YASKAWA Cockpit
Torque Sensor Monitor
INSTRUCTIONS

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

Please have the following information available when contacting Yaskawa Customer Support:
- System
- Primary Application
- Software Version (Located on Programming Pendant by selecting: {Main Menu} - {System Info} - {Version})
- Robot Serial Number (Located on robot data plate)
- Robot Sales Order Number (Located on controller data plate)

Part Number: 188054-1CD
Revision: 0
DANGER

• This manual describes details on the functions of YASKAWA Cockpit add-on application software including settings for the controller to use YASKAWA Cockpit add-on application software. Read this manual carefully and be sure to understand its contents before handling the controller. Any matter, including operation, usage, measures, and an item to use, not described in this manual must be regarded as “prohibited” or “improper”.

• General information related to safety are described in “Chapter 1. Safety” of the YRC1000micro/YRC1000/DX200/DX100/RM100 INSTRUCTIONS. To ensure correct and safe operation, carefully read “Chapter 1. Safety” of the YRC1000micro/YRC1000/DX200/DX100/RM100 INSTRUCTIONS.

CAUTION

• In some drawings in this manual, protective covers or shields are removed to show details. Make sure that all the covers or shields are installed in place before operating this product.

• YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids the product warranty.

• Software described in this manual is supplied against licensee only, with permission to use or copy under the conditions stated in the license. No part of this manual may be copied or reproduced in any form without written consent of YASKAWA.

NOTICE

• 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.
Notes for Safe Operation

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

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

**DANGER**
Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. Safety Signs identified by the signal word DANGER should be used sparingly and only for those situations presenting the most serious hazards.

**WARNING**
Indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury. Hazards identified by the signal word WARNING present a lesser degree of risk of injury or death than those identified by the signal word DANGER.

**CAUTION**
Indicates a hazardous situation, which if not avoided, could result in minor or moderate injury. It may also be used without the safety alert symbol as an alternative to “NOTICE”.

**NOTICE**
NOTICE is the preferred signal word to address practices not related to personal injury. The safety alert symbol should not be used with this signal word. As an alternative to “NOTICE”, the word “CAUTION” without the safety alert symbol may be used to indicate a message not related to personal injury.

Even items described as “CAUTION” may result in a serious accident in some situations. At any rate, be sure to follow these important items.

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

1 Introduction ..................................................................................................................................... 1-1  
   1.1 Torque Sensor Monitor ............................................................................................................ 1-1  
   1.2 Related Manuals .................................................................................................................... 1-1  
   1.3 Terms ..................................................................................................................................... 1-2  
   1.4 System Configuration ............................................................................................................ 1-3  
   1.5 Provided Data ....................................................................................................................... 1-3  
   1.6 Operating Environment ........................................................................................................ 1-4  
   1.7 Issuing and Setting the License .............................................................................................. 1-4  
   1.8 Precautions .......................................................................................................................... 1-4  
      1.8.1 Number of Robot Controller Connections ............................................................ 1-4  

2 How to Use the Torque Sensor Monitor ....................................................................................... 2-1  
   2.1 Overview ............................................................................................................................... 2-1  
   2.2 Items to Check before Setup ................................................................................................ 2-1  
   2.3 Installing the DA Application Software ................................................................................. 2-2  
   2.4 Installing the DW Application Software ................................................................................. 2-5  
   2.5 Reconfiguring the Torque Sensor Home Positions ............................................................... 2-5  
   2.6 Adding the Job File ............................................................................................................... 2-6  

3 Application Software Configuration ............................................................................................ 3-1  

4 RobotDC ......................................................................................................................................... 4-1  
   4.1 RobotDC Settings ................................................................................................................... 4-1  
   4.2 Executing RobotDC ................................................................................................................. 4-3  
   4.3 Exiting RobotDC ..................................................................................................................... 4-3  

5 DA Application Software (DA App) ........................................................................................... 5-1  
   5.1 When the DA Application Software Analyzes Data ............................................................ 5-1  
   5.2 Executing the DA Application Software ................................................................................ 5-1  
   5.3 Executing the Job .................................................................................................................. 5-3  
   5.4 Exiting the DA Application Software .................................................................................... 5-3  

