Simple Motion Control via EtherNet/IP with Kinetix 300 Drives Connected Components Building Block

Quick Start
Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (publication SGI-1.1 available from your local Rockwell Automation sales office or online at http://www.rockwellautomation.com/literature/) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

---

**WARNING**

Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

---

**IMPORTANT**

Identifies information that is critical for successful application and understanding of the product.

---

**ATTENTION**

Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.

---

**SHOCK HAZARD**

Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.

---

**BURN HAZARD**

Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.

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Follow the path below to complete your Simple Motion Control application.

**Chapter 1 Kinetix 300 Drive Integration**

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Notes:
Preface

Introduction

This quick start is designed to provide a way to implement a connected component for simple motion control.

**IMPORTANT** The Simple Motion Control Connected Component Building Block (CCBB) uses predefined configurations in the Kinetix 300 drive and the MicroLogix 1400 controller to create a functional connected-component solution. Altering or failing to correctly configure the settings and parameters explained in Chapter 1...Chapter 3 or failure to use the pre-configured RSLogix 500 files provided with the Simple Motion Control Building Block may result in unexpected behavior and potentially unexpected motion. If you want to alter the Simple Motion Control Connected Component configurations or application code, consult the user manuals for each related product to understand the ramifications of your desired changes.

**IMPORTANT** Use this Quick Start in conjunction with the Connected Components Building Blocks Quick Start, publication CC-QS001. Refer to Additional Resources on page 9 for a listing of other related documents.

To assist in the design and installation of your system, application files and other information are provided on the Connected Component Building Blocks Overview CD, publication CC-QR001. The CD provides bills of materials (BOM), CAD drawings for panel layout and wiring, control programs, Human Machine Interface (HMI) screens, and more. With these tools and the built-in best-practices design, the system designer is free to focus on the design of their machine control and not on design overhead tasks.

The beginning of each chapter contains the following information. Read these sections carefully before beginning work in each chapter:

- **Before You Begin** - This section lists the steps that must be completed and decisions that must be made before starting that chapter. The chapters in this quick start do not have to be completed in the order in which they appear, but this section defines the minimum amount of preparation required before completing the current chapter.
- **What You Need** - This section lists the tools that are required to complete the steps in the current chapter. This includes, but is not limited to, hardware and software.
- **Follow These Steps** - This illustrates the steps in the current chapter and identifies which steps are required to complete the examples.
## Conventions Used in This Manual

This manual uses the following conventions.

<table>
<thead>
<tr>
<th>Convention</th>
<th>Meaning</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check or uncheck</td>
<td>To activate or deactivate a checkbox.</td>
<td>Check Disable Keying.</td>
</tr>
<tr>
<td>Click</td>
<td>Click the left mouse button once while the cursor is positioned on object or selection.</td>
<td>Click Browse.</td>
</tr>
<tr>
<td>Double-click</td>
<td>Click the left mouse button twice in quick succession while the cursor is positioned on object or selection.</td>
<td>Double-click the application icon.</td>
</tr>
<tr>
<td>Expand</td>
<td>Click the + to the left of a given item /folder to show its contents.</td>
<td>Expand 1768 Bus under I/O Configuration.</td>
</tr>
<tr>
<td>Right-click</td>
<td>Click the right mouse button once while the cursor is positioned on object or selection.</td>
<td>Right-click the 1768 Bus icon.</td>
</tr>
<tr>
<td>Select</td>
<td>Using the mouse to highlight a specific option.</td>
<td>Select the New Module folder.</td>
</tr>
<tr>
<td>Enter</td>
<td>What you type.</td>
<td>Enter your choice.</td>
</tr>
<tr>
<td>Press</td>
<td>Pressing a specific key on the keyboard.</td>
<td>Press Enter.</td>
</tr>
<tr>
<td>&gt;</td>
<td>Use this symbol to indicate the sub-menu name.</td>
<td>Choose File&gt;Menu&gt;Options.</td>
</tr>
</tbody>
</table>
## Additional Resources

<table>
<thead>
<tr>
<th>Resource</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connected Components Building Blocks Quick Start, publication CC-QS001</td>
<td>Provides information about how to select products and gain access to panel and wiring information.</td>
</tr>
<tr>
<td>Connected Component Building Blocks Overview CD, publication CC-QR001</td>
<td>Provides files for the Connected Component Building Blocks.</td>
</tr>
<tr>
<td>MicroLogix 1400 Programmable Controllers User Manual, publication 1766-UM001</td>
<td>Provides information about using the MicroLogix 1400 programmable controller.</td>
</tr>
<tr>
<td>MicroLogix 1400 Programmable Controllers Installation Instructions, publication 1766-IN001</td>
<td>Provides information about using the MicroLogix 1400 programmable controller.</td>
</tr>
<tr>
<td>MicroLogix 1400 Programmable Controllers Instruction Set Reference Manual, publication 1766-RM001</td>
<td>Provides information about using the MicroLogix 1400 programmable controller RSLogix 500 instruction set.</td>
</tr>
<tr>
<td>PanelView Component Operator Terminals User Manual, publication 2711C-UM001</td>
<td>Provides information about using the PanelView Component HMI terminals.</td>
</tr>
<tr>
<td>Kinetix 300 EtherNet/IP Indexing Servo Drives User Manual, publication 2097-UM001</td>
<td>Provides information about using the Kinetix 300 drive.</td>
</tr>
<tr>
<td><a href="http://www.ab.com">http://www.ab.com</a></td>
<td>Provides access to the Allen-Bradley website.</td>
</tr>
<tr>
<td><a href="http://www.rockwellautomation.com/components/connected">http://www.rockwellautomation.com/components/connected</a></td>
<td>Provides access to the Connected Components website.</td>
</tr>
</tbody>
</table>
Notes:
Kinetix 300 Drive Integration

Introduction

In this chapter, you configure the Kinetix 300 drive parameters as necessary for the MicroLogix 1400 controller to communicate and control the drive. Configuration is done by using your personal computer connected to the drive.

The Kinetix 300 drive communicates with the MicroLogix 1400 controller via an EtherNet/IP connection. Each Kinetix 300 drive must have a unique IP address and needs to be configured with MotionView OnBoard software contained within the drive. This chapter provides step-by-step instructions for configuring required settings, whether you are using the 1-axis, 2-axis, or 3-axis Simple Motion Control Connected Component Building Block (CCBB) solution.

