DX200 & FS100 OPTIONS
INSTRUCTIONS
for MS3D CORTEX CONFIGURATION

Part Number: 165197-1CD

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

MOTOMAN INSTRUCTIONS

MOTOMAN-□□□ INSTRUCTIONS
DX200 OR FS100 INSTRUCTIONS
DX200 OR FS100 OPERATOR'S MANUAL
DX200 OR FS100 MAINTENANCE MANUAL

Part Number: 165197-1CD
Revision: 1

YASKAWA
MOTOMAN ROBOTICS

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❗ MANDATORY

- This manual explains MS3D for the DX200 or FS100 system. Read this manual carefully and be sure to understand its contents before using the MS3D Cortex Configurator.

- General items related to safety are listed in the Chapter 1: Safety of the DX200 or FS100 Instructions. To ensure correct and safe operation, carefully read the DX200 or FS100 Instructions before reading this manual.

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⚠ CAUTION

- 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 installing or operating MS3D Cortex Configurator.

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.

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

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1   Introduction

- This product is based on Cortex Recognition software written by Recognition Robotics, Inc. for a PC computer running Windows XP or Windows 7 and provides a PC based vision guidance software package.

- Does not require structured lighting.

- Features a very easy to use interface

    – Does not require complex programming or calibration.

    – Determines the camera position which an object was trained providing a common reference point between the robot and the camera.

- Utilizes a single mobile camera.

- **The Cortex Recognition user manual should be consulted for details of how to use the program. The manual is accessible from the Programs → Recognition Robotics, Inc. selection.**

- An "embedded" PC is required for this application. The PC, running Windows 7, is mounted on the outside of the Motoman Controller cabinet. The PC will have an Ethernet port and a PoE (Power over Ethernet) port to communicate with and power a Baumer camera.

- No PC monitor is supplied with this product. One must be supplied by the customer, or the customer can remote desktop into the PC over Ethernet for initial training and setup. A monitor is not required after the system has been setup and verified to be running correctly.

- The camera is typically mounted on the robot and a TCP and reference frame will be set up relative to the camera.

- The first step is to train or teach the universe of parts to be recognized by the Cortex Recognition software. Each part is assigned a unique number. It is recommended to read the Cortex Recognition manual for details of this procedure.

- In use, the robot is moved into a position (or executes a searching motion) so the part may be captured by the camera.

- An I/O command from the robot job is sent to the Cortex Recognition program to trigger the camera.

- The camera will send an image back to the Cortex Recognition program.

- The program will determine if it recognizes any of the taught parts, and identify which one it sees and the 6 degrees (X, Y, Z, R_x, R_y, and R_z) deviation the part is currently oriented relative to the taught position. This deviation is displayed on the monitor (if there is one) and relayed back to a position variable in the robot job.

- Inside a loop in a running job, the robot will then attempt to apply the deviation as a correction to move to the trained position relative to the part. When this iterative process results in a sufficiently small deviation, the position and orientation of the part relative to the camera (and robot) is known. The robot will then be able to (typically) pick the part.

2   Configuration

The MS3D Configurator is used to generate a configuration file for the robot controller. This contains the information about where to store the vision results returned from the Cortex system.

■ **Starting MS3D Configurator**
  • On the PC screen, click the MS3DCortexConfig icon to bring up the MS3D Configurator
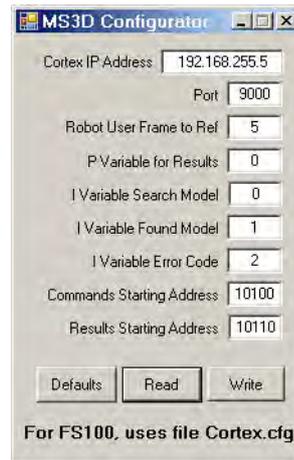
■ **Parameters that can be set or modified:**

> NOTE
> For most systems, it is recommended to click [Defaults] and use the values which are automatically populated.

  • *Cortex IP Address* - This is the IP address of the embedded PC port that is connected to the robot.

  • *Port* - Defined by Cortex Vision System. Default value is 9000.

  • *Robot User Frame to Ref* - The robot user frame referenced by the PVar that holds the location result.

  • *P Variable for Results* - The index of the robot position-variable that will hold the result of the vision inspection.

  • *I Variable Search Model* - The index of robot integer-variable that will supply the model ID number when specifying a search model to the Cortex Vision System.

  • *I Variable Found Model* - The index of the robot integer-variable that will hold the model ID found on the last vision inspection.

