Kinetix 6000 Multi-Axis Servo Drive

(Catalog Numbers
2094-AC05-M01, -AC09-M02, -BC01-M01, and -BC02-M02
2094-AM01, -AM02, -BM01, and -BM02
2094-PR1, -PR2, -PR4, -PR6, and -PR8
2094-PRF
2094-AL09, and -BL02
2094-ASP2, and -BSP2)

Integration Manual
Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of this control equipment must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards.

The illustrations, charts, sample programs and layout examples shown in this guide are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Allen-Bradley® does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Allen-Bradley publication SGI-1.1, Safety Guidelines for the Application, Installation and Maintenance of Solid-State Control (available from your local Allen-Bradley office), describes some important differences between solid-state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication.

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Throughout this manual we use notes to make you aware of safety considerations:

ATTENTION Identifies information about practices or circumstances that can lead to personal injury or death, property damage or economic loss.

Attention statements help you to:

• identify a hazard
• avoid a hazard
• recognize the consequences

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

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</tr>
</tbody>
</table>
Preface

Introduction

Read this preface to familiarize yourself with the rest of the manual. This preface contains the following topics:

- Who should use this manual
- Purpose of this manual
- Contents of this manual
- Related documentation
- Conventions used in this manual
- Product receiving and storage responsibility
- Allen-Bradley support

Who Should Use this Manual

This manual is intended for engineers or programmers directly involved in the operation, field maintenance, and integration of the Kinetix™ 6000 multi-axis servo drive with the 1756-MxxSE SERCOS interface™ module.

If you do not have a basic understanding of the Kinetix 6000, contact your local Allen-Bradley representative for information on available training courses before using this product.

Purpose of this Manual

This manual provides the startup, configuration, and troubleshooting procedures for the Kinetix 6000. The purpose of this manual is to assist you in the integration of your Kinetix 6000 servo drive with the 1756-MxxSE SERCOS interface module.
Contents of this Manual

Refer to the following listing for the descriptive contents of this installation manual.

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<th>Chapter</th>
<th>Title</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Describes the purpose, background, and scope of this manual. Also specifies the audience for whom this manual is intended.</td>
<td></td>
</tr>
<tr>
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<td>Commissioning Your Kinetix 6000</td>
<td>Provides steps to follow when configuring your Kinetix 6000, the 1756-MxSE SERCOS interface module, and when applying power to the Kinetix 6000 for the first time.</td>
</tr>
<tr>
<td>2</td>
<td>Troubleshooting Your Kinetix 6000</td>
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<td>Interconnect Diagrams</td>
<td>Provides interconnect diagrams between the Kinetix 6000 and the Line Interface Module, Shunt Module, and servo motors.</td>
</tr>
<tr>
<td>Appendix B</td>
<td>Upgrading Firmware</td>
<td>Provides steps to follow when you need to upgrade (flash) your IAM and AM firmware.</td>
</tr>
</tbody>
</table>

Related Documentation

The following documents contain additional information concerning related Allen-Bradley products. To obtain a copy, contact your local Allen-Bradley office, distributor, or download them from TheAutomationBookstore.com.

<table>
<thead>
<tr>
<th>For: The instructions needed for the installation and wiring of the Kinetix 6000</th>
<th>Read This Document: Kinetix 6000 Installation Manual</th>
<th>Catalog Number: 2094-IN001x-EN-P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation instructions for the LIM and removal/replacement procedures for selected internal LIM components</td>
<td>Kinetix 6000 Line Interface Module Installation Instructions</td>
<td>2094-IN005x-EN-P</td>
</tr>
<tr>
<td>A description and specifications for the 2094 family including motors and motor accessories</td>
<td>Motion Control Selection Guide</td>
<td>GMC-SG001x-EN-P</td>
</tr>
<tr>
<td>Application sizing and configuration information</td>
<td>Motion Book Servo Sizing CD (v4.0 or above)</td>
<td>Motion Book-&lt;mm-yyyy&gt;</td>
</tr>
<tr>
<td>More detailed information on the use of ControlLogix™ motion features and application examples</td>
<td>ControlLogix Motion Module Programming Manual</td>
<td>1756-RM086x-EN-P</td>
</tr>
<tr>
<td>8 Axis SERCOS interface module installation instructions</td>
<td>8 Axis SERCOS interface Module Installation Instructions</td>
<td>1756-IN572x-EN-P</td>
</tr>
<tr>
<td>The instructions needed to program a motion application</td>
<td>Logix™ Controller Motion Instruction Set Reference Manual</td>
<td>1756-RM007x-EN-P</td>
</tr>
<tr>
<td>Information on configuring and troubleshooting your ControlLogix motion module</td>
<td>ControlLogix Motion Module Setup and Configuration Manual</td>
<td>1756-UM006x-EN-P</td>
</tr>
<tr>
<td>Information, examples, and techniques designed to minimize system failures caused by electrical noise</td>
<td>System Design for Control of Electrical Noise</td>
<td>GMC-RM001x-EN-P</td>
</tr>
<tr>
<td>An article on wire sizes and types for grounding electrical equipment</td>
<td>National Electrical Code</td>
<td>Published by the National Fire Protection Association of Boston, MA.</td>
</tr>
<tr>
<td>A glossary of industrial automation terms and abbreviations</td>
<td>Allen-Bradley Industrial Automation Glossary</td>
<td>AG-7.1</td>
</tr>
</tbody>
</table>
Conventions Used in this Manual

The following conventions are used throughout this manual.

- Bulleted lists such as this one provide information, not procedural steps
- Numbered lists provide sequential steps or hierarchical information
- Words that you type or select appear in bold
- When we refer you to another location, the section or chapter name appears in italics
- Acronyms for the Kinetix 6000 components, shown in the table below, are used throughout this manual.

<table>
<thead>
<tr>
<th>Kinetix 6000 Component</th>
<th>Catalog Numbers</th>
<th>Acronym</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Rail</td>
<td>2094-PRx</td>
<td>PR</td>
</tr>
<tr>
<td>Power Rail Slot Filler</td>
<td>2094-PRF</td>
<td>PRF</td>
</tr>
<tr>
<td>Integrated Axis Module</td>
<td>2094-xxMxx</td>
<td>IAM</td>
</tr>
<tr>
<td>Axis Module</td>
<td>2094-xMxx</td>
<td>AM</td>
</tr>
<tr>
<td>Line Interface Module</td>
<td>2094-xLxx</td>
<td>LIM</td>
</tr>
<tr>
<td>Shunt Module</td>
<td>2094-xSP2</td>
<td>SM</td>
</tr>
</tbody>
</table>

Product Receiving and Storage Responsibility

You, the customer, are responsible for thoroughly inspecting the equipment before accepting the shipment from the freight company. Check the item(s) you receive against your purchase order. If any items are obviously damaged, it is your responsibility to refuse delivery until the freight agent has noted the damage on the freight bill. Should you discover any concealed damage during unpacking, you are responsible for notifying the freight agent. Leave the shipping container intact and request that the freight agent make a visual inspection of the equipment.

Store the product in its shipping container prior to installation. If you are not going to use the equipment for a period of time, store using the following guidelines.

- Use a clean, dry location
- Maintain an ambient temperature range of -40 to 70°C (-40 to 158°F)
- Maintain a relative humidity range of 5% to 95%, non-condensing
- Store it where it cannot be exposed to a corrosive atmosphere
- Store it in a non-construction area
Allen-Bradley Support

Allen-Bradley offers support services worldwide, with over 75 Sales/Support Offices, 512 authorized Distributors and 260 authorized Systems Integrators located throughout the United States alone, plus Allen-Bradley representatives in every major country in the world.

Local Product Support

Contact your local Allen-Bradley representative for:

- Sales and order support
- Product technical training
- Warranty support
- Support service agreements

Technical Product Assistance

If you need to contact Allen-Bradley for technical assistance, please review the information in the chapter *Troubleshooting Your Kinetix 6000* first, then call your local Allen-Bradley representative or Rockwell Automation Technical Support at (440)-646-5800. For the quickest possible response, please have the catalog numbers of your products available when you call. For Rockwell Automation Technical Support on the web, go to www.ab.com/support.

Comments Regarding this Manual

To offer comments regarding the contents of this manual, go to www.ab.com/manuals/gmc and download the Motion Control Problem Report form. Mail or fax your comments to the address/fax number given on the form.
Chapter Objectives

This chapter provides you with information to apply power and configure your Kinetix 6000. This chapter includes:

- General startup precautions
- Understanding Kinetix 6000 connectors
- Locating connectors and indicators
- Configuring your Kinetix 6000
- Configuring your 1756-MxxSE SERCOS interface module
- Applying Power to your Kinetix 6000
- Testing and tuning your axes

Note: Some of the procedures in this chapter include information regarding integration with other products.

General Startup Precautions

The following precautions pertain to all of the procedures in this chapter. Be sure to read and thoroughly understand them before proceeding.

**ATTENTION**

This product contains stored energy devices. To avoid hazard of electrical shock, verify that all voltages on the system bus network have been discharged before attempting to service, repair or remove this unit. Only qualified personnel familiar with solid state control equipment and safety procedures in publication NFPA 70E or applicable local codes should attempt this procedure.

**ATTENTION**

This drive contains ESD (Electrostatic Discharge) sensitive parts and assemblies. You are required to follow static control precautions when you install, test, service, or repair this assembly. If you do not follow ESD control procedures, components can be damaged. If you are not familiar with static control procedures, refer to Allen-Bradley publication 8000-4.5.2, *Guarding Against Electrostatic Damage* or any other applicable ESD Protection Handbook.
### Understanding Kinetix 6000 Connectors

The following tables provide a brief description of the Kinetix 6000 connectors.

