to prevent injury to the operators and persons nearby, to prevent damage to assets and to assure correct use. Make sure that the following details (indications and symbols) are well understood before reading this manual.

[Page 7](#) Disassembly prohibited • Always use the Toshiba Machine's designated spare parts when replacing the parts. • Maintenance and inspection should be performed regularly. Mandatory Otherwise, the system may malfunction or accidents will be caused.

## [Page 8: Table Of Contents](#)

MAINTENANCE MANUAL Table of Contents Page	Section 1 Maintenance Items .....	9
Maintenance Schedule .....	9 Items for Maintenance and Inspection .....	10
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## [Page 9: Section 1 Maintenance Items](#)

MAINTENANCE MANUAL Section 1 Maintenance Items Maintenance Schedule Maintenance comes in the two (2) types; daily inspection, and regular inspection and maintenance. For the regular inspection and maintenance, inspection items are added every 1,200 running hours. 3-month 1200 check 3-month 6-month 2400 check...

## [Page 10: Items For Maintenance And Inspection](#)

MAINTENANCE MANUAL Items for Maintenance and Inspection This section describes the items for maintenance and inspection. For the executing procedures, see the relevant paragraph listed in the table below. Daily inspection Item Inspection procedures Relevant Para. Cable ducts (1) Make sure that any cable duct will 2.3.1 not twist, bend or crack locally at the time of robot motion.

[Page 11](#) MAINTENANCE MANUAL Quarterly (every three (3)-month) inspection Item Inspection procedures Relevant Para. Lubricated state of Make sure that the ball screw spline (or 2.3.4 ball screw spline tool shaft) is greased completely and that no rust is developed on it. Semi-annual (every six (6)-month) inspection Item Inspection procedures...

[Page 12](#) MAINTENANCE MANUAL Overhaul (every five (5) years) Item Inspection procedures Relevant Para. Inspection of Inspect the flexible cables, reduction consumable parts gears, ball screw splines, timing belts and motors, then replace them when necessary. Battery Replace the RAM (controller) backup 3.3.3 replacement battery.

## [Page 13: Maintenance Tools](#)

If a fault has occurred or if repair is necessary, turn off the controller power and contact the Toshiba Machine Service Department. At this time, advise us of the details of the fault and the following information stated on the robot and controller.

## [Page 14: Modification](#)

MAINTENANCE MANUAL 1.4.3 Modification This robot and controller MUST NOT be modified without the consent from Toshiba Machine. CAUTION • The user must NEVER replace or modify parts other than those described in the instruction manual. Otherwise, the performance may deteriorate or faults or accidents will be caused.

## [Page 15: Section 2 Maintenance Of The Robot](#)

MAINTENANCE MANUAL Section 2 Maintenance of the Robot Cautions on Maintenance and Inspection When performing inspection or maintenance of the robot, strictly observe the following precautions to protect yourself and coworkers. DANGER • Be sure to turn off the main power switch of the controller before approaching the robot for maintenance and inspection.

[Page 16](#) Axis 2 Air piping 1 Air piping 4 Axis 3 Ball screw spline shaft Air piping 3 ENC: Encoder connector MOTOR: Motor power connector HAND: Hand I/O connector Axis 4 Axis 1 Fig. 2.2 Layout of robot mechanical components (TH180)

[Page 17](#) MAINTENANCE MANUAL Air piping 2 HAND: Hand I/O connector Air piping 1 Air piping 3 Air piping 4 Robot harness (cable duct) Axis 2 motor Clean vacuum air joint Axis 3 motor HAND: Hand I/O connector Axis 4 motor Ball screw spline shaft Axis 3 brake OFF switch MOTOR: Motor power connector Axis 3 belt...

## [Page 18: Robot Maintenance Procedures](#)

If the hexagon nut is loosened, tighten it with a pair of water pump pliers, etc. Hexagon nut Robot harness (cable duct) Hexagon nut Fig. 2.4 Cable duct layout (TH250A, TH350A) Robot harness (cable duct) Hexagon nut Hexagon nut Fig. 2.5 Cable duct layout (TH180)

[Page 19](#) MAINTENANCE MANUAL Robot harness (cable duct) Hexagon nut Hexagon nut Fig. 2.6 Cable duct layout (TH350A-T)

## [Page 20: Check Of Hand And Base For Mounting](#)

MAINTENANCE MANUAL 2.3.2 Check of Hand and Base for Mounting DANGER • Completely tighten the hand clamp bolt. Otherwise, the hand may drop or shift from a predetermined position. Check of hand set flange (option) for looseness Make sure, using a hexagonal wrench key, that the hexagon socket head cap screw of the hand set flange that is tightened to the ball screw spline is not loosened.