  • *I Variable Error Code* - The index of the robot integer-variable that will hold any returned error code from the last vision inspection.

  • *Commands Starting Address* - This is the starting address for the robot I/O commands.

  • *Results Starting Address* - The inspection status signals are returned in robot outputs. This is the starting address for those results.

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■ **The Configurator reads and writes to the file Cortex.cfg located in the directory where the program is installed, by default:**
  • C:\Program Files\Motoman\MS3DCortexConfig\

■ **After creating or modifying a file,**
  • Copy to a USB drive or CF card

  • Load the configuration file into the Motoman robot controller through the pendant main menu.

    EX- MEMORY → LOAD → USER DEFINED FILE → Cortex.cfg

■ **The goal of the Configurator is to create a configuration file that is loaded onto the pendant.**
  • The file can be created/edited directly.

  • The format of this ASCII file is as follows:

192.168.255.5\CrLf	IP Address
9000\CrLf	Port
5\CrLf	User Frame
0\CrLf	Robot position variable index for output
0\CrLf	Robot integer variable (I) index for search model
1\CrLf	Robot inter ger variable (I) index of model found
2\CrLf	Robot inter ger variable (I) index for error code
10100\CrLf	Starting address for I/O commands
10110\CrLf	Starting address for I/O results

NOTE The last entry and starting address for the I/O results, require a terminating carriage return/line feed. A file not having a terminating carriage return/line feed the file will be considered invalid without it.

■ **Example of Triggering Vision System**
The 'rl' command is used by the vision system to trigger an inspection. Using the robot variables specified in the configuration file, the trigger can be used to search for a specific image model. Additionally, the trigger can be used to search all image models and return the closest match.

The trigger method is controlled by the value in the robot integer variable for "search model".

NOTE See the *Cortex Recognition* user manual for more information on commands to the vision system.

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• Example:

I000 is designated as the search model variable

I000 = 12

Output 10 is turned on

The actual command sent is 'rl0012'. This will search specifically for image model #12.

I000 = 0

Output 10 is turned on

The actual command sent is 'rl'. This will search through all image models and return the closest match.

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3   Robot I/O

The Robot I/O's are shown with the default address values.

> **NOTE** The standard robot ladder has been modified to map results to the appropriate robot inputs.

Address		Robot Output	Description
10100	100	Trigger RI	
10101	101	Trigger RL	
10102	102	Light ON	
10103	103	Light OFF	
10104	104	Send Integer	Sends robot integer variable value alone
10105	105		
10106	106		
10107	107		
10110	108	Data Valid	Inspection Complete
10111	109	Object Found	
10112	110	Object Not Found	
10113	111	OOBXYZ	(Object out of bounds)
10114	112	OOBRxRyRz	(Object out of bounds)
10115	113	Out of Focus	
10116	114		
10117	115		

- *Trigger RI* - When Cortex Recognition receives an RI command it recognizes the objects and sends the guidance coordinates without acquiring new image from the camera.

- *Trigger RL* - When Cortex Recognition receives an RL command it acquires new image from the camera, recognizes the objects and sends the guidance coordinates.

- *Light ON* - Turns on the integrated camera light if applicable.

- *Light OFF* - Turns off the integrated camera light if applicable.

- *Send Integer* - Send the value of the robot integer variable without a trigger command.

■ **If the robot integer variable search model contains:**
- A value other than 0, the RI and RL commands will pass that value to the Cortex Recognition system specifying that it search for that particular model.

- A value of 0, a standard search will take place looking for any taught model.

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4   Troubleshooting

If the delay time is not long enough for the camera(s) to make a connection before launching the Cortex application try one of these fixes;

- **Disable any unused TCP/IP ports.**
  - (1) Right click "My Network Neighborhood".

  - (2) Right click the unused port.

  - (3) Select "Disable".

  - (4) Repeat for each unused port.

- **Adjust the Cortex application start delay time.**
  - (1) Launch the Delayed Start application and press 'Stop'.

  - (2) Increase the time value by clicking on the seconds count using the up/down controls to set the new delay time.

  - (3) Click 'Save'.

  - (4) Close the application.

  - (5) Reboot to test the new time value.

- **Vendor Resources:**
  - • UsersGuide_Baumer_GigE_IPConfig_Win_v30e_100913.pdf (located in \Program Files\IpConfig)

  - • CortexRecognition.pdf (accessible from Programs -> Recognition Robotics, Inc. selection)

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