#### Integrated Axis Module/Axis Module Connectors

<table>
<thead>
<tr>
<th>Designator</th>
<th>Description</th>
<th>Connector</th>
<th>Present on IAM or AM</th>
</tr>
</thead>
<tbody>
<tr>
<td>IOD</td>
<td>User I/O (drive)</td>
<td>26-pin high-density D-shell IAM/AM</td>
<td></td>
</tr>
<tr>
<td>MF</td>
<td>Motor Feedback</td>
<td>15-pin high-density D-shell (male)IAM/AM</td>
<td></td>
</tr>
<tr>
<td>AF</td>
<td>Auxiliary Feedback</td>
<td>15-pin high-density D-shell (female)IAM/AM</td>
<td></td>
</tr>
<tr>
<td>CPD</td>
<td>Control Input Power (drive)</td>
<td>2-position connector housing IAM</td>
<td></td>
</tr>
<tr>
<td>IPD</td>
<td>DC Bus and VAC Input Power (drive)</td>
<td>6-position connector housing IAM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>230V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>460V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CED</td>
<td>Contactor Enable</td>
<td>2-position connector housing IAM</td>
<td></td>
</tr>
<tr>
<td>MP</td>
<td>Motor Power</td>
<td>4-position connector housing IAM/AM</td>
<td></td>
</tr>
<tr>
<td>BC</td>
<td>Dynamic/Motor Brake</td>
<td>6-position connector housing IAM/AM</td>
<td></td>
</tr>
<tr>
<td>Tx and Rx</td>
<td>SERCOS Transmit and Receive</td>
<td>SERCOS fiber optic (2) IAM/AM</td>
<td></td>
</tr>
<tr>
<td>DPI</td>
<td>DPI</td>
<td>DPI</td>
<td>IAM</td>
</tr>
</tbody>
</table>

#### Shunt Module Connectors

<table>
<thead>
<tr>
<th>Designator</th>
<th>Description</th>
<th>Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>RC</td>
<td>External Shunt Resistor Connector</td>
<td>3-position connector housing</td>
</tr>
<tr>
<td>TC</td>
<td>Thermal Switch Connector</td>
<td>2-position connector housing</td>
</tr>
</tbody>
</table>

#### Line Interface Module Connectors

<table>
<thead>
<tr>
<th>Designator</th>
<th>Description</th>
<th>Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>IOI</td>
<td>Status I/O (LIM)</td>
<td>26-pin high-density D-shell</td>
</tr>
<tr>
<td>IPL</td>
<td>VAC LINE Input Power (LIM)</td>
<td>4-position terminals</td>
</tr>
<tr>
<td>OPL</td>
<td>VAC LOAD Output Power</td>
<td>4-position terminals</td>
</tr>
<tr>
<td>PSL</td>
<td>Brake and I/O Power Output (24V dc)</td>
<td>4-position connector housing</td>
</tr>
<tr>
<td>CPL</td>
<td>Control Power Output (LIM)</td>
<td>2-position connector housing</td>
</tr>
</tbody>
</table>
Locating IAM Connectors and Indicators

Use the figure below to locate the Integrated Axis Module connectors and indicators. Shown below is the 2094-ACxx-Mxx (230V) model. Although the physical size of the 2094-BCxx-Mxx (460V) model is larger, the location of the connectors and indicators is identical.

**Figure 1.1**
Kinetix 6000 Integrated Axis Modules (2094-ACxx-Mxx and -BCxx-Mxx)

Note: Power, feedback, and I/O connectors are shown, however for wiring information, refer to the *Kinetix 6000 Multi-Axis Servo Drive Installation Manual* (publication 2094-IN001x-EN-P).
Locating AM Connectors and Indicators

Use the figure below to locate the Axis Module connectors and indicators. Shown below is the 2094-AMxx (230V) model. Although the physical size of the 2094-BMxx (460V) model is larger, the location of the connectors and indicators is identical.

Figure 1.2
Kinetix 6000 Axis Modules (2094-AMxx and -BMxx)

Note: Power, feedback, and I/O connectors are shown, however for wiring information, refer to the Kinetix 6000 Multi-Axis Servo Drive Installation Manual (publication 2094-IN001x-EN-P).
Locating SM Connectors and Indicators

Use the figure below to locate the Shunt Module connectors and indicators.

**Figure 1.3**
Kinetix 6000 Shunt Modules (2094-ASP2 and -BSP2)

- **External Shunt Resistor (RC) Resistor Connector**
- **External Shunt Resistor (TC) Thermal Switch Connector**
- **Status LEDs**
- **Mounting Screw**
Locating LIM Connectors and Indicators

Use the figure below to locate the Line Interface Module connectors and indicators.

**Figure 1.4**

*Kinetix 6000 Line Interface Modules (2094-AL09 and -BL02)*

- **VAC Line (IPL) Connector**
- **VAC Load (OPL) Connector**
- **24 VDC Brake Power (PSL) Connector**
- **Control Power Load (CPL) Connector**
- **24 VDC Brake Power Status LED**
- **I/O Power Status LED**
- **I/O (IOL) Connector**
- **Main VAC**
- **Auxiliary VAC**
- **Brake - I/O VAC**
Locating SERCOS Interface Module Connectors

Use the figure below to locate the 1756-MxxSE SERCOS fiber-optic connectors. The fiber-optic ring is connected using the SERCOS Receive and Transmit connectors.

**Figure 1.5  
SERCOS Fiber-Optic Connections**

Note: Fiber optic cable lengths of 0.3 m (4.0 in.) to 32 m (105.0 ft) are available in plastic or glass. Lengths of 50 m (164.2 ft) to 200 m (656.7 ft) are available in glass only.

Configuring Your Kinetix 6000

These procedures assume you have completed mounting, wiring, and connecting your 1756-MxxSE SERCOS interface module and Kinetix 6000 drive as described in the *Kinetix 6000 Multi-Axis Servo Drive Installation Manual* (publication 2094-IN001x-EN-P).

The procedures in this section apply to Kinetix 6000 drive components and describe how to:

- Configure your Kinetix 6000 IAM and AM(s)
- Configure your 1756-MxxSE SERCOS interface module using RSLogix 5000™ software
- Download your program to your ControlLogix controller
- Apply power to your Kinetix 6000 drive components
- Test and tune your motor using RSLogix 5000 software

These procedures assume you have connected the fiber optic cables between your IAM (2094-xCxx-Mxx, inverter section), axis modules (2094-xMxx), and the 1756-MxxSE SERCOS interface module.
Configuring Your Integrated Axis Module

To configure your IAM:

1. Verify that there is no power applied to the IAM and that the SERCOS fiber-optic cables are plugged into the Tx and Rx connectors. To verify your fiber-optic cable connections, refer to the Kinetix 6000 Multi-Axis Servo Drive Installation Manual (publication 2094-IN001x-EN-P).

2. Set the base node address for the IAM by setting the SERCOS Node Address switch. Valid node addresses are 01-99. The left hand switch sets the most significant digit (MSD) and the right hand switch sets the least significant digit (LSD). Refer to the table below for switch operation. Refer to Figure 1.1 for switch location.

<table>
<thead>
<tr>
<th>To:</th>
<th>Press:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increment the (MSD/LSD) node address</td>
<td>The plus (+) switch.</td>
</tr>
<tr>
<td>Decrement the (MSD/LSD) node address</td>
<td>The minus (-) switch.</td>
</tr>
</tbody>
</table>

**Figure 1.6**  
Setting the Base Address Switches

Setting the base node address on the IAM determines the node address for the IAM inverter. Node addressing for all slot locations on the same power rail increment (from the IAM inverter) left to right.

**IMPORTANT**  
After setting the base node address, always cycle control power to initialize the IAM.

**IMPORTANT**  
When two or more IAMs are connected to the same 1756-MxxSE module, each node address must be unique.

Refer to figures 1.7 and 1.8 for examples of how node addresses are assigned.
In the example above, Kinetix 6000 System 1 is mounted on a six-axis power rail with four axes (total), one shunt module, and one slot filler module. The shunt module and slot filler slots are not assigned a node address.

Kinetix 6000 System 2 is mounted on a two-axis power rail with two axes (total). The base node address of the IAM (system 2) must be set for an address of \( \geq 14 \) or \( \leq 8 \).

**IMPORTANT**

Do not position axis modules to the right of shunt or slot filler modules. The added distance between non-adjacent axes can increase electrical noise and impedance, and requires longer fiber-optic cable lengths.
In the example above, ControlLogix chassis 1 controls axes 1-3 and chassis 2 controls axes 4-6. The slot filler module is not assigned a node address.

**IMPORTANT**

Do not position axis modules to the right of shunt or slot filler modules. The added distance between non-adjacent axes can increase electrical noise and impedance, and requires longer fiber-optic cable lengths.

Note: You can mount the two 1756-MxxSE SERCOS interface modules in two separate ControlLogix chassis (as shown above) or you can mount them in the same chassis.

Utilizing two 1756-MxxSE SERCOS interface modules to control axes from a single Kinetix 6000 power rail allows you to reduce the cycle times.
3. Set the SERCOS baud rate using DIP switches 2 and 3, as shown in Figure 1.9. Refer to the table below for baud rate switch settings. Refer to Figure 1.1 for the baud rate (DIP) switch location.