6 DW Application Software (DW App) .......................................................................................... 6-1  
   6.1 Executing the DW Application Software ............................................................................... 6-1  
   6.2 Viewing the Data Analysis Results ......................................................................................... 6-1  
      6.2.1 Torque Sensor Monitor Page .................................................................................... 6-2
Contents

6.2.2 Data Graph for the Axis External Force Torque Estimates ........................................ 6-3
  6.2.2.1 Basic Graph ........................................................................................................ 6-3

6.2.3 Data Graph for the TCP Estimates ........................................................................ 6-4
  6.2.3.1 Basic Graph ........................................................................................................ 6-4

6.2.4 Graph Display Options ............................................................................................ 6-5

6.2.5 Maintenance Function ............................................................................................. 6-6

6.3 Exiting the DW Application Software ......................................................................... 6-7

7 Troubleshooting ............................................................................................................ 7-1

8 Appendix ....................................................................................................................... 8-1
  8.1 RobotDC, DA App, and DW App Timing Chart .......................................................... 8-1
1 Introduction

1.1 Torque Sensor Monitor

The Torque Sensor Monitor automatically collects information about the torque sensors on collaborative robots, and then it analyzes that data, displays it, and uses it for maintenance management.

This function allows torque sensor information to be checked on a computer in addition to the programming pendant, which facilitates remote monitoring of robots and checking the necessity of maintenance.

The Torque Sensor Monitor has the following two functions:

• External Force Monitor: External force values from the torque sensors can be checked on the web.

• Maintenance Function: Monitors the external force torque estimate of each axis at a regular interval and provides notification for when to reconfigure the torque sensor home position.

1.2 Related Manuals

Manuals related to this manual are given next. Refer to these manuals when reading this manual.

<table>
<thead>
<tr>
<th>Manual Name</th>
<th>Manual No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>YASKAWA Cockpit INSTRUCTIONS</td>
<td>HW1485838</td>
<td>Describes in detail how to install and operate YASKAWA Cockpit.</td>
</tr>
<tr>
<td>YRC1000/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>YRC1000micro</td>
<td>HW1484764</td>
<td>Describes the functions that support collaborative operation. Refer to this</td>
</tr>
<tr>
<td>Collaborative Operation</td>
<td></td>
<td>manual for the procedure to reconfigure torque sensor home positions.</td>
</tr>
<tr>
<td>Instructions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*For the manipulators and robot controllers, refer to the manuals for your particular models.
# Terms

The terms associated with this manual are given next.

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RobotDC</td>
<td>The standard data collection function in YASKAWA Cockpit. RobotDC collects the specified data from the robot controller and stores in the YASKAWA Cockpit database. The stored data is used by DA App and DW App. DC is an abbreviation for data collection.</td>
</tr>
<tr>
<td>DA Application Software</td>
<td>DA App analyzes and processes the data collected by RobotDC and stores the analyzed results in the YASKAWA Cockpit database. The stored data is used by DW App. DA is an abbreviation for data analysis.</td>
</tr>
<tr>
<td>DW Application Software</td>
<td>DW App displays the analyzed results stored by DA App in the web browser. DW is an abbreviation for data window.</td>
</tr>
<tr>
<td>Registers</td>
<td>Refers to the register area held in the robot controller.</td>
</tr>
<tr>
<td>Axis external force torque estimate</td>
<td>Refers to the theoretical external force applied externally to the torque sensor of each axis. The unit is [N·m]. This data can be collected only from collaborative robots.</td>
</tr>
<tr>
<td>TCP</td>
<td>Refers to the center point of the tool connected to the tip of the manipulator. TCP is an abbreviation for tool center point.</td>
</tr>
<tr>
<td>TCP external force estimate</td>
<td>Refers to the theoretical external force and moment applied externally to the TCP. The unit is [N] for external force and [N·m] for moment. This data can be collected only from collaborative robots.</td>
</tr>
<tr>
<td>PFL</td>
<td>For a manipulator which has collaborative operation enabled, this function stops the manipulator according to the external force which is applied to it. PFL is an abbreviation for power and force limiting.</td>
</tr>
<tr>
<td>Torque sensor</td>
<td>Sensor for the collaborative robot to detect external force. This function monitors these sensors and displays the data.</td>
</tr>
<tr>
<td>Reconfiguring the torque sensor home position</td>
<td>If the manipulator is used incorrectly, there is a chance that the home position of a torque sensor may deviate. In this case, the home position must be reconfigured (calibrated).</td>
</tr>
<tr>
<td>Deviation amount</td>
<td>The amount of deviation in the torque sensor home position that occurs over time after the home position was set.</td>
</tr>
</tbody>
</table>
1.4 System Configuration