This chapter also specifies the minimum number of parameters that need to be changed from the factory default settings for the Kinetix 300 drive to be controlled by the MicroLogix 1400 controller. For your machine application, there may also be other drive parameters that need to be adjusted. Consult the drive documentation for information on all other drive parameters.

**IMPORTANT**

The Kinetix 300 drive, the personal computer, the MicroLogix 1400 controller, and the PV component must all be configured to operate on the same EtherNet network. All devices will require configuring to enable EtherNet communication between them. Consult the devices documentation for information on configuring EtherNet communications.

Before You Begin

- Review the Connected Components Building Blocks Quick Start, publication CC-QS001.
- Apply power to your drive.
Chapter 1  Kinetix 300 Drive Integration

What You Need

- Personal computer with EtherNet connection
- Kinetix 300 drive(s)
- EtherNet switch
- MicroLogix 1400 controller
- RSLogix 500 software
- Java-enabled web browser
- Connected Components Building Blocks Overview CD, publication CC-QR001

Follow These Steps

Follow these steps to configure each of your Kinetix 300 drives.

Start

Connect to the Kinetix 300 Drive, page 13

Reset the Drive to Factory Settings, page 15

Drive Commissioning, page 16

Configure Drive Home and Index Settings, page 17

Configure the Drive Operating Mode, page 19
Connect to the Kinetix 300 Drive

Kinetix 300 drives are configured by using MotionView OnBoard software, a web-based configuration tool contained within the drive itself.

To access the MotionView OnBoard software, the Kinetix 300 drive and your personal computer must be configured to operate on the same EtherNet network. The IP addresses of the Kinetix 300 drive, the personal computer, or both drive and personal computer may require configuring to enable EtherNet communication between the two devices. Consult the Kinetix 300 user manual for information on how to configure the drives IP address setting.

1. Connect your personal computer’s EtherNet communication port to the Kinetix 300 drive’s 10/100 Mbps EtherNet communication port with a standard EtherNet cable.

2. Run a Java-enabled web browser and enter the drive’s IP address into the browser. A File Download dialog box will prompt you to Open or Save the MotionView.jnlp file.

3. Click Open.

4. Read the Hazard of Unexpected Motor Starting warning and answer, Yes, I have to the prompt.
The MotionView OnBoard screen is displayed.

5. To attach to your drive, click Connect.

   The Connection dialog box is displayed.

6. Enter the IP address for the drive and click Connect.

   ![Connection dialog box](image)

When connected, the drive will appear in the Drive Organizer on the left side of the MotionView OnBoard window and you will be able to browse the drive's parameters.
Reset the Drive to Factory Settings

To be sure that the Kinetix 300 drive is at a known starting point, you must reset the drive to its factory settings.

To reset the Kinetix 300 drive to factory settings, perform the following steps.

1. Click on the Restore Defaults button.

2. At the confirmation dialog box, click Yes.

The dialog box below will display if successful.
Drive Commissioning

For the Kinetix 300 drive to operate properly, the following items must be configured for your setup.

Consult the Kinetix 300 Drive User Manual, publication 2097-UM001, for additional information on configuration parameters.

Motor

Motor window displays motor information and lets you change the motor.

- Allen-Bradley motors and actuators with intelligent feedback devices will automatically be populated into the motor configuration.
- For Allen-Bradley motors and actuators with incremental encoders, click Change Motor and choose the device from the provided list.

User Units

Set the units your system will be using under the General tab.

EtherNet Communication

The EtherNet window displays the IP address configuration, which is where you can manually set the drive IP address.

Digital and Analog I/O

Configure any additional I/O you will be using.

Auto-tune

Auto-tune the drive/motor system. The drive will need to be in Auto Tune mode (General tab). The Dynamics tab contains the auto-tuning interface and gain values.
Configure Drive Home and Index Settings

The Simple Motion Control CCBB includes the ability to home an axis and run any of the Kinetix 300 drive’s 32 indexes. To configure the homing parameters, complete the following steps.

1. Select Homing from the Controller Organizer.

2. Set the homing parameter values based on your system requirements.

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home Accel/Decel</td>
<td>1.0000</td>
<td>User Units/Sec²</td>
</tr>
<tr>
<td>Home Offset</td>
<td>0.0000</td>
<td>User Units</td>
</tr>
<tr>
<td>Home Velocity Fast</td>
<td>1.0000</td>
<td>User Units/Sec</td>
</tr>
<tr>
<td>Home Velocity Slow</td>
<td>1.0000</td>
<td>User Units/Sec</td>
</tr>
<tr>
<td>Home Switch</td>
<td>Input B1</td>
<td></td>
</tr>
</tbody>
</table>

3. Select the Home Method from the drop-down list, based on your system requirements.
To configure the Indexing parameters, complete the following steps.

1. Select the Indexing tab from the Controller Organizer.

2. Verify the AutoStart Index is set to Disable.

3. Expand the Indexes and configure as required for your application.

Below is an example of a configured index (00) that will transition to the next index (01) on completion.

The Simple Motion Control CCBB can configure any index from the HMI, but it is preferred that you configure indexes within MotionView and make adjustments from the HMI.
Configure the Drive Operating Mode

Kinetix 300 drives can be configured to run in a variety of operational modes. The Simple Motion Control CCBB requires the Kinetix 300 drives to be set to Indexing mode.

To configure the Kinetix 300 Drive Mode parameter, perform the following steps.

1. Select General from the Controller Organizer.

2. Set the Drive Mode to Indexing from the drop-down list.

![Image](image_url)

IMPORTANT Repeat the steps in this chapter for each Kinetix 300 drive in your application that will use the Kinetix 300 Control Building Block.

Additional Resources

Refer to page 9 for a listing of product and information resources.
Notes:
Chapter 2

System Validation and Application Tips

Introduction

In this chapter, you confirm that communication is occurring as intended between the MicroLogix 1400 controller and the Kinetix 300 drives, as well as between the MicroLogix 1400 controller and the PanelView terminal.

The operation of the sample screens for Simple Motion Control Program mode and Operator mode is described as well.

Before You Begin

- Verify that you have completed all of the steps in Chapter 1.
- Verify that all of the devices are connected per the Simple Motion Control CAD wiring diagram.
- Verify that the MicroLogix 1400 controller, Kinetix 300 drive, and PanelView Component terminal have power applied to them.
- Review the Connected Components Building Blocks Quick Start, publication CC-QS001, verifying that you have completed all of the steps in Chapter 3 of that quick start.