<table>
<thead>
<tr>
<th>For this baud rate:</th>
<th>Set switch 2:</th>
<th>Set switch 3:</th>
</tr>
</thead>
<tbody>
<tr>
<td>4M baud</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>8M baud</td>
<td>ON</td>
<td>OFF</td>
</tr>
</tbody>
</table>

4. Set the SERCOS optical power level to **High** using DIP switch 1, as shown in Figure 1.9 (page 1-11). Refer to the table below for optical power level switch settings. Refer to Figure 1.1 for the optical power switch location.

<table>
<thead>
<tr>
<th>For this optical power level:</th>
<th>Set switch 1:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>OFF</td>
</tr>
<tr>
<td>High</td>
<td>ON</td>
</tr>
</tbody>
</table>

Figure 1.9
SERCOS Baud Rate and Optical Power DIP Switches
Configuring Your Axis Module(s)

This procedure assumes you have configured your IAM. Use the following procedure to configure your axis module(s). In this procedure you will set the baud rate and optical power level switches for your IAM and each AM.

![Image of a table or diagram]

**IMPORTANT** The node address for each axis module is determined by the base node address switch setting on the IAM. Refer to Figure 1.7.

To configure your Axis Module(s):

1. Verify that there is no power applied to the IAM and that the SERCOS fiber-optic cables are plugged into the Tx and Rx connectors. To verify your fiber-optic cable connections, refer to the *Kinetix 6000 Multi-Axis Servo Drive Installation Manual* (publication 2094-IN001x-EN-P).

2. Set the SERCOS baud rate using DIP switches 2 and 3, as shown in Figure 1.9. Refer to the table below for baud rate switch settings. Refer to Figure 1.2 for the baud rate (DIP) switch location.

<table>
<thead>
<tr>
<th>For this baud rate:</th>
<th>Set switch 2:</th>
<th>Set switch 3:</th>
</tr>
</thead>
<tbody>
<tr>
<td>4M baud</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>8M baud</td>
<td>ON</td>
<td>OFF</td>
</tr>
</tbody>
</table>

3. Set the optical power level to **High** using DIP switch 1, as shown in Figure 1.9. Refer to the table below for optical power level switch settings. Refer to Figure 1.2 for the optical power (DIP) switch location.

<table>
<thead>
<tr>
<th>For this optical power level:</th>
<th>Set switch 1:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>OFF</td>
</tr>
<tr>
<td>High</td>
<td>ON</td>
</tr>
</tbody>
</table>
Configuring Your 1756-MxxSE SERCOS Interface Module

This procedure assumes that you have wired your Kinetix 6000 system and have configured the Kinetix 6000 baud rate and optical power switches.

Note: For detailed configuration information, refer to the *ControlLogix Motion Module Setup and Configuration Manual* (publication 1756-UM006x-EN-P).

**IMPORTANT** In order for the Kinetix 6000 to communicate with the 1756-MxxSE SERCOS interface module, (indicated by the three LEDs on the 1756-MxxSE going solid green) your RSLogix 5000 software must be version 11.0 or above.

To configure your 1756-MxxSE SERCOS interface module and create a program including your 2094-xCxx-Mxx IAM and -xMxx AM(s):

1. **If you have:**
   - Already configured your 1756-MxxSE SERCOS interface module using the *ControlLogix Motion Module Setup and Configuration Manual* (publication 1756-UM006x-EN-P)
   - Not configured your 1756-MxxSE SERCOS interface module

   **Then:**
   - Go to section Applying Power to Your Kinetix 6000.
   - Go to step 2.

2. Apply power to your ControlLogix chassis containing the 1756-MxxSE SERCOS interface module and open your RSLogix 5000 software.

   **IMPORTANT** Refer to the *ControlLogix Motion Module Setup and Configuration Manual* (publication 1756-UM006x-EN-P) for specific instructions and troubleshooting.


4. Provide/select the following New Controller attributes:
   - Controller type
   - File name
   - ControlLogix chassis size
   - ControlLogix processor slot

5. Select **OK**.
6. Select **Controller Properties** in the edit menu. The Controller Properties window opens.

7. Select the **Date and Time** tab.

8. Check the box **Make this controller the Coordinated System Time master**.

   ![Controller Properties window](image)

   **IMPORTANT** Only one ControlLogix processor can be assigned as the Coordinated System Time master.

9. Select **OK**.

10. Right-click on I/O Configuration in the explorer window and select **New Module**. The Select Module Type window opens.

11. Select **1756-MxxSE** as appropriate for your actual hardware configuration.


   ![Module Properties window](image)

   - Name the module
   - Select the slot where your module resides (left most slot = 0)
   - Select an Electronic Keying option (select Disable Keying if unsure)
13. Select **Next** until the following screen opens.

![Module Properties - Local 4 (1756-M08SE 11.1)](image)

14. Select **Data Rate**, **Cycle Time**, and **optical power Power** settings.

- Ensure the Data Rate setting matches DIP switches 2 and 3 (baud rate) as set on the IAM and AM(s), or use the Auto Detect setting.
- Set the Cycle Time according to the table below.

<table>
<thead>
<tr>
<th>ControlLogix SERCOS Module</th>
<th>Data Rate Mbit/s</th>
<th>SERCOS Ring Cycle Time ms</th>
<th>Number of Axes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1756-M08SE</td>
<td>4</td>
<td>0.5</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.0</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>0.5</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.0</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.0</td>
<td>8</td>
</tr>
<tr>
<td>1756-M16SE</td>
<td>4</td>
<td>0.5</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.0</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>0.5</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.0</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.0</td>
<td>16</td>
</tr>
</tbody>
</table>

- Ensure the Optical Power setting (high or low) matches DIP switch 1 as set on the IAM and AM(s).

15. Select **Finish**. Your new 1756-MxxSE servo module appears under the I/O Configuration folder in the explorer window.

16. Right-click on the new 1756-MxxSE module you just created and select **New Module**. The Select Module Type window opens.
17. Select your 2094-xxCxx-Mxx IAM.


19. Provide/select the following Module Properties attributes:
   - Module name
   - Base Node address
   - Electronic Keying option

20. Select Next until the following window opens.


22. Provide/select the following New Tag attributes:
   - Axis name
   - AXIS_SERVO_DRIVE as the Data Type

23. Assign your axis to the node address (as shown in the window below).

24. Select Next.

25. Select None as the Bus Regulator Catalog Number (shunt option).

27. Repeat steps 16-26 for each 2094-xxMxx Axis Module (AM). The axes appear under the Ungrouped Axes folder in the explorer window.

28. Right-click Motion Groups in the explorer window and select New Motion Group. The New Tag window opens.

29. Name the new motion group.

30. Select OK. New group appears under the Motion Groups folder.

31. Right-click on the new motion group and select Motion Group Properties. The Motion Group Properties window opens.

32. Select the Axis Assignment tab and move your axes (created in Step 21) from Unassigned to Assigned.

33. Select the Attribute tab and edit the default values as appropriate for your application.

34. Select OK.

35. Right-click on an axis in the explorer window and select Axis Properties. The Axis Properties window opens.

36. Select the Units tab and edit default values as appropriate for your application.

37. Select the Conversion tab and edit default values as appropriate for your application.

38. Select the Drive tab and set the Kinetix 6000 (2094-xxCxx-Mxx) Amplifier Catalog Number.

39. Set Loop Configuration to Position Servo.

40. Select the Motor/Feedback tab and set the Motor Catalog Number and Feedback Type as appropriate for your actual hardware configuration.

41. Select OK.

42. Repeat steps 35-41 for each axis.

43. Verify your ControlLogix program and save the file.

44. Download your program to the ControlLogix processor.
Applying Power to Your Kinetix 6000

Use the table below to determine where to begin applying power to your Kinetix 6000.

<table>
<thead>
<tr>
<th>If your Kinetix 6000 system:</th>
<th>Then:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Includes a (2094-xLxx) LIM</td>
<td>Go to Applying Power to Your Kinetix 6000 (with LIM)</td>
</tr>
<tr>
<td>Does not include a (2094-xLxx) LIM</td>
<td>Go to Applying Power to Your Kinetix 6000 (without LIM)</td>
</tr>
</tbody>
</table>

Applying Power to Your Kinetix 6000 (with LIM)

This procedure assumes that you have wired and configured your Kinetix 6000 (including the LIM) and your 1756-MxxSE SERCOS interface module.

**IMPORTANT** Follow this procedure if your Kinetix 6000 system includes a Line Interface Module (LIM).

To apply power to your Kinetix 6000 system:

1. Ensure CB1, CB2, and CB3 on the LIM are in the OFF (down) position (refer to Figure 1.4 for the location of the CB1, CB2, and CB3).

2. Disconnect the load to the motor(s).

**ATTENTION** To avoid personal injury or damage to equipment, disconnect the load to the motor(s). Ensure each motor is free of all linkages when initially applying power to the system.

3. Apply three-phase input power to the LIM VAC Line connector.

4. Set CB3 on the LIM to the ON (up) position.

5. Observe the Brake Power LED on the LIM (refer to Figure 1.4 for the location of the Brake Power LED).

<table>
<thead>
<tr>
<th>If the Brake Power LED is:</th>
<th>Status:</th>
<th>Do This:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid green</td>
<td>Brake power is ready</td>
<td>Go to step 6.</td>
</tr>
<tr>
<td>Not solid green</td>
<td>Brake power fault</td>
<td>Go to the chapter Troubleshooting Your Kinetix 6000.</td>
</tr>
</tbody>
</table>
6. Observe the I/O Power LED on the LIM (refer to Figure 1.4 for the location of the I/O Power LED).