1) For the specifications of the Ethernet cable, refer to chapter 2.4 "Connecting the Controller and the Personal Computer for YCP" in "YASKAWA Cockpit INSTRUCTIONS (HW1485838)".

1.5 Provided Data

The provided DVD contains the following data.

- DA App installer
- DW App file (DW App zip file)
- RobotDC import file (JSON file)
- SENSORTEST.JBI
- Instruction manual PDF file (this document)
1.6 Operating Environment

The following environment is required to use the Torque Sensor Monitor.

<table>
<thead>
<tr>
<th>Item</th>
<th>Operating Conditions</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>YASKAWA Cockpit</td>
<td>Version 1.1.0 or higher.</td>
<td>You can find the version number at the top left of the window when YASKAWA Cockpit starts.</td>
</tr>
<tr>
<td>Computer</td>
<td>• YASKAWA Cockpit is installed on the computer. • YASKAWA Cockpit can run in the operating environment.</td>
<td>For the YASKAWA Cockpit operating environment, refer to chapter 1.2 &quot;System Requirements to Use YASKAWA Cockpit&quot; in &quot;YASKAWA Cockpit INSTRUCTIONS (HW1485838)&quot;.</td>
</tr>
<tr>
<td>Web browser</td>
<td>A web browser that is compatible with YASKAWA Cockpit.</td>
<td>For web browsers that are compatible with YASKAWA Cockpit, refer to chapter 1.3 &quot;Supported Web Browsers&quot; in &quot;YASKAWA Cockpit INSTRUCTIONS (HW1485838)&quot;.</td>
</tr>
<tr>
<td>Collaborative robot</td>
<td>Collaborative operation is enabled.</td>
<td>This function can be used only when the robot is in collaborative mode. Confirm that the collaborative operation lamp on the robot is lit.</td>
</tr>
</tbody>
</table>

1.7 Issuing and Setting the License

To use the Torque Sensor Monitor, a license must be issued and set in YASKAWA Cockpit.

Refer to the following sections in "YASKAWA Cockpit INSTRUCTIONS (HW1485838)".

• Issuing the license: Chapter 9 "License Request Tool"
• Setting the license: Chapter 4.2 "License Manager"

1.8 Precautions

1.8.1 Number of Robot Controller Connections

This add-on app can collect data from 10 robot controllers. However, there may be limits on the number of robot controller connections due to the number of other device connections and the operation of different add-on apps.

Contact your YASKAWA representative for more information.
2 How to Use the Torque Sensor Monitor

2.1 Overview

Use the Torque Sensor Monitor with the following procedure. For more information, refer to the relevant sections.

2.2 Items to Check before Setup

- Log in to the computer using an administrator account.
- Confirm that YASKAWA Cockpit is installed on the computer. For how to install YASKAWA Cockpit, refer to chapter 2.1 "Installation of the YCP Software" in "YASKAWA Cockpit INSTRUCTIONS (HW1485838)".
- Ensure that the system drive of the computer has 300 MB or more free space.
2 How to Use the Torque Sensor Monitor
2.3 Installing the DA Application Software

1. Exit any running applications.
2. Insert the installation DVD into the appropriate drive on the computer.
3. Open the TorqueSensorMonitor folder and DA folder, and then double-click TorqueSensorMonitor.exe.
   The Select Setup Language window will be displayed.
4. Select the language and click "OK".

The License Agreement window will be displayed.

5. Check the displayed information and select "I accept the agreement", and then click "Next".

The Select Additional Tasks window will be displayed.