What You Need

- Personal computer with Internet Explorer or Firefox web browser
- PanelView Component terminal
- Kinetix 300 drives
- MicroLogix 1400 controller
- Previously loaded software
- EtherNet switch so that you can connect your personal computer to both the MicroLogix 1400 controller and PanelView terminal over an isolated EtherNet network
- Connected Component Building Blocks Overview CD, publication CC-QR001
Follow These Steps

Follow these steps to verify that communication is occurring between your devices.

1. **Start**
2. **Messaging IP Address Change**, page 23
3. **Configure Controller-to-drive Communication**, page 25
4. **Configure PVc Terminal-to-controller Communication**, page 27
5. **Test the Simple Motion Control Functionality**, page 30

Multiple Drive Considerations

The Kinetix 300 Control Building Block supports one-axis, two-axis, and three-axis configurations. When completing Chapter 3 of the Connected Components Building Blocks Quick Start, publication CC-QS001, be sure to use the correct RSLogix Control and PanelView Component HMI Programs for your particular application. Additionally, Chapter 1 of this document should be completed for each of your Kinetix 300 drives.

**IMPORTANT** The RSLogix Control and PanelView Component HMI Programs must be the same version (one-axis, two-axis, or three-axis) for the Simple Motion Control Building Block to function correctly.
Messaging IP Address Change

The MicroLogix 1400 controller communicates to the Kinetix 300 drive via EtherNet IP. Information is read from and written to the Kinetix 300 drive by using MicroLogix CIP Generic (MSG) instruction. Explicit messaging lets DINT, REAL, and String data pass back and forth, to and from the drive.

Each message instruction is configured with a drive's IP address so it knows with which drive to communicate. Depending on the IP address you configured your Kinetix 300 drive(s) with, you may have to modify the IP address parameter of the various Message (MSG) instructions used in the controller program to match those of each drive.

A controller program routine has been created to help streamline the process of changing the IP address parameter of the Message (MSG) instructions used throughout the Simple Motion Control via EtherNet/IP CCBB. The default IP addresses of the three Kinetix 300 drives are as follows:

- Axis 1 = 192.168.1.5
- Axis 2 = 192.168.1.6
- Axis 3 = 192.168.1.7

If your system setup requires you to modify the default IP address, perform the following steps to complete the IP address change for the Kinetix 300 drive. You must use the MotionView OnBoard configuration software to modify the IP address for the Kinetix 300 drive.

1. In the MotionView OnBoard configuration software, select Ethernet from the Controller Organizer.
2. Make the necessary changes to the IP address configuration.
3. You will need to cycle power to the drive for the new settings to take effect.

Consult the Kinetix 300 drive user manual, 2097-UM001, for additional information.
Chapter 2       System Validation and Application Tips

Now that the drive IP address has been changed, you must adjust the controller program to modify the IP address parameter in the message instructions to communicate with the Kinetix 300 drive. To modify the drive(s) IP address in the controller program, complete the following steps.

1. Open the Simple Motion Control controller program you will be using.

2. Open Data File ST199 and change the string value to match the IP address of your drive.

You have the choice of one, two, or three-axis configurations in this building block. The string address ST199:0 corresponds to Axis 1, ST199:1 to Axis 2, and ST199:2 to Axis 3.

When you run the program code, the message instructions will be updated when the power-up routine is executed. For additional information, see Review the Program Mode Commands in Chapter 3 and the rung comments in the controller program.
Configure Controller-to-drive Communication

Once you have the correct RSLogix control program downloaded to the MicroLogix 1400 controller, you are ready to validate the controller-to-drive communication. Perform the following steps to complete this validation for each Kinetix 300 drive.

1. Make sure that the MicroLogix 1400 controller is in RUN mode by verifying that the RUN status indicator next to the LCD screen is ON (solid green).

   If not, you can change the controller to RUN mode by using either the programming software or the Mode Switch function of the MicroLogix 1400 LCD display.

   The Kinetix 300 Control ladder logic should now be constantly communicating with the drive via Message (MSG) instructions.

   **IMPORTANT**  
   It is critical the Kinetix 300 drive is communicating to the MicroLogix 1400 controller when the controller is put in RUN mode to ensure that the POWER UP routine executes and initializes program values.

2. Make sure that the Kinetix 300 drive is ready and communicating by verifying that the Kinetix 300 drive front panel display is scrolling the drive’s IP address, shows ‘diS’ (for disabled), and the ‘E’ status indicator is flashing green to indicate communication activity.

   ![Diagram of Kinetix 300 Drive Status Indicators]

   Drive is faulted (solid)

   Communication is happening (flashing)

   Do not worry if the Kinetix 300 drive is faulted (status indicator ‘D’ is solid red); we can clear the fault from the HMI once communication to the PVc is established.

   **TIP**

   If the drive is faulted, the fault should be E91 (user watchdog has timed out). The watchdog function in the drive is set up in the controller POWER UP routine, which causes the drive to fault when communication to the controller is lost.
3. Examine the MicroLogix 1400 data files to make sure that the Kinetix 300 drive and MicroLogix 1400 controller are communicating correctly via explicit messaging.
   a. Expand the Custom Data Monitors section located in the Project tree in RSLogix 500 software and double-click CDM 0 - AX1 INPUT ASSBLY as shown below.

   ![Custom Data Monitors]

   b. Verify that the Drive Status is as expected by examining some of the data bits.

   ![CDM 0 - AX1 INPUT ASSBLY]

   c. If possible, verify that the Axis Actual Velocity and Actual Position signals are functioning as expected by manually turning your motor and watching the values change.

   **IMPORTANT** This next step is not be possible for all applications.

4. Perform steps 2 and 3 for each Kinetix 300 drive in your system.

   Review the correct Kinetix 300 drive front-panel display in step 2 and the correct Axis Input Assembly data monitor in step 3 for the specific drive you are verifying.

   **TIP** Explicit message instructions may not be configured with the correct drive IP address if drive status data is not correctly representing a Kinetix 300 drive and values are not updating. See Messaging IP Address Change in this chapter for more information on correctly configuring the message instructions.
Configure PVc Terminal-to-controller Communication

The PanelView Component (PVc) terminal communicates with the MicroLogix 1400 controller over an EtherNet network. The PVc application reads from and writes to the data table of the MicroLogix 1400 controller. When the PVc application writes to the MicroLogix 1400 controller, the controller program detects the value change and interacts with the Kinetix 300 drive appropriately via explicit messaging. Since the controller program is continually updating status data from the Kinetix 300 drives into its data table via explicit messaging, the PVc application is monitoring the latest drive status data.