<table>
<thead>
<tr>
<th>If the I/O Power LED is:</th>
<th>Status:</th>
<th>Do This:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid green</td>
<td>I/O power is ready</td>
<td>Go to step 7.</td>
</tr>
<tr>
<td>Not solid green</td>
<td>I/O power fault</td>
<td>Go to the chapter Troubleshooting Your Kinetix 6000.</td>
</tr>
</tbody>
</table>

7. Set CB2 on the LIM to the ON (up) position.

8. Set CB1 on the LIM to the ON (up) position.

9. Verify the Hardware Enable Input signal (IOD pin 2) for each axis is at 0 volts.

<table>
<thead>
<tr>
<th>If the Hardware Enable Input signal is:</th>
<th>Then:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 volts</td>
<td>Go to step 10.</td>
</tr>
</tbody>
</table>
| 24 volts                               | 1. Remove connection between IOD-2 and IOD-3.  
                                          | 2. Go to step 10. |

10. Observe the IAM/AM front panel logic power LED as shown in the figure below.

**Figure 1.10**
Logic Power and Status LED Display

<table>
<thead>
<tr>
<th>If the Logic Power LED is:</th>
<th>Then:</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>Go to step 11.</td>
</tr>
</tbody>
</table>
| Not ON                    | 1. Check your control power connections.  
                                          | 2. Repeat step 10. |
11. Observe the IAM/AM front panel seven segment status LED display as shown in Figure 1.10.

Note: The seven segment LED will cycle through phases until final configuration (phase 4) is reached.

<table>
<thead>
<tr>
<th>If: The seven segment status LED on your 2094-xCxx-Mxx IAM or 2094-xMxx AM</th>
<th>Is:</th>
<th>Status:</th>
<th>Do This:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actively cycling (phase 0)</td>
<td>The drive is looking for a closed SERCOS ring. Wait for phase 1 or take corrective action until you reach phase 1.</td>
<td>Check fiber-optic connections.</td>
<td></td>
</tr>
<tr>
<td>Displaying a fixed 1 (phase 1)</td>
<td>The drive is looking for active nodes. Wait for phase 2 or take corrective action until you reach phase 2.</td>
<td>Check node addressing.</td>
<td></td>
</tr>
<tr>
<td>Displaying a fixed 2 (phase 2)</td>
<td>The drive is configuring nodes for communication. Wait for phase 3 or take corrective action until you reach phase 3.</td>
<td>Check program motor and drive configuration against installed hardware.</td>
<td></td>
</tr>
<tr>
<td>Displaying a fixed 3 (phase 3)</td>
<td>The drive is configuring device specific parameters. Wait for phase 4 or take corrective action until you reach phase 4.</td>
<td>Check motor catalog number against selection.</td>
<td></td>
</tr>
<tr>
<td>Displaying a fixed 4 (phase 4)</td>
<td>The drive is configured and active.</td>
<td>Go to step 12.</td>
<td></td>
</tr>
<tr>
<td>Flashing an “E” followed by two numbers</td>
<td>Drive is faulted.</td>
<td>Go to the chapter Troubleshooting Your Kinetix 6000.</td>
<td></td>
</tr>
</tbody>
</table>

1 You can get diagnostic information from the module by highlighting the module name in RSLogix 5000. A Pseudo Key Failure often indicates that the motor selection does not match the motor installed.

12. Observe the Drive Status LED.

<table>
<thead>
<tr>
<th>If the Drive Status LED is:</th>
<th>Status:</th>
<th>Do This:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Normal condition</td>
<td>Go to step 13.</td>
</tr>
<tr>
<td>Steady red</td>
<td>Drive is faulted</td>
<td>Go to the chapter Troubleshooting Your Kinetix 6000.</td>
</tr>
</tbody>
</table>

13. Observe the Comm Status LED.

<table>
<thead>
<tr>
<th>If the Comm Status LED is:</th>
<th>Status:</th>
<th>Do This:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flashing green</td>
<td>Establishing communication with network</td>
<td>Wait for steady green.</td>
</tr>
<tr>
<td>Steady green</td>
<td>Communication is ready</td>
<td>Go to step 14.</td>
</tr>
<tr>
<td>Off</td>
<td>Drive is faulted</td>
<td>Go to the chapter Troubleshooting Your Kinetix 6000.</td>
</tr>
</tbody>
</table>
14. Observe the Bus Status LED.

<table>
<thead>
<tr>
<th>If the Bus Status LED is:</th>
<th>Status:</th>
<th>Do This:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steady green</td>
<td>Axis is enabled when status should be disabled</td>
<td>1. Verify Hardware Enable Input (IOD-2) is open. 2. Verify MSO instruction is not commanded in RSLogix 5000. 3. Return to <em>Applying Power to Your Kinetix 6000 (with LIM)</em> on page 1-18.</td>
</tr>
<tr>
<td>Flashing green</td>
<td>Bus is up, axis is disabled (normal status)</td>
<td>Go to step 15.</td>
</tr>
<tr>
<td>Off</td>
<td>Drive is faulted</td>
<td>Go to the chapter <em>Troubleshooting Your Kinetix 6000</em>.</td>
</tr>
</tbody>
</table>

15. Observe the three SERCOS LEDs on the 1756-MxxSE module.

<table>
<thead>
<tr>
<th>If the three SERCOS LEDs are:</th>
<th>Status:</th>
<th>Do This:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flashing green and red</td>
<td>Establishing communication</td>
<td>Wait for steady green on all three LEDs.</td>
</tr>
<tr>
<td>Steady green</td>
<td>Communication ready</td>
<td>Go to <em>Testing and Tuning Your Axes</em>.</td>
</tr>
<tr>
<td>Not flashing or steady green</td>
<td>1756-MxxSE module is faulted</td>
<td>Go to the <em>ControlLogix Motion Module Setup and Configuration Manual</em> (publication 1756-UM006x-EN-P) for specific instructions and troubleshooting.</td>
</tr>
</tbody>
</table>
Applying Power to Your Kinetix 6000 (without LIM)

This procedure assumes that you have wired and configured your Kinetix 6000 and 1756-MxxSE SERCOS interface module.

IMPORTANT Follow this procedure if your Kinetix 6000 system does not include a Line Interface Module (LIM).

To apply power to your Kinetix 6000 system:

1. Disconnect the load to the motor(s).

ATTENTION To avoid personal injury or damage to equipment, disconnect the load to the motor(s). Ensure each motor is free of all linkages when initially applying power to the system.

2. Apply (95-264V AC) control power to the IAM (CPD connector) and observe the logic power LED as shown in the figure below.

Figure 1.11 Logic Power and Status LED Display

<table>
<thead>
<tr>
<th>If the Logic Power LED is:</th>
<th>Then:</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>Go to main step 3.</td>
</tr>
</tbody>
</table>
| Not ON                    | 1. Check your control power connections.  
                            | 2. Repeat main step 2. |
3. Observe the front panel seven segment Status LED display as shown in Figure 1.11.

Note: The seven segment LED will cycle through phases until final configuration (phase 4) is reached.

<table>
<thead>
<tr>
<th>If:</th>
<th>Is:</th>
<th>Status:</th>
<th>Do This:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actively cycling (phase 0)</td>
<td>The drive is looking for a closed SERCOS ring. Wait for phase 1 or take corrective action until you reach phase 1.</td>
<td>Check fiber-optic connections.</td>
<td></td>
</tr>
<tr>
<td>Displaying a fixed 1 (phase 1)</td>
<td>The drive is looking for active nodes. Wait for phase 2 or take corrective action until you reach phase 2.</td>
<td>Check node addressing.</td>
<td></td>
</tr>
<tr>
<td>Displaying a fixed 2 (phase 2)</td>
<td>The drive is configuring nodes for communication. Wait for phase 3 or take corrective action until you reach phase 3.</td>
<td>Check program motor and drive configuration against installed hardware.</td>
<td></td>
</tr>
<tr>
<td>Displaying a fixed 3 (phase 3)</td>
<td>The drive is configuring device specific parameters. Wait for phase 4 or take corrective action until you reach phase 4.</td>
<td>Check motor catalog number against selection.</td>
<td></td>
</tr>
<tr>
<td>Displaying a fixed 4 (phase 4)</td>
<td>The drive is configured and active</td>
<td>Go to step 4.</td>
<td></td>
</tr>
<tr>
<td>Flashing an “E” followed by two numbers</td>
<td>Drive is faulted</td>
<td>Go to the chapter Troubleshooting Your Kinetix 6000.</td>
<td></td>
</tr>
</tbody>
</table>

1 You can get diagnostic information from the module by highlighting the module name in RSLogix 5000. A Pseudo Key Failure often indicates that the motor selection does not match the motor installed.

4. Observe the Drive Status LED.

<table>
<thead>
<tr>
<th>If the Drive Status LED is:</th>
<th>Status:</th>
<th>Do This:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Normal condition</td>
<td>Go to step 5.</td>
</tr>
<tr>
<td>Steady red</td>
<td>Drive is faulted</td>
<td>Go to the chapter Troubleshooting Your Kinetix 6000.</td>
</tr>
</tbody>
</table>

5. Observe the Comm Status LED.

<table>
<thead>
<tr>
<th>If the Comm Status LED is:</th>
<th>Status:</th>
<th>Do This:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flashing green</td>
<td>Establishing communication with network</td>
<td>Wait for steady green.</td>
</tr>
<tr>
<td>Steady green</td>
<td>Communication is ready</td>
<td>Go to step 6.</td>
</tr>
<tr>
<td>Off</td>
<td>Drive is faulted</td>
<td>Go to the chapter Troubleshooting Your Kinetix 6000.</td>
</tr>
</tbody>
</table>
6. Observe the Bus Status LED.