6. Select the required additional tasks and click "Next".

The Ready to Install window will be displayed.
2. How to Use the Torque Sensor Monitor

2.3 Installing the DA Application Software

7. Check the displayed information and click "Install".

The Setup Wizard Completed window will be displayed.

8. Click "Finish".
When the DA App executable file is installed, the "Run this program as an administrator" check box is selected by default.

Do not change this setting.

If the check box is cleared, DA App will not perform analysis processing and the analysis results will not be displayed in DW App.

*Use the following procedure to check the above setting.
1. Right-click the DA App executable file (or the shortcut icon on the desktop) and select "Properties". The Properties window will be displayed.
2. Select the "Compatibility" tab.
3. Confirm that the "Run this program as an administrator" check box is selected.
2.4 Installing the DW Application Software

1. Log in to YASKAWA Cockpit.
2. Click Settings - Initial Settings ( ) - Add On ( ).

   The Add On page will be displayed.
3. Click “Add”.

   The setting window will be displayed.
4. Set the following items.
   • UI Name and Description\(^1\) ( ) : Enter “TorqueMonitor”.
   • Zip File/Bin File ( ) :
     On the installation DVD, in the TorqueSensorMonitor folder and DW folder, select TorqueMonitor.zip.
   • Register UI to ( ) :
     Select the factory to which the Torque Sensor Monitor will be applied.

\(^1\) UI Name and Description can be set to any desired name, but there are restrictions on the length and characters that can be used.

   For more information, refer to chapter 4.1.9 "Add On' Settings" in "YASKAWA Cockpit INSTRUCTIONS (HW1485838)".

5. Click “Add” ( ) .

2.5 Reconfiguring the Torque Sensor Home Positions

To use the Maintenance Function, first reconfigure the torque sensor home positions. For how to reconfigure the torque sensor home positions, refer to chapter 5 "Daily Inspection Items" in "YRC1000/YRC1000micro Collaborative Operation Instructions (HW1484764)".
2 How to Use the Torque Sensor Monitor
2.6 Adding the Job File

The Maintenance Function analyzes data and provides notification of the results when the SENSORTEST.JBI job file located on the installation DVD is running.

To check the amount of deviation in the torque sensor home positions, add this job file to the robot controller in advance and run it. To load the job file, refer to chapter 7 "External Memory Device" in the operator's manual for your controller.

The details of SENSORTEST.JBI are given next.

**NOTE**
Do not modify this job file. If this job is modified, the deviation in the torque sensor home positions can no longer be checked accurately.

<table>
<thead>
<tr>
<th>Details of SENSORTEST.JBI</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOP</td>
</tr>
<tr>
<td>TIMER= 3.0</td>
</tr>
<tr>
<td>TIMER= 0.1</td>
</tr>
<tr>
<td>END</td>
</tr>
</tbody>
</table>

'Time for stopping the robot
'Time for checking
3 Application Software Configuration

The following diagram gives the application software configuration of the Torque Sensor Monitor.

The following chapters provide information about the three pieces of application software (RobotDC, DA App, and DW App) that are required to use the Torque Sensor Monitor.
4 RobotDC

4.1 RobotDC Settings

RobotDC collects data from the robot controller that is required for the Torque Sensor Monitor.

* RobotDC is the standard data collection function in YASKAWA Cockpit.

4.1 RobotDC Settings

Use the following procedure to import the JSON file.

The basic settings can be installed by importing this data.

1. Log in to YASKAWA Cockpit.
2. Click Settings - Robot Controller Settings ( ) - Data Collection ( ).

The Data Collection page will be displayed.

3. Click "Add".

The Channel Setting page will be displayed.

4. Click "Import".

5. Select the TorqueMonitor.json file in the DC folder in the TorqueSensorMonitor folder stored on the installation DVD, and click "Open".