The sample Simple Motion Control CCBB programs for the controller and PVc terminal assumes the static IP address for the MicroLogix 1400 controller is 192.168.1.2.

If you are using a different IP address for the controller, you must modify the MicroLogix 1400 IP address in the PVc application.

Follow this procedure if you need to modify the MicroLogix 1400 IP address in the PVc application.

1. Connect to the PVc terminal with your Internet Explorer or Firefox web browser by entering the terminal IP address in the web browser location bar and pressing Enter.

2. Select the application name in the PVc dashboard screen and then click Edit.

The PVc Edit dialog box is displayed.
3. From the Edit dialog box, click on the Communication tab.

4. Change the Address field (populated automatically with the static IP address 198.168.1.2) by typing your correct IP address.

5. Once you have added the correct IP address, click on the Screens tab.

6. Click on the Validate icon so the new IP address is recognized and validated.

7. Once it is validated, click on the Save icon to save your entered information.
8. From the Application Dashboard screen, click Run to run the PVc Kinetix 300 Control application.

![Application Dashboard](image)

**Understanding the Network Overview Screen Functionality**

Since you have already verified that communication between the MicroLogix 1400 controller and the Kinetix 300 drive is working, each axis in your application (one-axis, two-axis, or three-axis depending on your configuration) should display as being “Disabled” or “Faulted” on the Network Overview screen once the PVc application is running.

“Disabled” indicates that the drive is responding when the MicroLogix 1400 controller attempts to communicate with it via explicit messaging, and indicates that the drive is not enabled but is ready and not faulted.

If you get a yellow banner message like the one at right, then the PVc application cannot communicate with the MicroLogix 1400 controller over the EtherNet network at the configured IP address.
If these cases, use RSLogix programming software and your web browser to verify that the MicroLogix 1400 controller’s IP address configured for channel 1 matches the one in the PVc application. If your personal computer can communicate with both devices over the EtherNet network, then the PVc terminal should be able to communicate with the MicroLogix 1400 controller over the EtherNet network.

Once the PVc terminal is successfully communicating with the MicroLogix 1400 controller, you may observe a drive status other than Disabled. The other possibilities are:

- Disabled – The drive is ready but not enabled.
- Enabled – The drive is enabled.
- Faulted – The drive is faulted.
- No Comms – The EtherNet communication connection has been broken.

You can now review the status of each axis in your system from the Network Overview screen.

**TIP**

On this screen, Axis x is a text object that is tied to AX1_DESCRIPTION, tag ST199:0, in the RSLogix 500 file. This axis description can be changed to give the axis a name that is more appropriate to your application. Once the axis description string is changed, the updated axis description will show on the axis buttons in the Network Overview screen as well as in the Simple Motion Control screen.

Pressing the X button in the top-right corner will return you to the Network Overview screen.

**Test the Simple Motion Control Functionality**

Now that the PVc terminal is successfully communicating with the MicroLogix 1400 controller, you are ready to navigate the screens and then test the Simple Motion Control functionality, first in Operator mode and then in Program mode.
Navigate the Program Mode Screen

Follow this procedure to understand the Simple Motion Control Program mode functionality.

1. Press the Axis $x$ button on the Network Overview screen to select an axis that is ready to test.

The Simple Motion Control screen will appear and will be in Program mode (default). Your screen will be similar to the one shown below:

2. The Program button in the lower-right corner indicates the Simple Motion Control CCBB is currently in Program mode.

TIP

On this screen, Axis 1 is a text object that is tied to K1_DESCRIPTION, tag ST199:24, in the RSLogix 500 file (Axis 2 is tag ST199:125 and Axis 3 is tag ST199:26). This axis description can be changed for an axis name more appropriate to your application. Once the axis description string is changed, the updated axis description will show on the axis buttons in the Network Overview screen as well as in the Simple Motion Control screens.

The indicators on the left side show:

- Enabled – The servo loop is enabled.
- Homed – The drive has been successfully homed.
- Motion Complete – The drive has completed a position-based move.
- Indexing – The drive is currently operating out of the indexing table.

The solid green color indicates on or active.
The numeric displays in the middle show:

- **Current Index (0-31)** – when drive is indexing, displays the currently executing index.
- **Actual Position (User Units)** – current position of the motor.
- **Actual Velocity (User Units/sec)** – current velocity of the motor.

The control buttons show:

- **Starting Index (0-31)** – defines the first index the drive should execute on Start command transition. This value can be changed by the user at anytime, but will not take effect until the next Start command transition.
- **Index Setup** – takes you to the Index Setup screen where the user can edit parameters for any of the 32 drive indexes.
- **Start** – the drive will begin executing the index defined by the Starting Index setting when this button is pressed.
- **Stop** – the drive will abort the executing index and decel to zero velocity when this button is pressed. The drive will remain enabled.

Pressing the button in the top-right corner will return you to the Network Overview screen.
Navigate the Index Setup Screen

Follow this procedure to understand the Index Setup functionality.

1. Press the Index Setup button on the Program mode screen to edit any of the 32 indexes for the selected axis.

The Index Setup screen is displayed.

The Index Setup screen displays the currently-selected index parameters in two different columns.

- Current Values – for the selected index, the parameter values are read back from the drive and displayed in this column. The values are read; on transition to the Index Setup screen, after selecting a new index or after the Apply (New Values) button is pressed.

- New Values – for the selected index, allows you to edit the parameters associated with that index. Each value can be changed as needed. To write the new values to the drive, press the Apply button.

The control buttons show:

- Up/down – allow you to scroll through the selectable items for three of the index parameters. The parameters are Index Type, Move Type and Next Action.

- Apply – for the selected index, writes the parameter in the New Values column to the selected drive.

When the parameter values for the selected drive are read back from the drive, they are not only displayed in the Current Values column, but are also copied to the New Values column. This allows for minimal input when making minor adjustments to an index’s parameters.

Pressing the button in the top-right corner will return you to the Program mode screen.
Navigate the Operator Mode Screen

Follow this procedure to understand the Simple Motion Control Operator mode functionality.

1. To manually control the drive, press Program to change the Simple Motion Control screen to Operator mode.

   The Simple Motion Control screen will be displayed and will be in Operator mode.

   2. The Operator button in the lower-right corner indicates the Simple Motion Control CCBB is currently in Operator mode. The Enable, Disable, Home, and Jog buttons have become visible, and a Jog Velocity setpoint numeric entry button is displayed (Jog Vel. SP [UU/sec]).