<table>
<thead>
<tr>
<th>If the Bus Status LED is:</th>
<th>Status:</th>
<th>Do This:</th>
</tr>
</thead>
</table>
| Steady green             | Axis is enabled when status should be disabled | 1. Verify Hardware Enable Input (IOD-2) is open.  
                              2. Verify MSO instruction is not commanded in RSLogix 5000.  
                              3. Return to Applying Power to Your Kinetix 6000 (without LIM) on page 1-22. |
| Flashing green           | Bus is up, axis is disabled (normal status) | Go to step 7. |
| Off                      | Drive is faulted | Go to the chapter Troubleshooting Your Kinetix 6000. |

7. Observe the three SERCOS LEDs on the 1756-MxxSE module.

<table>
<thead>
<tr>
<th>If the three SERCOS LEDs are:</th>
<th>Status:</th>
<th>Do This:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flashing green and red</td>
<td>Establishing communication</td>
<td>Wait for steady green on all three LEDs.</td>
</tr>
<tr>
<td>Steady green</td>
<td>Communication ready</td>
<td>Go to Testing and Tuning Your Axes.</td>
</tr>
<tr>
<td>Not flashing or steady green</td>
<td>1756-MxxSE module is faulted</td>
<td>Go to the ControlLogix Motion Module Setup and Configuration Manual (publication 1756-UM006x-EN-P) for specific instructions and troubleshooting.</td>
</tr>
</tbody>
</table>

Testing and Tuning Your Axes

This procedure assumes that you have configured your Kinetix 6000, your 1756-MxxSE SERCOS interface module, and applied power to the system.

**IMPORTANT** Before proceeding with testing and tuning your axes, verify that the IAM and AM status LEDs are as described in the table below.

<table>
<thead>
<tr>
<th>Status LED:</th>
<th>Must be:</th>
<th>Status:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive</td>
<td>Off</td>
<td>Normal condition</td>
</tr>
<tr>
<td>Comm</td>
<td>Steady green</td>
<td>Communication is ready</td>
</tr>
<tr>
<td>Bus</td>
<td>Flashing green</td>
<td>Bus is up, axis is disabled (normal status)</td>
</tr>
<tr>
<td>Seven Segment</td>
<td>Displaying a fixed 4 (phase 4)</td>
<td>The drive is configured and active.</td>
</tr>
</tbody>
</table>

Note: For detailed testing and tuning information, refer to the ControlLogix Motion Module Setup and Configuration Manual (publication 1756-UM006x-EN-P).
To test and tune each axis:

1. Verify the load was removed from the motor(s).

2. Right-click on an axis in your Motion Group folder in the explorer window and select **Axis Properties**. The Axis Properties window appears.

3. Select the **Hookup** tab.

4. Select 2.0 as the number of revolutions for the test (or another number more appropriate for your application).

---

### If you have:

<table>
<thead>
<tr>
<th>Already tested and tuned your 1756-MxxSE SERCOS interface module axes using the <em>ControlLogix Motion Module Setup and Configuration Manual</em> (publication 1756-UM006x-EN-P)</th>
<th>Then: You are finished commissioning your Kinetix 6000.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not tested and tuned your 1756-MxxSE SERCOS interface module</td>
<td>Go to step 2.</td>
</tr>
</tbody>
</table>

---

### This Test:

| Test Marker | Verifies marker detection capability as you rotate the motor shaft. |
| Test Feedback | Verifies feedback connections are wired correctly as you rotate the motor shaft. |
| Test Command & Feedback | Verifies motor power and feedback connections are wired correctly as you command the motor to rotate. Also, allows you to define polarity. |
6. Apply Hardware Enable Input signal (IOD-2) for the axis you are testing.

ATTENTION

To avoid personal injury or damage to equipment, apply 24V ENABLE signal (IOD-2) only to the axis you are testing.

7. Select the **Test** (Marker/Feedback/Command & Feedback) button to verify connections. The Online Command window opens. Follow the on-screen test instructions. When the test completes, the Command Status changes from *Executing* to *Command Complete*.

8. Select **OK**.

9. The Online Command - Apply Test window opens (Feedback and Command & Feedback tests only). When the test completes, the Command Status changes from *Executing* to *Command Complete*.
10. Select **OK**.

If:

Your test completes successfully, this window appears:

![Success Window](image1)

Then:

1. Select **OK**.
2. Go to step 11.

Your test failed, this widow appears:

![Fail Window](image2)

Then:

1. Select **OK**.
2. Verify that the Hardware Enable Input signal (IOD-2) is applied to the axis you are testing.
3. Verify the Bus Status LED turned solid green during the test.
4. Return to step 7 and run the test again.

11. Select the **Tune** tab.

![Tune Tab](image3)

12. Enter values for Travel Limit and Speed. In this example, Travel Limit = 5 and Speed = 10.

Note: Actual value of programmed units depend on your application.

13. Check **Tune** boxes as appropriate for your application.
14. Apply Hardware Enable Input signal (IOD-2) for the axis you are tuning.

**ATTENTION**
To avoid personal injury or damage to equipment, apply 24V ENABLE signal (IOD-2) only to the axis you are tuning.

15. Select the **Start Tuning** button to auto-tune your axis. The Online Command - Tune Servo window opens. When the test completes, the Command Status changes from **Executing** to **Command Complete**.

16. Select **OK**. The Tune Bandwidth window opens.

Note: Actual bandwidth values (Hz) depend on your application and may require adjustment once motor and load are connected.

17. Select **OK**.
18. The Online Command - Apply Tune window opens. When the test completes, the Command Status changes from *Executing* to *Command Complete*.

![Online Command - Apply Tune window](image)

19. Select **OK**.

<table>
<thead>
<tr>
<th>If:</th>
<th>Then:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your test completes successfully, this window appears:</td>
<td>1. Select <strong>OK</strong>.</td>
</tr>
<tr>
<td></td>
<td>2. Go to step 20.</td>
</tr>
<tr>
<td><img src="image" alt="Notification" /></td>
<td></td>
</tr>
<tr>
<td>Your test failed, this widow appears:</td>
<td>1. Select <strong>OK</strong>.</td>
</tr>
<tr>
<td></td>
<td>2. Make an adjustment to motor velocity.</td>
</tr>
<tr>
<td></td>
<td>3. Refer to 1756-UM006x-EN-P for more information.</td>
</tr>
<tr>
<td></td>
<td>4. Return to step 15 and run the test again.</td>
</tr>
<tr>
<td><img src="image" alt="Notification" /></td>
<td></td>
</tr>
</tbody>
</table>

20. Remove Hardware Enable Input (IOD-2) signal (applied in step 6 above) to disable the axis.

21. Repeat steps 2-20 for each axis.
Troubleshooting Your Kinetix 6000

Chapter Objectives

This chapter provides a description of maintenance and troubleshooting activities for the Kinetix 6000. This chapter includes:

- Safety precautions
- General troubleshooting
- Troubleshooting IAM/AM LEDs
- Troubleshooting LIM LEDs
- Troubleshooting general system problems
- Supplemental troubleshooting information
- Removing and replacing Kinetix 6000 system components

Safety Precautions

Observe the following safety precautions when troubleshooting your Kinetix 6000 drive.

**ATTENTION**

DC bus capacitors may retain hazardous voltages after input power has been removed, but will normally discharge in several seconds. Before working on the drive, measure the DC bus voltage to verify it has reached a safe level or wait the full time interval listed on the warning on the front of the drive. Failure to observe this precaution could result in severe bodily injury or loss of life.

Do not attempt to defeat or override the drive fault circuits. You must determine the cause of a fault and correct it before you attempt to operate the system. If you do not correct a drive or system malfunction, it could result in personal injury and/or damage to equipment as a result of uncontrolled machine system operation.

If you use an oscilloscope (or chart recorder) for troubleshooting, you must properly ground it. The oscilloscope chassis can be at a potentially fatal voltage if you do not properly ground it. Always connect the oscilloscope chassis to an earth ground.
General Troubleshooting

Refer to the Error Codes section below to identify problems, potential causes, and appropriate actions to resolve the problems. If problems persist after attempting to troubleshoot the system, please contact your Allen-Bradley representative for further assistance. To determine if your Kinetix 6000 drive has an error, refer to the table below.

If the Logic Power LED is ON and the Status LED display on your:

<table>
<thead>
<tr>
<th>Is:</th>
<th>Then:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2094-xxxx-Mxx IAM</td>
<td>Actively cycling segments in a full circle</td>
</tr>
<tr>
<td></td>
<td>Your Kinetix 6000 drive is ready, but SERCOS communications is not available.</td>
</tr>
<tr>
<td></td>
<td>Displaying a fixed 4</td>
</tr>
<tr>
<td></td>
<td>Your Kinetix 6000 drive is ready.</td>
</tr>
<tr>
<td>All drives</td>
<td>Flashing “E” followed by two numbers</td>
</tr>
<tr>
<td></td>
<td>Your Kinetix 6000 drive has an error. Proceed to the section Error Codes below.</td>
</tr>
</tbody>
</table>

Error Codes

The following list of problematic symptoms (no error code shown) and problems with assigned error codes is designed to help you resolve problems.