6. Set the RobotDC items as given in the following table.

<table>
<thead>
<tr>
<th>Item</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting Name</td>
<td>TorqueMonitor</td>
</tr>
<tr>
<td>Sampling Time</td>
<td>8 [ms]</td>
</tr>
<tr>
<td>Collection Time</td>
<td>00:00 to 24:00</td>
</tr>
</tbody>
</table>

1) The collection time can be changed. Change it according to how the function will be used.
4. RobotDC
4.1 RobotDC Settings

7. Confirm that the RobotDC channel settings have been set as given in the following table.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Signal Selection</th>
<th>Database Name¹</th>
<th>Axis</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Register 310</td>
<td>AxisExt_S</td>
<td></td>
<td></td>
<td>R1 S-axis external force torque estimate</td>
</tr>
<tr>
<td>Register 311</td>
<td>AxisExt_L</td>
<td></td>
<td></td>
<td>R1 L-axis external force torque estimate</td>
</tr>
<tr>
<td>Register 312</td>
<td>AxisExt_U</td>
<td></td>
<td></td>
<td>R1 U-axis external force torque estimate</td>
</tr>
<tr>
<td>Register 313</td>
<td>AxisExt_R</td>
<td></td>
<td></td>
<td>R1 R-axis external force torque estimate</td>
</tr>
<tr>
<td>Register 314</td>
<td>AxisExt_B</td>
<td></td>
<td></td>
<td>R1 B-axis external force torque estimate</td>
</tr>
<tr>
<td>Register 315</td>
<td>AxisExt_T</td>
<td></td>
<td></td>
<td>R1 T-axis external force torque estimate</td>
</tr>
<tr>
<td>Register 320</td>
<td>TcpExt_Fx</td>
<td></td>
<td></td>
<td>R1 TCP external force estimate (Fx)</td>
</tr>
<tr>
<td>Register 321</td>
<td>TcpExt_Fy</td>
<td></td>
<td></td>
<td>R1 TCP external force estimate (Fy)</td>
</tr>
<tr>
<td>Register 322</td>
<td>TcpExt_Fz</td>
<td></td>
<td></td>
<td>R1 TCP external force estimate (Fz)</td>
</tr>
<tr>
<td>Register 323</td>
<td>TcpExt_Mx</td>
<td></td>
<td></td>
<td>R1 TCP external force estimate (Mx)</td>
</tr>
<tr>
<td>Register 324</td>
<td>TcpExt_My</td>
<td></td>
<td></td>
<td>R1 TCP external force estimate (My)</td>
</tr>
<tr>
<td>Register 325</td>
<td>TcpExt_Mz</td>
<td></td>
<td></td>
<td>R1 TCP external force estimate (Mz)</td>
</tr>
<tr>
<td>Register 326</td>
<td>TcpExt_F</td>
<td></td>
<td></td>
<td>R1 TCP external force estimate (F)</td>
</tr>
</tbody>
</table>

¹ Correctly enter the strings for the database names paying particular attention to capitalization and the placement of underscores and spaces. If the wrong database name is entered, the DW App information may not be correctly displayed.

8. Click "Register".
4.2 Executing RobotDC

After you have completed the RobotDC settings, use the following procedure to start data collection.

1. Select the icon from the running tasks to display the Robot Data Collection window (① in the following diagram).

2. Confirm that the robot controller from which data will be collected is displayed in the window (①). (② in the following diagram)

3. Click "Start Measurement" (③ in the following diagram). ¹)

¹) If the robot controller from which data will be collected is not displayed or if the data cannot be obtained even though the "Start Measurement" was clicked, check chapter 6 "Data Collection Settings" in "YASKAWA Cockpit INSTRUCTIONS (HW1485838)" and change the settings as necessary.

Data collection will start.

To continue data collection, do not click "Measurement Stop" or "×" at the top right of the window. This will exit RobotDC and data will no longer be collected.

4.3 Exiting RobotDC

Keep RobotDC running while using YASKAWA Cockpit.

RobotDC will be exited automatically when YASKAWA Cockpit is exited.

For how to exit YASKAWA Cockpit, refer to chapter 3.1.1.2 "Batch Stop" in "YASKAWA Cockpit INSTRUCTIONS (HW1485838)".
5 DA Application Software (DA App)

Using the data collected by RobotDC, DA App calculates the amount of deviation in the torque sensors from the torque estimates of each axis when SENSORTEST.JBI is running.