   The indicators on the left side show:
   - Enabled – The servo loop is enabled.
   - Homed – The drive has been successfully homed.
   - Motion Complete – The drive has completed a position-based move.
   - Homing – The drive is currently executing the homing method.

   The solid green color indicates on or active.

   The numeric displays in the middle show:
   - Jog Vel. SP (User Units/sec) – enter the velocity at which you want to jog the motor. Enter a positive value for forward direction and a negative value for reverse direction.
   - Actual Position (User Units) – current position of the motor.
   - Actual Velocity (User Units/sec) – current velocity of the motor.
The control buttons show:

- Enable and Disable – enable or disable the drive’s servo loops depending on the current state. If the drive is disabled, the Enable button is active and the Disable button is inactive (grayed out). If the drive is enabled, the Disable button is active and the Enable button is inactive.

- Jog – active when the drive is enabled and inactive when the drive is disabled. When pressed, the controller program sends a jog command to the drive at the speed currently entered in the Jog Velocity Setpoint numeric entry. The Jog button is a momentary button and therefore the jog will stop executing when the button is released.

- Home – active when the drive is enabled and inactive when the drive is disabled. When pressed, the controller program sends a home command to the drive and the drive will execute the homing method that was set in the MotionView configuration.

- Stop – lets you terminate homing if homing is active.

**TIP** The drive must be enabled to jog or home the axis.

Pressing the button in the top-right corner will return you to the Network Overview screen.
Test the Operator Mode Functionality

Follow this procedure to test your axis by using the Simple Motion Control Operator mode functionality.

1. Verify that the motor is disconnected from the load (open shaft) and it is safe to turn the motor.

2. Navigate to the Operator Mode screen.

3. Enable the Kinetix 300 drive by pressing Enable.

   The Kinetix 300 drive should now be enabled and maintaining position. The Enabled status indicator should be green, and the Jog and Home buttons should now be active. As a check, the ‘A’ status light on the front panel display should also be on and the scrolling display should show the IP address and the word ‘run’.

   If not, then go back to the beginning of this chapter and verify the MicroLogix 1400 controller communication to this drive.

4. Click the Jog Velocity SP button and enter a valid jog speed.

   **IMPORTANT** Verify that the speed you choose is safe for your setup.

5. Press and hold the Jog button.

   You should see the motor accelerate and rotate at the set velocity. Verify that the actually position value is also changing.


   The drive should decelerate back to stop.

7. Enter a negative value for the Jog Velocity SP and repeat steps 5 and 6, verifying that the motor spins in the opposite direction.

8. Unplug the motor feedback cable and verify that an Axis Fault E7 is displayed.
Notice that the Kinetix 300 drive is now disabled, and the screen indicators and screen buttons have responded appropriately. Your screen will be similar to the one shown.

Note that two new buttons have appeared on the screen. The **Clear Fault** button will clear the Kinetix 300 drive fault as long as the fault condition is no longer present. The long white button flashing ‘Drive Fault: Ex’ provides more diagnostic information for the displayed fault condition when it is pressed.

9. Press the long white button that is flashing to see more diagnostic information.

As shown here, the fault is displayed along with a fault description and possible solutions (following the `->` symbol).

9. Press the long white button that is flashing to see more diagnostic information.

As shown here, the fault is displayed along with a fault description and possible solutions (following the `->` symbol).

**IMPORTANT** The fault code should also be scrolling across the Kinetix 300 drive front-panel display. If the fault code displayed does not match the HMI or the HMI display not fault code, then the fault is not recognized or is unlisted. Contact Rockwell Tech Support for assistance.
10. Reconnect the motor feedback cable and press **Clear Fault**.

   After doing so, the fault clears, as indicated by the fault display button disappearing, along with the Clear Fault button.

11. Enable the drive again.

12. Press the **Home** button to start the homing method you configured in MotionView.

   **TIP** If your configured homing method uses a home switch, then homing may not work if the motor is not connected to the system.

You have now completed testing the Simple Motion Control Operator mode functionality.

Pressing the **X** button in the top-right corner will return you to the previous screen.

**Test the Program Mode Functionality**

Follow this procedure to test your axis by using the Simple Motion Control Program mode functionality.

1. Press the **Operator** button to return to Program mode.

2. Verify the motor is disconnected from the load (open shaft) and it is safe to turn the motor.

3. Press the **Index Setup** button to prompt the Axis screen shown below.

4. Enter values for Index 0 similar to those shown above. Make any necessary changes for your system.
5. Press **Apply** when you have finished entering index parameters.

   Pressing the **X** button in the top-right corner will return you to the previous screen.

6. Press the Starting Index numeric entry button and enter ‘0’ for the starting index.

7. Press the **Start** button to execute Index 0.

   Verify the motor rotates 20 user units at the set speed and then stops. You will also notice the **Index Setup** and **Start** buttons are no longer visible. They are hidden while the drive is executing an index profile move.

   You can also press the **Stop** button at any time an index profile is executing. The Indexing status indicator will be solid green while the drive is running an index profile.

   **TIP** When the index profile is complete or the Stop button is pressed, the axis will decelerate to a stop but will not disable. To disable the drive, you would need to switch to Operator Mode and then disable the drive.

You have now completed testing all the Simple Motion Control Program mode functionality.

**IMPORTANT** Be sure to complete the [Test the Operator Mode Functionality](#) and [Test the Program Mode Functionality](#) sections for all Kinetix 300 drives in your system.

### Additional Resources

Refer to [page 9](#) for a listing of product and information resources.
Control Program Integration

Introduction

In this chapter, you will explore the Simple Motion Control ladder logic structure, the modes of operation, and the program commands. You will learn that there are hooks for the various commands that let you create your own Axis User Program routine for axis control, as well as use the Machine Control Program routine for simultaneous control of all your axes.

Before You Begin

Verify the following:

- You have completed all steps in Chapter 1 and Chapter 2.
- All of the devices are connected per the Simple Motion Control CAD wiring diagram.
- The MicroLogix 1400 controller, Kinetix 300 drive, and PanelView terminal have power applied to them.
- The MicroLogix 1400 controller, Kinetix 300 drive, and PanelView terminal are all properly configured and communicating correctly as explained in Chapter 2.

What You Need

- PanelView Component terminal
- Kinetix 300 drives
- MicroLogix 1400 controller
- Previously loaded software
- Standalone EtherNet switch so that you can connect your personal computer to both the MicroLogix 1400 controller and PanelView terminal over an isolated EtherNet network
Follow These Steps

Follow these steps to integrate your control program into the Simple Motion Control ladder logic.