## [Page 21: Check Of Air Leakage](#)

Hand air joint 4xM5 Hand air tube 4xφ4 Hand air joint (for 4xφ4 tube) Fig. 2.9 Hand air piping (TH250A, TH350A) Hand air joint 4xM5 Hand air tube 4xφ4 Hand air joint (for 4xφ4 tube) Fig. 2.10 Hand air piping (TH180)

[Page 22](#) MAINTENANCE MANUAL Hand air joint Hand air joint (for 4xφ4 tube) Hand air tube Fig. 2.11 Hand air piping (TH350A-T)

## [Page 23: Lubrication Of Ball Screw Spline Shaft](#)

MAINTENANCE MANUAL 2.3.4 Lubrication of Ball Screw Spline Shaft To lubricate the ball screw spline shaft, use the following grease. • FOMBLIN grease (Ex. OT-20 made by Solvay Solexis) CAUTION • DO NOT mistake the type of grease. Otherwise, the robot performance may deteriorate or the robot may malfunction.

## [Page 24: Check Of Each Axis Drive Status](#)

Also check the timing belt for tension and adjust as necessary, referring to Table 2.1 below.  
Table 2.1 Robot model Axis Tension Unit mass Belt width Span [g/cm [mm] [mm] TH250A 48 ~ 64 0.22 49.5 TH350A 66 ~ 88 0.22 TH350A-T 44 ~ 50 0.025 TH180 96 ~ 110 0.040...

## [Page 25: Greasing Of Reduction Gears \(Th250A, Th350A, Th350A-T\)](#)

The type of grease nipple is A-M6F. As the axis 4 reduction gear of TH250A, TH350A and TH350A-T and axes 1, 2, 4 reduction gears of TH180 are grease-sealed, they need not be greased at all. Grease nipple for axis 2 reduction gear...



[Page 26](#) MAINTENANCE MANUAL Grease nipple for axis 2 reduction gear Grease nipple for axis 1 reduction gear Fig. 2.13 Greasing locations of reduction gears (TH350A-T) CAUTION • After all greases in the axis 1 and axis 2 reduction gears have been replaced, be sure to perform running-in for more than half an hour at 5 % speed override.

### [Page 27: Replacement Of Position Detector \(Or Encoder\) Batteries](#)

MAINTENANCE MANUAL 2.3.8 Replacement of Position Detector (or Encoder) Batteries To back up the data of the position detector attached to each motor, batteries are used. The battery life changes with the controller power OFF time. When the controller is operated at a rate of eight (8) hours per day, the calculated life is approximately two (2) years which may vary, however, with the operating condition, ambient temperature, etc.

[Page 28](#) MAINTENANCE MANUAL Error code Description Remarks 8-611 Axis1 Enc battery alarm 8-612 Axis2 Enc battery alarm 8-613 Axis3 Enc battery alarm 8-614 Axis4 Enc battery alarm 8-615 Axis5 Enc battery alarm If any of these errors is displayed, the battery power may be insufficient. Change the battery.

[Page 29](#) MAINTENANCE MANUAL DANGER • The batteries should be replaced while the power is turned on and emergency stop is effected only after the safety is assured. [Replacing procedures] Assure the safety, then press the EMERGENCY stop switch to emergency-stop the robot while the power is turned on. Remove the truss head screws 4×6 SUS or truss head screws 3×6 SUS from the robot base unit, and disengage the battery case or battery box.

[Page 30](#) MAINTENANCE MANUAL Battery box Truss head screw Truss head screw Batteries Fig. 2.15 Position detector battery set position (TH180) Truss head screw Battery case Batteries Section A-A Fig. 2.16 Position detector battery set position (TH350A-T)

### [Page 31: Disconnection Of Arm 2 Cover](#)

MAINTENANCE MANUAL 2.3.9 Disconnection of Arm 2 Cover First of all, provide the following tools. • Hexagonal wrench key • Plus driver Turn off the controller power before the operation. Remove the truss head screws 3×8 SUS and hexagon socket head cap screws 3×16 SUS as shown in Fig.