DA App then stores the torque estimates for each axis, deviation amounts, and torque sensor home position reconfigure judgments in the database.

5.1 When the DA Application Software Analyzes Data

In DA App, the analysis processing holds the data within approximately 5 minutes from the current time. For this reason, a delay of approximately 5 minutes occurs when the information in DW App is at its most recent.

5.2 Executing the DA Application Software

1. Double-click "TorqueSensorMonitor.exe".
   Use the computer on which DA App was installed and click "Start ( )" > "YASKAWA" > "TorqueSensorMonitor".
   DA App can also be opened from a desktop shortcut if one was created during the installation process.

   The Login window will be displayed.
2. Select the language, enter the user name and password set in YASKAWA Cockpit, and then click "OK".  

![Login Window]

*The following error message will be displayed if the user name or password is wrong or if YASKAWA Cockpit is not running.

![Error Window]

3. When you have finished logging in, the following window will be displayed, and torque sensor home position monitoring will start.

![Monitor Window]

*Always ensure that the torque sensor home positions are reconfigured before starting DA App for the first time. For how to reconfigure the torque sensor home positions, refer to chapter 5 "Daily Inspection Items" in "YRC1000/YRC1000micro Collaborative Operation Instructions (HW1484764)".*
5.3 Executing the Job

The Maintenance Function analyzes data and provides notification of the results when the SENSORTEST.JBI job file located on the installation DVD is running. SENSORTEST.JBI must be run to check the deviation amounts of the torque sensor home positions. For how to add the file, refer to chapter 2.6 “Adding the Job File”.

Use and execute SENSORTEST.JBI periodically.

5.4 Exiting the DA Application Software

To exit DA App, click "×" at the top right of the DA App window.

When the following message is displayed, click "Yes" to close the window.
6 DW Application Software (DW App)

DW App displays the list of data that includes the external force torque estimates for each axis and TCP external force estimates. The current deviation information and reconfigure notifications for torque sensor home positions can also be received.

6.1 Executing the DW Application Software

1. Log in to YASKAWA Cockpit.
   The page that shows the factories registered in YASKAWA Cockpit will be displayed.
2. Click "TorqueMonitor".

1) If multiple add-on apps are installed for the factory, "TorqueMonitor" may be displayed on the second or lower lines.
   Scroll the page to check the second or lower lines if "TorqueMonitor" is not displayed.

6.2 Viewing the Data Analysis Results

A minimum of 10 minutes may be required until the analysis results are reflected in DW App. For more information, refer to chapter 5.1 "When the DA Application Software Analyzes Data".

You can view the torque sensor information registered in YASKAWA Cockpit and whether or not maintenance is required.

This section describes the items that are displayed.
6 DW Application Software (DW App)
6.2 Viewing the Data Analysis Results

6.2.1 Torque Sensor Monitor Page

The following page is displayed when DW App is executed. You can check the registered information about the robot controller and the time when the deviation amount was last recorded.

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>• Factory</td>
<td>These columns display the registered information about the robot controller.</td>
</tr>
<tr>
<td></td>
<td>• Line</td>
<td>This is the robot controller information registered in chapter 4.3 “Robot</td>
</tr>
<tr>
<td></td>
<td>• Cell</td>
<td>Controller Settings” in “YASKAWA Cockpit INSTRUCTIONS”.</td>
</tr>
<tr>
<td></td>
<td>• Controller</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Mechanism</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Axis External Force Torque Monitor</td>
<td>Click the icon to display the data graph of external force torque estimates</td>
</tr>
<tr>
<td></td>
<td></td>
<td>for each robot. For more information, refer to chapter 6.2.2 “Data Graph</td>
</tr>
<tr>
<td></td>
<td></td>
<td>for the Axis External Force Torque Estimates”.</td>
</tr>
<tr>
<td>3</td>
<td>TCP External Force Monitor</td>
<td>Click the icon to display information about the deviation amounts of torque</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sensor home positions. For more information, refer to chapter 6.2.3 “Data</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Graph for the TCP Estimates”.</td>
</tr>
<tr>
<td>4</td>
<td>Calibration Monitor</td>
<td>Click the icon to display information about the deviation amounts of torque</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sensor home positions. For more information on the deviation amounts, refer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>to chapter 6.2.5 “Maintenance Function”.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>🚨 will be displayed if reconfiguring a torque sensor home position is judged</td>
</tr>
<tr>
<td></td>
<td></td>
<td>as required for the deviation amount.</td>
</tr>
<tr>
<td>5</td>
<td>Final Confirm Date</td>
<td>This column displays the last time at which the deviation amount was</td>
</tr>
<tr>
<td></td>
<td></td>
<td>measured.</td>
</tr>
</tbody>
</table>