1. Review the Ladder Logic Structure, page 43
2. Review the Modes of Operation, page 43
3. Review the Program Mode Commands, page 44
4. Axis User Program Ladder Logic (optional), page 46
5. Customize the Machine-control Ladder Logic, page 48
Review the Ladder Logic Structure

The Simple Motion Control CCBB consists of four core ladder routines (Main, Power-up, Machine Control, and STI Control) that are specific to CCBB functionality as well as an additional four ladder routines (Axis Calculation, Axis Command, Axis Monitor, and Axis User Program) for each Kinetix 300 drive axis. These routines are briefly described below. Consult the ladder logic comments for further information.

<table>
<thead>
<tr>
<th>Routine</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Routine (Main)</td>
<td>Calls all other routines.</td>
</tr>
<tr>
<td>Power-up Routine (POWER UP)</td>
<td>Clears Axis Command, Axis Data, and Axis Status values and sets program constant values.</td>
</tr>
<tr>
<td></td>
<td>Use this to set initial program values for all axes.</td>
</tr>
<tr>
<td>Machine Control Routine (MCHN CNTRL)</td>
<td>Use this routine to control all of the axes in the system at the same time. This control can be done by using the Broadcast command functionality or by controlling each axis independently with separate Axis commands.</td>
</tr>
<tr>
<td></td>
<td>Executes the custom user machine-control code.</td>
</tr>
<tr>
<td>Message Instruction IP Address</td>
<td>Called by the POWER UP routine.</td>
</tr>
<tr>
<td>(IP CONVERT)</td>
<td>Converts a string value representing an IP address into an equivalent integer value. This value is then copied to the message instructions used to communicate with the Kinetix 300 drives.</td>
</tr>
<tr>
<td>AX1 Command Routine (AX# CMD)</td>
<td>Executes the commands requested in Operator mode by using the HMI and in Program mode by using the Axis User Program routine or the Machine Control routine.</td>
</tr>
<tr>
<td>AX1 Monitor Routine (AX# MNTR)</td>
<td>Monitors the axis status as well as the HMI status. The axis status is used throughout the CCBB for axis and drive control. The HMI Status is used for HMI screen control by using visibility functionality.</td>
</tr>
</tbody>
</table>

**IMPORTANT**

It is critical that the Kinetix 300 drives be communicating to the MicroLogix 1400 controller when the controller is put in RUN mode so the POWER UP routine executes and initializes program values.

Review the Modes of Operation

As explained in the previous chapter, the Simple Motion Control CCBB has two modes of operation, Program mode and Operator mode. Each mode has its own Status and Command PLC tags and ladder logic, and HMI interlocking keeps each mode mutually exclusive.

Operator mode lets you jog, home, enable/disable, clear faults, and adjust the jog speed, strictly through the HMI. The HMI sends HMI commands to the PLC and it responds accordingly.
In Program mode, you interact with the axis via the HMI or optional PLC application code. The HMI can be used to configure indexes, set the starting index, and start or stop an index. Other Program mode interaction can be done via an optional PLC Axis User Program routine or Machine Control routine by using the Program mode commands that are explained in the next section.

**IMPORTANT** An optional Axis User Program routine is not provided in this Simple Motion Control via EtherNet/IP CCBB. It is discussed here as another way to control the Simple Motion Control program besides through the HMI. An Axis User Program would need to be created by the user.

---

**Review the Program Mode Commands**

There are two types of Simple Motion Control Program mode commands: Axis commands and Broadcast commands. Axis commands are executed on a particular axis and each axis has its own control tags, status tags, routine, and so forth. Broadcast commands are executed on all of the axes in the Simple Motion Control CCBB and can be implemented by using the Machine Control Program.

**IMPORTANT** Axis commands can be executed via an optional Axis User Program routine, and affect only that particular axis. Broadcast commands are executed in the Machine Control routine and affect all of the axes in the Simple Motion Control CCBB. This provides the flexibility to independently control an axis or to consolidate machine control code when possible.

Program mode commands provide pre-defined, basic motion-control functionality and can be executed as an Axis command or a Broadcast command and the functionality remains the same. The only difference is whether the function is executed on one axis (Axis command) or all axes (Broadcast command). Program mode commands include the following:

- Disable
- Enable
- Stop
- Start
- Fault Reset
- Home
- Write Index

All Program mode commands are one-time instructions.
The commands are briefly explained in the table below. For further detail on each command, consult the ladder logic comments.

**Table 1 Commands**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disable Command</td>
<td>One-time command that turns OFF the Kinetix 300 drive's enable and software enable. This disables the axis.</td>
</tr>
<tr>
<td>• K#_CMD_PRG_DSBL</td>
<td></td>
</tr>
<tr>
<td>• BDCST_CMD_DSBL</td>
<td></td>
</tr>
<tr>
<td>Enable Command</td>
<td>One-time command that turns ON the Kinetix 300 drive's enable and software enable. This enables the axis.</td>
</tr>
<tr>
<td>• K#_CMD_PRG_ENBL</td>
<td></td>
</tr>
<tr>
<td>• BDCST_CMD_ENBL</td>
<td></td>
</tr>
<tr>
<td>Stop Command</td>
<td>One-time command that stops the axis and clears the necessary Axis Command data. The Stop command will be executed automatically if the axis is not ready or not enabled.</td>
</tr>
<tr>
<td>• K#_CMD_PRG_STOP</td>
<td></td>
</tr>
<tr>
<td>• BDCST_CMD_STOP</td>
<td></td>
</tr>
<tr>
<td>Start Command</td>
<td>One-time command that starts the axis indexing (or could be used to start an optional Axis User Program) if it is not already in process.</td>
</tr>
<tr>
<td>• K#_CMD_PRG_START</td>
<td></td>
</tr>
<tr>
<td>• BDCST_CMD_START</td>
<td></td>
</tr>
<tr>
<td>Fault Reset Command</td>
<td>One-time command that clears the Kinetix 300 drive’s fault via software. This resets the axis.</td>
</tr>
<tr>
<td>• K#_CMD_PRG_RESET</td>
<td></td>
</tr>
<tr>
<td>• BDCST_CMD_RESET</td>
<td></td>
</tr>
<tr>
<td>Home Command</td>
<td>One-time command that starts the homing sequence configured in the Kinetix 300 drive.</td>
</tr>
<tr>
<td>• K#_CMD_PRG_HOME</td>
<td></td>
</tr>
<tr>
<td>• BDCST_CMD_PROG_FWD</td>
<td></td>
</tr>
<tr>
<td>Write Index Command</td>
<td>One-time command that writes index parameters to the Kinetix 300's Index Assembly object.</td>
</tr>
<tr>
<td>• K#_CMD_PRG_WRT_IDX</td>
<td></td>
</tr>
<tr>
<td>• BDCST_CMD_PROG_REV</td>
<td></td>
</tr>
</tbody>
</table>
Axis User Program Ladder Logic (optional)

The Simple Motion Control via EtherNet/IP CCBB does not include an Axis User Program. An Axis User Program could be added as a routine in the controller program, and with some small modifications could be executed by the HMI Start command, the Axis Start command, or the Broadcast Start command.