When a fault is detected, the 7-segment LED will display an E followed by the flashing of the two-digit error code, one digit at a time. This is repeated until the problem is cleared.

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Fault Message</th>
<th>Problem or Symptom</th>
<th>Possible Cause(s)</th>
<th>Action/Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>BusIndervoltage Fault (Blown fuse)</td>
<td>A blown fuse was detected on the inverter PCB</td>
<td>Blown fuse.</td>
<td>Call your Allen-Bradley representative to return module for repair.</td>
</tr>
<tr>
<td>04</td>
<td>MotorOvertemp Fault (Motor Overtemp)</td>
<td>Motor thermal switch tripped</td>
<td>• High motor ambient temperature and/or Excessive current</td>
<td>• Operate within (not above) the continuous torque rating for the ambient temperature (40°C maximum). • Lower ambient temperature, increase motor cooling.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Motor wiring error.</td>
<td>Check motor wiring at MF connector on the IAM/AM.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Incorrect motor selection.</td>
<td>Verify the proper motor has been selected.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Fault Message</th>
<th>Problem or Symptom</th>
<th>Possible Cause(s)</th>
<th>Action/Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power (PWR) indicator not ON</td>
<td>No AC power or auxiliary logic power.</td>
<td>Verify AC control power is applied to the Kinetix 6000.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal power supply malfunction.</td>
<td>Call your Allen-Bradley representative to return module for repair.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor jumps when first enabled</td>
<td>Motor wiring error.</td>
<td>• Check motor wiring. • Run Hookup test in RSLogix 5000.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incorrect motor chosen.</td>
<td>Verify the proper motor is selected.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital I/O not working correctly</td>
<td>I/O power supply disconnected.</td>
<td>Verify connections and I/O power source.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Publication 2094-IN002A-EN-P — August 2002
<table>
<thead>
<tr>
<th>Error Code</th>
<th>Fault Message (RSLogix HIM)</th>
<th>Problem or Symptom</th>
<th>Possible Cause(s)</th>
<th>Action/Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>05</td>
<td>DriveOvercurrent Fault (Power Fault)</td>
<td>Self-protection of the Intelligent Power Module (IPM) is indicating a major power related fault condition.</td>
<td>Motor cables shorted. Motor winding shorted internally. Kinetix 6000 temperature too high. Operation above continuous power rating and/or product environmental ratings. Kinetix 6000 has a short circuit, overcurrent, or failed component.</td>
<td>Verify continuity of motor power cable and connector. Disconnect motor power cables from the motor. If the motor is difficult to turn by hand, it may need to be replaced. Check for clogged vents or defective fan. Ensure cooling is not restricted by insufficient space around the unit. Verify ambient temperature is not too high. Operate within the continuous power rating. Reduce acceleration rates. Remove all power and motor connections, and perform a continuity check from the DC bus to the U, V, and W motor outputs. If a continuity exists, check for wire fibers between terminals, or send drive in for repair.</td>
</tr>
<tr>
<td>06</td>
<td>HardOvertravel Fault (+/- Hard Overtravel)</td>
<td>Axis moved beyond the physical travel limits in the positive/negative direction. Dedicated overtravel input is inactive.</td>
<td></td>
<td>Check wiring. Verify motion profile. Verify axis configuration in software.</td>
</tr>
<tr>
<td>07</td>
<td>MotFeedbackFault (Motor Feedback Loss)</td>
<td>The feedback wiring is open, shorted, or missing.</td>
<td></td>
<td>Check motor encoder wiring. Run Hookup test in RSLogix 5000.</td>
</tr>
<tr>
<td>09</td>
<td>BusUndervoltage Fault (Bus Under Voltage)</td>
<td>With three-phase power present, the DC bus voltage is below limits.</td>
<td>DC bus voltage for 460V system is below 275V DC bus voltage for 230V system is below 137V</td>
<td>Verify voltage level of the incoming AC power. Check AC power source for glitches or line drop. Install an uninterruptible power supply (UPS) on your AC input.</td>
</tr>
<tr>
<td>10</td>
<td>DriveOvervoltage Fault (Bus Overvoltage)</td>
<td>The DC bus voltage is above limits. Excessive regeneration of power. When the motor is driven by an external mechanical power source, it may regenerate too much peak energy through the Kinetix 6000’s power supply. The system faults to save itself from an overload. DC bus voltage for 460V system is over 820V DC bus voltage for 230V system is over 410V</td>
<td>Change the deceleration or motion profile. Use a larger system (motor and Kinetix 6000). Install shunt module. Verify input is within specifications.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>MotFeedbackFault (Illegal Hall State)</td>
<td>State of Hall feedback inputs is incorrect.</td>
<td>Bad connections.</td>
<td>Verify the Hall wiring at the MF connector on the IAM/AM. Verify 5V power supply to the encoder.</td>
</tr>
<tr>
<td>16</td>
<td>Softovertravel Fault (+/- Software Overtravel)</td>
<td>Axis position exceeded maximum software setting.</td>
<td></td>
<td>Verify motion profile. Verify overtravel settings are appropriate.</td>
</tr>
<tr>
<td>18</td>
<td>OverSpeedFault (Overspeed Fault)</td>
<td>Motor speed has exceeded 150% of maximum rated speed.</td>
<td></td>
<td>Check cables for noise. Check tuning.</td>
</tr>
<tr>
<td>Error Code</td>
<td>Fault Message (RSLogix HIM)</td>
<td>Problem or Symptom</td>
<td>Possible Cause(s)</td>
<td>Action/Solution</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------</td>
<td>--------------------</td>
<td>------------------</td>
<td>----------------</td>
</tr>
</tbody>
</table>
| 19         | PositionErrorFault (Follow Error) | Position error limit was exceeded. | • Increase the feed forward gain.  
• Increase following error limit or time.  
• Check position loop tuning.  
• Verify sizing of system.  
• Verify mechanical integrity of system within specification limits. |
| 20         | MotFeedbackFault (Mtr Fdbk AQB) | Motor Encoder State Error | The motor encoder encountered an illegal transition. | • Use shielded cables with twisted pair wires.  
• Route the feedback away from potential noise sources.  
• Check the system grounds.  
• Replace the motor/encoder. |
| 21         | AuxFeedbackFault (Aux Feedback Comm) | Communication was not established with an intelligent encoder. | • Verify auxiliary encoder wiring. |
| 30         | MotFeedbackFault (Motor Feedback Comm) | Communication was not established with an intelligent encoder. | • Verify motor selection.  
• Verify the motor supports automatic identification.  
• Verify motor encoder wiring. |
| 34         | GroundShortFault (Ground Fault) | Excessive ground current in the converter was detected. | Motor internal ground short.  
Internal malfunction. | Replace motor.  
Disconnect motor power cable from drive and enable drive with current limit set to 0.  
If fault clears, then a wiring error or motor internal problem exists. If fault remains, call your A-B representative. |
| 35         | DriveUndervoltageFault (Precharge Fault) | Converter pre-charge cycle failed. | Low AC input voltage.  
Internal malfunction. | Check input AC voltage on all phases.  
Call your A-B representative. |
| 36         | DriveOvertempFault (System Overtemperature) | Converter thermal switch tripped. | Excessive heat exists in the power circuitry. | • Reduce acceleration rates.  
• Reduce duty cycle (ON/OFF) of commanded motion.  
• Increase time permitted for motion.  
• Use larger Kinetix 6000 converter.  
• Check for clogged vents or defective fan.  
• Ensure cooling is not restricted by insufficient space around the unit. |
| 37         | PowerPhaseLossFault (Phase Loss Fit) | One or more phases of the input AC power is missing. Axis was enabled when main (3-phase) power was removed. | • Check input AC voltage on all phases.  
• Disable axis before removing power.  
• Clear fault. |
<p>| 38         | SERCOSFault (SERCOS Ring Fit) | The SERCOS ring is not active after being active and operational. | Cable disconnected. | Check that fiber-optic cable is present and connected properly. |</p>
<table>
<thead>
<tr>
<th>Error Code</th>
<th>Fault Message (RSLogix HIM)</th>
<th>Problem or Symptom</th>
<th>Possible Cause(s)</th>
<th>Action/Solution</th>
</tr>
</thead>
</table>
| 39         | DriveHardFault SERCOS Init | Control hardware fault detected. | Motion required for self-sensing startup commutation was obstructed. | • Verify that there are no impediments to motion at startup, such as hard limits.  
  • Increase self-sensing current if high friction or load conditions exist.  
  • Check motor or encoder wiring using wiring diagnostics. |
| 61         | AuxFeedbackFault Aux Fdbk AQB | Excessive noise detected on feedback signals | Poor grounding. | • Check ground clamp on feedback connector(s).  
  • Check Kinetix 6000 grounding. |
| 62         | AuxFeedbackFault (Aux Fdbk Loss) | The feedback wiring is open, shorted, or missing. | | Check the motor feedback cable connectors/wiring to the IAM/AM and motor. |
| 65         | No Fault Message (condition indicated by on-screen message) (Hookup Fault) | Hookup procedure failed | Motor or feedback device malfunction. | • Check motor power/feedback wiring.  
  • Refer to on-screen message for resolution. |
| 66         | No Fault Message (condition indicated by on-screen message) (Atune Flt) | Autotune procedure failed | Motor or feedback device malfunction. | • Check motor power/feedback wiring.  
  • Refer to on-screen message for resolution.  
  • Perform Hookup in RSLogix 5000.  
  • Consult RSLogix 5000 help screen. |
| 67         | DriveHardFault (Task init) | Operating system failed | Software initialization fault detected due to hardware failure. | • Cycle power.  
  • If fault persists, replace module. |
| 68         | DriveHardFault (SCAnport™ Comm) | DPI communication failed | The DPI device or cable is faulty. | Check DPI connections. |
| 69         | DriveHardFault (Objects Init) | Non-volatile memory is corrupt due to control board hardware failure. | | Load default parameters, save to non-volatile memory, and recycle power or reset the drive. |
| 70         | DriveHardFault (NV Mem Init) | Non-volatile memory is corrupt due to control board software error. | | Load default parameters, save to non-volatile memory, and recycle power or reset the drive. |
| 71         | DriveHardFault (Memory Init) | RAM or Flash memory validation failure | | • Cycle power.  
  • If fault persists, replace module. |
| 72         | DriveOvettmp Fault (Drive Overtmp) | Inverter thermal switch tripped | The fan on the IAM or an AM failed. | Replace the failed module.  
  The cabinet ambient temperature is above rating. | Check the cabinet temperature.  
  The machine duty cycle requires an RMS current exceeding the continuous rating of the controller. | Change the command profile to reduce speed or increase time.  
  The airflow access to the Kinetix 6000 is limited or blocked. | Check airflow and re-route cables away from the Kinetix 6000. |
| 73         | GroundShortFault (Backplane Comm) | Power rail CAN communications failed. | | • Check module for proper mount.  
  Power rail connection shorted or open. | Check power rail and module for foreign objects. |
| 74         | DriveOvercurrent Fault (Bus OverCurrent) | DC link current exceeds rating. | Motor or transmission malfunction. | • Check for proper motor sizing.  
  • Check/replace transmission device.  
  • Check/replace motor.  
  IAM not properly sized. | • Check for proper IAM sizing.  
  • Install larger kW rated IAM. |
## Troubleshooting IAM/AM LEDs