![Torque Sensor Monitor](image)
6.2.2 Data Graph for the Axis External Force Torque Estimates

6.2.2.1 Basic Graph

Click the \( \text{\textregistered} \) icon under the Axis External Force Torque Monitor column on the Torque Sensor Monitor page to display the following graph.

This section describes the items.

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td>Factory Line Cell Controller</td>
<td>Information about the robot controller displayed on the graph.</td>
</tr>
<tr>
<td>①</td>
<td>Job Alarm</td>
<td>This column displays the job file name on the robot. The alarm number is also displayed if an alarm occurs.</td>
</tr>
<tr>
<td>②</td>
<td>Graph</td>
<td>This area displays the graph of external force torque estimates for each axis. The vertical axis shows the external force estimate for each axis, and the horizontal axis shows the time that the data was recorded. Click the axis labels on the right side of the graph to show and hide the corresponding graph.</td>
</tr>
</tbody>
</table>

For the options at the top right of the graph, refer to chapter 6.2.4 “Graph Display Options”.

*The graph is automatically updated with the most recent collected data in the database every 30 s.*
6.2.3 Data Graph for the TCP Estimates

6.2.3.1 Basic Graph

Click the icon under the External Force Monitor column on the Torque Sensor Monitor page to display the following graph.

This section describes the items.

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td>Factory, Line, Cell, Controller</td>
<td>Information about the robot controller displayed on the graph.</td>
</tr>
<tr>
<td>②</td>
<td>Job, Alarm</td>
<td>This column displays the job file name on the robot. The alarm number is also displayed if an alarm occurs.</td>
</tr>
<tr>
<td>③</td>
<td>Change graph display button</td>
<td>You can change the display between the TCP external force estimates graph and TCP moment estimates. The initial setting is TCP external force estimates.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>This area graphs the data selected with ②. The vertical axis shows the data values, and the horizontal axis shows the time that the data was recorded. Click the axis labels on the right side of the graph to show and hide the corresponding graph.</td>
</tr>
</tbody>
</table>

For the options at the top right of the graph, refer to chapter 6.2.4 “Graph Display Options”.

*The graph is automatically updated with the most recent collected data in the database every 30 s.
6 DW Application Software (DW App)
6.2 Viewing the Data Analysis Results

6.2.4 Graph Display Options

The following icons will be displayed when the cursor is moved on the graph.

Various options can be used by selecting the icons.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>![icon]</td>
<td>Enlarges the selected area.</td>
</tr>
<tr>
<td>![icon]</td>
<td>Moves the graph.</td>
</tr>
<tr>
<td>![icon]</td>
<td>Enlarges the graph.</td>
</tr>
<tr>
<td>![icon]</td>
<td>Shrinks the graph.</td>
</tr>
<tr>
<td>![icon]</td>
<td>Resets the graph scaling.</td>
</tr>
<tr>
<td>![icon]</td>
<td>Resets all effects.</td>
</tr>
<tr>
<td>![icon]</td>
<td>Shows the vertical and horizontal axis guides on the graph. The guides are displayed as dashed lines.</td>
</tr>
<tr>
<td>![icon]</td>
<td>Shows the graph values. The value (time and numeric value) is displayed for the axis on which the cursor was placed.</td>
</tr>
<tr>
<td>![icon]</td>
<td>Shows all graph values. The values (time and numeric value) are displayed for all axes at the location on which the cursor was placed. <em>This option is selected by default.</em></td>
</tr>
</tbody>
</table>
6.2.5 Maintenance Function

The Maintenance Function analyzes data and provides notification of the results when the SENSORTEST.JBI job file located on the installation DVD is running.