An example of when you might use an Axis User Program would be when the axis needs to move to a predefined position before executing the starting index. You could have that happen in a user program, triggered by the Start command.

Any of the Simple Motion Control Program mode commands can be executed in an optional Axis User Program by using the Axis commands as shown below.

<table>
<thead>
<tr>
<th>Address</th>
<th>Symbol</th>
<th>Scope</th>
<th>Sym Group</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B195:1</td>
<td>KL_CMD_PRG_WORD</td>
<td>Global</td>
<td></td>
<td>AXIS1: COMMAND WORD FOR USER PROGRAM</td>
</tr>
<tr>
<td>B195:1/0</td>
<td>KL_CMD_PRG_ENBL</td>
<td>Global</td>
<td></td>
<td>AXIS1: ENABLE COMMAND</td>
</tr>
<tr>
<td>B195:1/1</td>
<td>KL_CMD_PRG_DSBL</td>
<td>Global</td>
<td></td>
<td>AXIS1: DISABLE COMMAND</td>
</tr>
<tr>
<td>B195:1/2</td>
<td>KL_CMD_PRG_RESET</td>
<td>Global</td>
<td></td>
<td>AXIS1: CLEAR FAULTS COMMAND</td>
</tr>
<tr>
<td>B195:1/3</td>
<td>KL_CMD_PRG_START</td>
<td>Global</td>
<td></td>
<td>AXIS1: START COMMAND</td>
</tr>
<tr>
<td>B195:1/4</td>
<td>KL_CMD_PRG_STOP</td>
<td>Global</td>
<td></td>
<td>AXIS1: STOP COMMAND</td>
</tr>
<tr>
<td>B195:1/5</td>
<td>KL_CMD_PRG_JOG</td>
<td>Global</td>
<td></td>
<td>AXIS1: JOG COMMAND</td>
</tr>
<tr>
<td>B195:1/6</td>
<td>KL_CMD_PRG_FWD</td>
<td>Global</td>
<td></td>
<td>AXIS1: FORWARD COMMAND</td>
</tr>
<tr>
<td>B195:1/7</td>
<td>KL_CMD_PRG_REV</td>
<td>Global</td>
<td></td>
<td>AXIS1: REVERSE COMMAND</td>
</tr>
<tr>
<td>B195:1/8</td>
<td>KL_CMD_PRG_HOME</td>
<td>Global</td>
<td></td>
<td>AXIS1: HOME COMMAND</td>
</tr>
<tr>
<td>B195:1/9</td>
<td>KL_CMD_PRG_MRT_IDX</td>
<td>Global</td>
<td></td>
<td>AXIS1: WRITE SELECTED INDEX</td>
</tr>
</tbody>
</table>
The Axis User Program can be structured as desired, but a state machine (sequencer) is strongly recommended for more complicated motion control. In general, state machines provide an easier approach to motion control programming and troubleshooting because of their step-by-step nature. A sample state machine program is available in the CCBB common folder.

**IMPORTANT**
If you want to use a state machine, use the K#_CMD_PROG_SEQ as your state machine value in the Axis User Program. This value is cleared (set to zero) when the Axis Stop command is executed or when the axis is in Operator mode. Verify that the initial state of your state machine is when AX#_CMD_PROG_SEQ=0 and then your state machine will execute every time the Axis Start command is executed.

**TIP**
Be sure to initialize or set the Axis command parameters before you execute each Axis command. This will help make sure that each command is always executed using the expected parameters.

Now that you know how to integrate your individual axes into the Simple Motion Control CCBB and control them individually, you will explore how to control all the axes simultaneously.
Customize the Machine-control Ladder Logic

The optional Axis User Program could control each axis independently while in Program mode, while the Machine Control routine is used to control all of the axes simultaneously while in Program mode.

Unlike an Axis User Program, there is not a ‘start’ command. Instead, the Machine Control routine will always be scanned when the MACHINE_ENB_USER_CTRL I/O (I0/0) is set, which can be removed if not needed or it can be tied to an input or other conditions as needed.

The Machine Control routine can use any of the Program mode commands, including the Axis commands and the Broadcast commands as shown below. This means that you can control axes independently, in groups or sections, or simultaneously.