[Page 32](#) NEVER remodel or change this robot and controller without prior written permission from Toshiba Machine. Hexagon socket head cap screws 3×10 SUS Hexagon socket head cap screws 3×10 SUS Fig. 2.18 Disengaging Arm cover (TH180)

### [Page 33: Cautions On Robot Transport And Storage](#)

MAINTENANCE MANUAL Truss head screw Truss head screw Hexagon socket head cap screws Hexagon socket head cap screws Fig. 2.19 Disengaging Arm cover (TH350A-T) Cautions on Robot Transport and Storage When transporting or storing the robot, it is recommended to secure the robot in the shipment posture, using the attached clamp for transport.

### [Page 34: Position Detector Error](#)

MAINTENANCE MANUAL Home position data within one (1) full turn of motor: At home point setting operation of the robot (i.e., ZEROP operation and REORG operation), the data are written into the parameter file. As the data is backed up by batteries, the parameters should be loaded again from the attached system disk at replacement of the main control printed board.

### [Page 35: Restoration From Position Detector Error](#)

MAINTENANCE MANUAL Errors detected by the encoder itself include the battery voltage drop, error caused by temperature rise in the encoder, counter overflow, internal counter data inconsistency, etc. Among these errors, the error which occurs most frequently is the battery voltage drop which is caused by the absence of maintenance at specified change intervals (once a year) due to a long-term shutdown or cable breakage.

[Page 36](#) MAINTENANCE MANUAL (2) When a position detection error has occurred during normal operation with the mechanical connection position unchanged: For example, if the battery voltage drops, or after changing the battery or cables, the position detector may operate abnormally. In such a case, perform recovery operation according to the procedure described below.



ball screw spline groove (left) with the axis 4 home point match-mark, as shown in Fig. 4.2. If this is not possible, mark the reference position of each axis and jot down its coordinate beforehand.

[Page 50](#) This position is the axis 3 home position (Z = 0). TH250A : 160.5 mm TH350A : 160.5 mm TH180 : 162 mm TH350A-T: 160.5 mm If the zero point adjustment of Axis 3 cannot be done as shown above, mark the reference position and record the coordinates in advance.

[Page 51](#) MAINTENANCE MANUAL Setting of new home position data (To be set through teach pendant.) CAUTION • ZEROP operation seriously affects the current position of the robot, it is always protected. Please do not release the protection except when setting up the zero point position. Be sure to set the home point in the order of E4 →...

[Page 52](#) MAINTENANCE MANUAL Z E R O P O S I T O N E 1 : - 7 5 0 0 0 E 2 : 1 3 9 9 8 0 0 E 3 : 5 8 0 9 E 4 : 2 9 0 0 0 0 E 5 : When the “↓”...

[Page 53](#) MAINTENANCE MANUAL PROGRAM ZERO SPEED=30 MOVEA 3,100 MOVEA 1,0 MOVEA 2,0 MOVEA 3,0 MOVEA 4,0 STOP Data saving Save the “MACHINE.PAR” file stored in the controller to another media. Connect the personal computer and controller using TSPC (option), insert the system disk into the floppy disk unit and save the “MACHINE.PAR”...

### [Page 54: Section 3 Maintenance Of Controller](#)

MAINTENANCE MANUAL Section 3 Maintenance of Controller Cautions on Maintenance and Inspection When performing maintenance and inspection of the controller, follow the items given below so that the work can be carried out safely. CAUTION • Before removing the controller cover for maintenance or inspection, be sure to turn off the main power switch of the controller.

### [Page 55: Layout Of Controller Parts](#)

MAINTENANCE MANUAL Layout of Controller Parts X8GN X8GB (X8GI) X8G2, G3 X8GC PS1 (P24V) X8GL PS2 (P5V) Fig. 3.1 Layout of controller parts Part name Descriptions P24V output switching power supply P5V output switching power supply X8GC Main control printed board X8GN (X8GI) I/O output printed board X8GL...

### [Page 56: Maintenance Procedures](#)

MAINTENANCE MANUAL Maintenance Procedures 3.3.1 Check of Controller Air Vent Holes If the air vent holes are blocked, the controller may overheat and malfunction. To avoid this, perform check on the air vent holes to make sure that air is flowing freely through them.

### [Page 57: Check Of Safety Devices For Function](#)

MAINTENANCE MANUAL 3.3.2 Check of Safety Devices for Function Make sure that the EMERGENCY stop pushbutton switches equipped on the control panel and teach pendant work properly. Also make sure that the safety devices controlled by the external operation input signals work correctly. □...