Click the icon under the Calibration Monitor column on the Torque Sensor Monitor page to display the following table. Axes for which reconfiguring the torque sensor home position is required due to the deviation amount are displayed in red. The analysis results are loaded and automatically updated for the displayed content. A minimum of 10 minutes may be required until the analysis results are reflected on the page. For more information, refer to chapter 8.1 “RobotDC, DA App, and DW App Timing Chart”.

This section describes the items that are displayed.

<table>
<thead>
<tr>
<th>No.</th>
<th>Item Description</th>
<th>S-Axis</th>
<th>L-Axis</th>
<th>U-Axis</th>
<th>R-Axis</th>
<th>B-Axis</th>
<th>T-Axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Factory Line Cell Controller</td>
<td>27 [Nm]</td>
<td>27 [Nm]</td>
<td>12 [Nm]</td>
<td>3 [Nm]</td>
<td>3 [Nm]</td>
<td>3 [Nm]</td>
</tr>
</tbody>
</table>
6 DW Application Software (DW App)
6.3 Exiting the DW Application Software

To exit DW App, exit YASKAWA Cockpit or close the web browser.

*DW App will be exited automatically if another page is displayed in YASKAWA Cockpit.
## 7 Troubleshooting

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Possible Cause</th>
<th>Corrective Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>DW App</td>
<td>Graph is not displayed or content is not updated.</td>
<td>No Torque Sensor Monitor analysis data. Wait until RobotDC collects the data. For more information, refer to chapter 8.1 “RobotDC, DA App, and DW App Timing Chart”.</td>
</tr>
<tr>
<td></td>
<td>RobotDC settings are incorrect and data cannot be collected.</td>
<td>Check for mistakes in the classification, signal selection, and capitalization of column names for the items set in chapter 4.2 “Executing RobotDC”.</td>
</tr>
<tr>
<td></td>
<td>Attempting to display a graph of data that was not collected.</td>
<td>Check if a graph of data that was not collected by RobotDC is being displayed. For more information, refer to chapter 4.2.</td>
</tr>
<tr>
<td></td>
<td>PFL is disabled or collaborative mode is OFF.</td>
<td>Check the status of PFL and collaborative mode and enable if disabled. For more information, refer to chapter 2.1 “PFL Function” in “YRC1000/YRC1000micro Collaborative Operation Instructions (HW1484764)”.</td>
</tr>
<tr>
<td></td>
<td>The times on the graph are incorrect.</td>
<td>Time on the robot controller is not set correctly.</td>
</tr>
<tr>
<td></td>
<td>The current axis torque estimates or deviation amounts are not displayed in the Maintenance Function.</td>
<td>The SENSORTEST.JBI job file is not being run. Data is not being collected when the SENSORTEST.JBI is running.</td>
</tr>
<tr>
<td></td>
<td>DA App</td>
<td>Cannot log in.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>YASKAWA Cockpit is not running.</td>
</tr>
</tbody>
</table>
8 Appendix

8.1 RobotDC, DA App, and DW App Timing Chart

The following diagram shows an example timing chart for RobotDC (data collection), DA App (data analysis), and DW App (data window).

- The following timing chart is just one example.
- In DA App, the analysis processing holds the data within approximately 5 minutes from the current time. A minimum of 10 minutes may be required until the analysis results are reflected on the page because DA App analyzes the data in a 300-s period. For more information, refer to chapter 5.1 “When the DA Application Software Analyzes Data”.

![Diagram of RobotDC, DA App, and DW App Timing Chart]

- RobotDC (data collection)
  - Always collects data.
  - Stores the data to the database in a 120-s cycle.

- DA App (data analysis)
  - Inserts a 300-s interval between data processing.
  - The data processing time depends on the number of items of data to process.

- DW App (data window)
  - Inserts a 30-s interval between data processing.
  - The data processing time depends on the number of items of data to process.
YASKAWA Cockpit
Torque Sensor Monitor
INSTRUCTIONS