Use the table below for troubleshooting the Drive Status LED on your Kinetix 6000 IAM (2094-xCxx-Mxx) or AM (2094-xMxx).

<table>
<thead>
<tr>
<th>Status is:</th>
<th>Potential Cause is:</th>
<th>Possible Resolution is:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Normal, no faults</td>
<td>N/A</td>
</tr>
<tr>
<td>Steady Red</td>
<td>Drive faulted</td>
<td>Seven-segment LED displays error code Refer to the section Error Codes and continue troubleshooting.</td>
</tr>
</tbody>
</table>

## Comm Status LED

Use the table below for troubleshooting the Comm Status LED on your Kinetix 6000 IAM (2094-xCxx-Mxx) or AM (2094-xMxx).

<table>
<thead>
<tr>
<th>Status is:</th>
<th>Potential Cause is:</th>
<th>Possible Resolution is:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steady Green</td>
<td>Communication ready</td>
<td>No faults or failures. N/A</td>
</tr>
<tr>
<td>Flashing Green</td>
<td>Establishing communication</td>
<td>System is still in the process of establishing SERCOS communication. Wait for steady green LED status.</td>
</tr>
<tr>
<td>Off</td>
<td>No communication</td>
<td>Loose fiber optic connection. Verify proper fiber optic cable connections.</td>
</tr>
</tbody>
</table>

### Drive Status LED

- **DriveOvervoltage Fault (Shunt Time Out)**
  - The IAM or AM has exceeded its shunt resistor continuous rating.
  - Use a properly sized shunt or modify duty cycle of the application.
  - System uses internal shunt and requires external shunt for additional capacity.

- **DriveHardFault (Can Init)**
  - SCANport hardware initialization fault detected.
  - Control board hardware failure.
  - Reset System.
  - If fault persists, replace system module.

- **DriveHardFault (Module Mismatch)**
  - Either 230V AM is installed on power rail with 460V IAM, or 460V AM is installed on power rail with 230V IAM.
  - Replace mismatched module.

- **All others RESERVED**
  - Call your local Allen-Bradley representative.
**Bus Status LED**

Use the table below for troubleshooting the Bus Status LED on your Kinetix 6000 IAM (2094-xxCxx-Mxx) or AM (2094-xxMxx).

<table>
<thead>
<tr>
<th>If the Bus Status LED is:</th>
<th>Status is:</th>
<th>Condition:</th>
</tr>
</thead>
</table>
| Steady Green             | Bus power is present, axis enabled. No faults or failures. | Normal when:  
  • 24V is applied to Hardware Enable Input (IOD-2).  
  • MSO instruction is commanded in RSLogix 5000 software. |
| Flashing Green           | Bus power is present, axis disabled. No faults or failures. | Normal when:  
  • 24V is not applied to Hardware Enable Input (IOD-2).  
  • MSO instruction is not commanded in RSLogix 5000 software. |
| Off                      | Bus power not present.  
  • Normal when bus power is not applied.  
  • Fault exists, refer to seven segment Error Code and General Troubleshooting beginning on page 2-2. | |

**Troubleshooting LIM LEDs**

**Brake Power Status LED**

Use the table below for troubleshooting the Brake Power Status LED on your Kinetix 6000 LIM (2094-xxLxx).

<table>
<thead>
<tr>
<th>If the Brake Power Status LED is:</th>
<th>Status is:</th>
<th>Potential Cause is:</th>
<th>Possible Resolution is:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steady Green</td>
<td>Normal, brake power enabled</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
| Off                              | Brake power disabled | 24V polarity is reversed | • Correct polarity.  
  • If polarity is correct and LED is not steady green, call your Allen-Bradley representative to return module for repair. |

**I/O Power Status LED**

Use the table below for troubleshooting the I/O Power Status LED on your Kinetix 6000 LIM (2094-xxLxx).

<table>
<thead>
<tr>
<th>If the I/O Power Status LED is:</th>
<th>Status is:</th>
<th>Potential Cause is:</th>
<th>Possible Resolution is:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steady Green</td>
<td>Normal, I/O power enabled</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
| Off                             | I/O power disabled | 24V polarity is reversed | • Correct polarity.  
  • If polarity is correct and LED is not steady green, call your Allen-Bradley representative to return module for repair. |
## Troubleshooting General System Problems

Use the tables below for troubleshooting general system faults. For a list of Bulletin 1756 product manuals, refer to Related Documentation in the Preface.

<table>
<thead>
<tr>
<th>Condition:</th>
<th>Potential Cause is:</th>
<th>Possible Resolution is:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Axis or System is unstable</strong></td>
<td>The position feedback device is incorrect or open.</td>
<td>Check wiring.</td>
</tr>
<tr>
<td></td>
<td>Unintentionally in torque mode.</td>
<td>Check to see what primary operation mode was programmed.</td>
</tr>
<tr>
<td></td>
<td>Motor tuning limits are set too high.</td>
<td>Run Tune in RSLogix 5000.</td>
</tr>
<tr>
<td></td>
<td>Position loop gain or position controller accel/decel rate is improperly set.</td>
<td>Run Tune in RSLogix 5000.</td>
</tr>
<tr>
<td></td>
<td>Improper grounding or shielding techniques are causing noise to be transmitted into the position feedback or velocity command lines, causing erratic axis movement.</td>
<td>Check wiring and ground.</td>
</tr>
</tbody>
</table>
| | Motor Select limit is incorrectly set (servo motor is not matched to axis module). | • Check setups.  
• Run Tune in RSLogix 5000. |
| | Mechanical resonance | Notch filter or output filter may be required (refer to Axis Properties window, Output tab in RSLogix 5000). |
| **You cannot obtain the motor acceleration/deceleration that you want** | Torque Limit limits are set too low. | Verify that current limits are set properly. |
| | Incorrect motor selected in configuration. | Select the correct motor and run Tune in RSLogix 5000 again. |
| | The system inertia is excessive. | • Check motor size vs. application need.  
• Review servo system sizing. |
| | The system friction torque is excessive. | Check motor size vs. application need. |
| | Available current is insufficient to supply the correct accel/decel rate. | • Check motor size vs. application need.  
• Review servo system sizing. |
| | Acceleration limit is incorrect. | Verify limit settings and correct them, as necessary. |
| | Velocity Limit limits are incorrect. | Verify limit settings and correct them, as necessary. |
| **Motor does not respond to a Velocity Command** | The axis cannot be enabled for 1.5 seconds after disabling. | Disable the axis, wait for 1.5 seconds, and enable the axis. |
| | Enable signal has not been applied or the enable wiring is incorrect. | • Check the controller.  
• Check the wiring. |
| | The motor wiring is open. | Check the wiring. |
| | The motor thermal switch has tripped. | • Check for a fault.  
• Check the wiring. |
<p>| | The motor has malfunctioned. | Repair or replace the motor. |
| | The coupling between motor and machine has broken (i.e., the motor moves, but the load/machine doesn’t). | Check and correct the mechanics. |
| | Primary operation mode is set incorrectly. | Check and properly set the limit. |
| | Velocity or current limits are set incorrectly. | Check and properly set the limit(s). |</p>
<table>
<thead>
<tr>
<th>Condition:</th>
<th>Potential Cause is:</th>
<th>Possible Resolution is:</th>
</tr>
</thead>
</table>
| Presence of noise on Command or motor feedback signal wires | Recommended grounding per installation instructions have not been followed. | • Verify grounding.  
• Route wire away from noise sources.  
• Refer to System Design for Control of Electrical Noise (publication GMC-RM001x-EN-P). |
| | Line frequency may be present. | • Verify grounding.  
• Route wire away from noise sources. |
| | Variable frequency may be velocity feedback ripple or a disturbance caused by gear teeth or ballscrew balls etc. The frequency may be a multiple of the motor power transmission components or ballscrew speeds resulting in velocity disturbance. | • Decouple the motor for verification.  
• Check and improve mechanical performance of the gearbox, ballscrew, etc. |
| No Rotation | The motor connections are loose or open. | Check motor wiring and connections. |
| | Foreign matter is lodged in the motor. | Remove foreign matter. |
| | The motor load is excessive. | Verify the servo system sizing. |
| | The bearings are worn. | Return the motor for repair. |
| | The motor brake is engaged (if supplied). | • Check brake wiring and function.  
• Return the motor for repair. |
| | The motor is not connect to the load. | Check coupling. |
| Motor Overheating | The duty cycle is excessive. | Change the command profile to reduce accel/decel or increase time. |
| | The rotor is partially demagnetized causing excessive motor current. | Return the motor for repair. |
| Abnormal Noise | Motor tuning limits are set too high. | Run Tune in RSLogix 5000 again. |
| | Loose parts are present in the motor. | • Remove the loose parts.  
• Return motor for repair.  
• Replace motor. |
| | Through bolts or coupling is loose. | Tighten bolts. |
| | The bearings are worn. | Return motor for repair. |
| | Mechanical resonance | Notch filter may be required (refer to Axis Properties window, Output tab in RSLogix 5000). |
| Erratic Operation - Motor locks into position, runs without control or with reduced torque | Motor power phases U and V, U and W, or V and W reversed. | Check and correct motor power wiring. |
| | Sine, Cosine or Rotor leads are reversed in the feedback cable connector. | Check and correct motor feedback wiring. |
| | Sine, Cosine, Rotor lead sets of resolver feedback are reversed. | Check and correct motor feedback wiring. |
Supplemental Troubleshooting Information