<table>
<thead>
<tr>
<th>Address</th>
<th>Symbol</th>
<th>Scope</th>
<th>Sys Group</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B195:0</td>
<td>BDCST_CMD_WORD</td>
<td>Global</td>
<td></td>
<td>BROADCAST COMMAND WORD</td>
</tr>
<tr>
<td>B195:0/0</td>
<td>BDCST_CMD_ENBL</td>
<td>Global</td>
<td></td>
<td>BROADCAST ENABLE COMMAND</td>
</tr>
<tr>
<td>B195:0/1</td>
<td>BDCST_CMD_DSBTL</td>
<td>Global</td>
<td></td>
<td>BROADCAST DISABLE COMMAND</td>
</tr>
<tr>
<td>B195:0/2</td>
<td>BDCST_CMD_RESET</td>
<td>Global</td>
<td></td>
<td>BROADCAST CLEAR FAULTS COMMAND</td>
</tr>
<tr>
<td>B195:0/3</td>
<td>BDCST_CMD_START</td>
<td>Global</td>
<td></td>
<td>BROADCAST START COMMAND</td>
</tr>
<tr>
<td>B195:0/4</td>
<td>BDCST_CMD_STOP</td>
<td>Global</td>
<td></td>
<td>BROADCAST STOP COMMAND</td>
</tr>
<tr>
<td>B195:0/5</td>
<td>BDCST_CMD_JOG</td>
<td>Global</td>
<td></td>
<td>BROADCAST JOG COMMAND</td>
</tr>
<tr>
<td>B195:0/6</td>
<td>BDCST_CMD_FWD</td>
<td>Global</td>
<td></td>
<td>BROADCAST FORWARD COMMAND</td>
</tr>
<tr>
<td>B195:0/7</td>
<td>BDCST_CMD_REV</td>
<td>Global</td>
<td></td>
<td>BROADCAST REVERSE COMMAND</td>
</tr>
<tr>
<td>B195:0/8</td>
<td>BDCST_CMD_HOME</td>
<td>Global</td>
<td></td>
<td>BROADCAST HOME COMMAND</td>
</tr>
<tr>
<td>B195:0/9</td>
<td>BDCST_CMD_WRT_IDX</td>
<td>Global</td>
<td></td>
<td>BROADCAST WRITE INDEX COMMAND</td>
</tr>
<tr>
<td>B195:0/10</td>
<td>BDCST_CMD_FB_DSBTL</td>
<td>Global</td>
<td></td>
<td>BROADCAST DISABLE OPERATOR MODE 0:ENBL 1:DISABLED</td>
</tr>
<tr>
<td>B195:1</td>
<td>KL_CMD_PROG_WORD</td>
<td>Global</td>
<td></td>
<td>AXIS1: COMMAND WORD FOR USER PROGRAM</td>
</tr>
<tr>
<td>B195:1/0</td>
<td>KL_CMD_PROG_ENBL</td>
<td>Global</td>
<td></td>
<td>AXIS1: ENABLE COMMAND</td>
</tr>
<tr>
<td>B195:1/1</td>
<td>KL_CMD_PROG_DSBTL</td>
<td>Global</td>
<td></td>
<td>AXIS1: DISABLE COMMAND</td>
</tr>
<tr>
<td>B195:1/2</td>
<td>KL_CMD_PROG_RESET</td>
<td>Global</td>
<td></td>
<td>AXIS1: CLEAR FAULTS COMMAND</td>
</tr>
<tr>
<td>B195:1/3</td>
<td>KL_CMD_PROG_START</td>
<td>Global</td>
<td></td>
<td>AXIS1: START COMMAND</td>
</tr>
<tr>
<td>B195:1/4</td>
<td>KL_CMD_PROG_STOP</td>
<td>Global</td>
<td></td>
<td>AXIS1: STOP COMMAND</td>
</tr>
<tr>
<td>B195:1/5</td>
<td>KL_CMD_PROG_JOG</td>
<td>Global</td>
<td></td>
<td>AXIS1: JOG COMMAND</td>
</tr>
<tr>
<td>B195:1/6</td>
<td>KL_CMD_PROG_FWD</td>
<td>Global</td>
<td></td>
<td>AXIS1: FORWARD COMMAND</td>
</tr>
<tr>
<td>B195:1/7</td>
<td>KL_CMD_PROG_REV</td>
<td>Global</td>
<td></td>
<td>AXIS1: REVERSE COMMAND</td>
</tr>
<tr>
<td>B195:1/8</td>
<td>KL_CMD_PROG_HOME</td>
<td>Global</td>
<td></td>
<td>AXIS1: HOME COMMAND</td>
</tr>
<tr>
<td>B195:1/9</td>
<td>KL_CMD_PROG_WRT_IDX</td>
<td>Global</td>
<td></td>
<td>AXIS1: WRITE SELECTED INDEX</td>
</tr>
</tbody>
</table>
Although the Machine Control routine can be structured as desired, it contains sample ladder logic for Machine Clear Faults, Machine Start, and Machine Stop operations.

### Table 2 Ladder Logic Examples

<table>
<thead>
<tr>
<th>Example</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine Clear Faults Example</td>
<td>The Machine Clear Fault example in the Machine Control routine uses the Broadcast command functionality to clear all of the axis faults at the same time. It executes when the MACHINE_CLEAR_FAULTS bit is set (I:0/1). This bit can be used as needed to control when the machine faults are cleared. The Axis command functionality could also be used to clear each axis fault individually, providing the ability to customize your machine’s clear fault process.</td>
</tr>
<tr>
<td>Machine Start Example</td>
<td>The Machine Start example in the Machine Control routine uses the Axis command functionality to clear each axis fault (if faulted) and start each Axis User Program. It executes when the MACHINE_START bit is set (I:0/2). This bit can be used as needed to control when the entire machine is started. Additionally, by using the Axis commands, you can control the Machine Start process and start optional Axis User Programs simultaneously, one at a time, or based upon some other predefined condition. The Broadcast command functionality could also be used to start all of the Axis User Programs at the same time.</td>
</tr>
<tr>
<td>Machine Stop Example</td>
<td>The Machine Stop example in the Machine Control routine uses the Broadcast command functionality to stop all of the axes simultaneously. It executes when the MACHINE_STOP bit is set (I:0/3). This bit can be used as needed to control when the machine is stopped. The Axis command functionality could also be used to stop each axis individually, providing the ability to customize your machine’s stopping process.</td>
</tr>
</tbody>
</table>

Change the operation of the Machine Control to reflect your application needs. If simultaneous control is needed, consider using Broadcast commands. If individual or step-by-step control is needed, consider using Axis commands and controlling each axis individually.

**TIP**

Be sure to initialize or set the Axis command parameters before you execute each Axis command to ensure each command is always executed with the expected parameters.

### Additional Resources

Refer to page 9 for a listing of product and information resources.
Notes:
Rockwell Automation provides technical information on the Web to assist you in using its products. At http://www.rockwellautomation.com/support, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration, and troubleshooting, we offer TechConnect Support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit http://www.rockwellautomation.com/support.

**Installation Assistance**

If you experience a problem with a hardware module within the first 24 hours of installation, please review the information that’s contained in this manual. You can also contact a special Customer Support number for initial help in getting your module up and running.

<table>
<thead>
<tr>
<th>United States</th>
<th>1.440.646.3434</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Monday – Friday, 8 a.m. – 5 p.m. EST</td>
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</tbody>
</table>

Outside United States

Please contact your local Rockwell Automation representative for any technical support issues.

**New Product Satisfaction Return**

Rockwell tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning, it may need to be returned.

<table>
<thead>
<tr>
<th>United States</th>
<th>Contact your distributor. You must provide a Customer Support case number (see phone number above to obtain one) to your distributor in order to complete the return process.</th>
</tr>
</thead>
</table>

Outside United States

Please contact your local Rockwell Automation representative for return procedure.