[Page 58](#) MAINTENANCE MANUAL Turn the EMERGENCY switch [2] clockwise and make sure that the same switch turns off. Make sure that the EMERGENCY STOP switch [6] provided on the teach pendant functions properly. To turn on the servo power, press the SERVO ON switch [4] on the teach pendant while keeping the ENABLE switch at the neutral position.

### [Page 59: Battery Replacement](#)

MAINTENANCE MANUAL At this time, make sure that the EMERGENCY STOP switch [5] remains depressed. Turn the EMERGENCY STOP switch [6] clockwise and make sure that the same switch turns off. Make sure that the safety devices controlled by the external operation signals work properly.

[Page 60](#) (5) years. Only the battery shown in Table 3.2 should be used. As this is an exclusive battery, contact Toshiba Machine at order entry. [Battery replacement procedures] If the battery is to be kept removed for more than one (1) minute, copy all programs and various parameters stored in the internal memory to the personal computer.

## [Page 61: Replacement Of Switching Power Supply Unit](#)

MAINTENANCE MANUAL Prepare a new battery, then remove the cover from the controller. Disconnect the battery connector from CN3 of the X8GC printed board, and remove the battery from the TY-RAP securing the battery. (For the battery position, see Fig. 3.5.) Set the new battery immediately.

[Page 62](#) MAINTENANCE MANUAL Remove the cover from the controller. Remove the two (2) screws securing the switching power supply (PS1). Fig. 3.6 Lower part of the TS3000 left side Mount the new power supply unit on the controller by tightening the screws. (At 2 positions) Attach the cover to the controller.

## [Page 63: Replacement Of Fuse \(X8Gn, X8Gi Printed Board\)](#)

MAINTENANCE MANUAL 3.3.5 Replacement of Fuse (X8GN, X8GI Printed Board) If the current exceeding the specified current has run through the I/O unit, the fuse in the front of TS3000 controller is blown out. If the alarm saying "I/O Fuse Broken (8-273)"...

## [Page 64: Replacement Of Output Ics \(X8Gn, X8Gi Printed Board\)](#)

MAINTENANCE MANUAL Mount the fuse holder. (Push and turn the holder to the right by 90°. It will be locked.) 1) Turn on the controller main power and make sure that no error will occur. 3.3.6 Replacement of Output ICs (X8GN, X8GI Printed Board) If the current exceeding the specified current has run through the output unit, the ICs on the X8GC, X8GN (X8GI) printed board is damaged.

[Page 65](#) Connector: SYSTEM Main printed board (X8GC) Name of board Type of IC  
Manufacturer X8GN TD62082AP Toshiba Corp. X8GI M54562WP Mitsubishi Electric  
[Replacement procedures] Turn off the controller main power. Remove the cover from the controller. Disconnect all connectors connected to the X8GC, X8GN (X8GI) printed board in the controller.

## [Page 66: Section 4 Maintenance Replacement Parts](#)

Solvay Solexis 2.5 kg CAUTION • With the exception of the grease, all parts listed above are custom-made to Toshiba Machine specifications. Contact Toshiba Machine at order entry. • NEVER replace the parts other than the batteries by the user.

[Page 67](#) Solvay Solexis 2.5 kg CAUTION • With the exception of the grease, all parts listed above are custom-made to Toshiba Machine specifications. Contact Toshiba Machine at order entry. • NEVER replace the parts other than the batteries by the user.

## [Page 68: List Of Mechanical Replacement Parts For Maintenance](#)

MAINTENANCE MANUAL List of Mechanical Replacement Parts for Maintenance  
TH250A/TH350A/TH350A-T Part name Type Q'ty Remarks PS1 (Switching power LEB100F-0524 supply) Main power switch IR-11-A8-25-1BF Lithium battery ER6C WK27 51NM030H X8GC printed Fuse board X8GCA (Main control) Y610A4000 Type N X8GCA (Main control) Y610A4020 Type P X8GNA (I/O printed board)

[Page 69](#) MAINTENANCE MANUAL TH180 Part name Type Q'ty Remarks PS1 (Switching power LEB100F-0524 supply) Main power switch IR-11-A8-25-1BF Lithium battery ER6C WK27 51NM030H X8GC printed Fuse board X8GCA (main control) Y610A4000 Type N X8GCA (main control) Y610A4020 Type P X8GNA (I/O board)

This manual is also suitable for:

[Th250aTh350a/ts3000](#)