This section provides information for accessing and changing parameters not accessible through RSLogix 5000 software.

Tools for Changing Parameters

Most parameters are accessible through RSLogix 5000 software. Alternatives to RSLogix 5000 software for changing parameters include the DPI compatible Human Interface Module (HIM) and DriveExplorer™ software. Refer to the table below for catalog numbers.

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
<th>Catalog Number</th>
<th>Firmware Revision</th>
</tr>
</thead>
<tbody>
<tr>
<td>DriveExplorer</td>
<td>DriveExplorer Software¹</td>
<td>9306-4KSOEFF</td>
<td>2.01 or later</td>
</tr>
<tr>
<td></td>
<td>Serial to SCANport Adapter</td>
<td>1203-SSS (Series B)</td>
<td>3.005 or later</td>
</tr>
<tr>
<td>HIM</td>
<td>Full Numeric LCD HIM</td>
<td>20-HIM-A3²</td>
<td>N/A</td>
</tr>
</tbody>
</table>

¹ Refer to DriveExplorer Getting Results Manual (publication 9306-GR001x-EN-E) for instructions.
² Compatible catalog numbers include all 20-HIM-Ax.

Changing Parameters Using DriveExplorer

To navigate using DriveExplorer, refer to the figure below. In this example, the I/O Interface group folder is open, the Analog Outputs parameter is selected, and the parameter elements are displayed in the box to the right.

**IMPORTANT**

Parameters are read-only when SERCOS ring is active. You must break SERCOS ring to change parameters.

To save changes, perform a non-volatile save (NVS) prior to cycling power.

Figure 2.1
DriveExplorer Example

<table>
<thead>
<tr>
<th>S</th>
<th>N</th>
<th>FIT</th>
<th>Name</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Changing Parameters Using the HIM

When using the HIM to monitor or change parameters, use the up and down arrows (\(\wedge\) and \(\vee\)) to arrive at selections. Refer to the instructions that came with your HIM for more information.

To monitor or change parameters using the HIM:

1. Select parameter. Press \(\downarrow\).

2. Select I/O AM1 Group (for IAM). Press \(\downarrow\).

3. Select Analog Outputs. Press \(\downarrow\).
   - Analog Output 1 is displayed. Press \(\downarrow\).
   - For Analog Output 2 use arrows to select. Press \(\downarrow\).

4. Press Sel.

5. Enter parameter number. Press \(\downarrow\).

Using Analog Test Points to Monitor System Variables

There are two analog output test points accessible from the IOD 26-pin connector on each IAM and AM (refer to figures 1.1 and 1.2 for connector locations).

<table>
<thead>
<tr>
<th>IOD Pin</th>
<th>Description</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>Analog Output 0</td>
<td>DAC0</td>
</tr>
<tr>
<td>24</td>
<td>Analog Output Common</td>
<td>DAC_COM</td>
</tr>
<tr>
<td>25</td>
<td>Analog Output 1</td>
<td>DAC1</td>
</tr>
<tr>
<td>26</td>
<td>Analog Output Common</td>
<td>DAC_COM</td>
</tr>
</tbody>
</table>

Refer to the Kinetix 6000 Multi-Axis Servo Drive Installation Manual (publication 2094-IN001x-EN-P) for analog output specifications.
Parameters begin with a variable to identify a specific axis by slot number, as follows:

- IAM = 0 for parameters 0-999
- 1st AM = 1 for parameters 1000-1999
- 2nd AM = 2 for parameters 2000-2999 and so on...
- 7th AM = 7 for parameter 7000-7999

Use the two analog output test points to monitor system variables, as shown in the table below.

<table>
<thead>
<tr>
<th>Analog Output</th>
<th>Controlling Parameter</th>
<th>Scale Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Parameter Number¹</td>
<td>Default Value¹</td>
</tr>
<tr>
<td>1</td>
<td>x681</td>
<td>xx40</td>
</tr>
<tr>
<td>2</td>
<td>x683</td>
<td>xx84</td>
</tr>
</tbody>
</table>

¹ x = slot number

The value entered in Scale Parameter will scale the analog output so that you can get a full scale reading of the specific parameter for the dynamic range or values you are testing.

To monitor dynamic system variables on analog outputs, use the values shown in the table below.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Parameter Number²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Velocity Feedback¹</td>
<td>xx40</td>
</tr>
<tr>
<td>Velocity Commanded¹</td>
<td>xx36</td>
</tr>
<tr>
<td>Torque Feedback²</td>
<td>xx84</td>
</tr>
<tr>
<td>Torque Commanded²</td>
<td>xx80</td>
</tr>
<tr>
<td>Following Error³</td>
<td>x189</td>
</tr>
</tbody>
</table>

¹ Velocity Command and Feedback scaling value is \( 0.25V = 1000 \text{ rpm} \) (using default scaling).
² Torque Command and Feedback scaling value is \( 0.25V = 100\% \) rated motor current or amplifier rating (whichever is less) using default scaling.
³ Output scaling is dependant on feedback device and drive resolution.
⁴ x = slot number
Replacing Kinetix 6000 System Components

Use these procedures to:

- Determine what you need to replace modules
- Remove a module from the Power Rail
- Install a replacement Power Rail module
- Remove the Power Rail
- Install a replacement Power Rail
- Remove the Line Interface Module
- Install a replacement Line Interface Module

**ATTENTION**

This drive contains ESD (Electrostatic Discharge) sensitive parts and assemblies. You are required to follow static control precautions when you install, test, service, or repair this assembly. If you do not follow ESD control procedures, components can be damaged. If you are not familiar with static control procedures, refer to Allen-Bradley publication 8000-4.5.2, *Guarding Against Electrostatic Damage* or any other applicable ESD Protection Handbook.

**Before You Begin**

Before you replace modules, be sure to have the following:

- A flat blade screw driver
- A small flat blade screw driver (3.5 mm (0.14 in.))
- Voltmeter
Removing Modules from the Power Rail

To remove module(s) from the power rail:

1. Verify that all control and input power has been removed from the system.

   **ATTENTION**
   
   To avoid shock hazard or personal injury, assure that all power has been removed before proceeding. This system may have multiple sources of power. More than one disconnect switch may be required to de-energize the system.

2. Allow five minutes for the DC bus to completely discharge before proceeding.

   **ATTENTION**
   
   To avoid hazard of electrical shock, verify that all voltage on the capacitors has been discharged before attempting to service, repair, or remove this unit. This product contains stored energy devices. You should only attempt the procedures in this document if you are qualified to do so and familiar with solid-state control equipment and the safety procedures in publication NFPA 70E.

3. Label and remove all connectors from the module (IAM, AM, or SM) you are removing. To identify each connector, refer to *Commissioning Your Kinetix 6000* (pages 1-3 to 1-5).

   Note: The Slot Filler module has no connectors aside from the connections to the power rail.

4. Remove the motor cable from the cable shield clamp, as shown in the figure below.

   **Figure 2.3**
   **Depressing the Spring Clamp**

   Use flat blade screwdriver with 3.5 mm (0.14 in.) tip to depress spring and remove cable.

   Cable Clamp

   Screwdriver tip in slot
5. Loosen the mounting screw (bottom center of each module).

6. Grasp top and bottom of the module with both hands and gently pull the module away from the connectors enough to clear the guide pin(s) (module will pivot on top bracket). Lift the bracket out of the power rail slot and remove module from the power rail.

![Figure 2.4 Removing Module from Power Rail](image)

**Replacing Power Rail Modules**

To replace the power rail module(s):

1. | If you are:                          | Then:                           |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Replacing a power rail module on</td>
<td>Go to step 3.</td>
</tr>
<tr>
<td>the existing power rail</td>
<td></td>
</tr>
<tr>
<td>Replacing a power rail module on a</td>
<td>Go to step 2.</td>
</tr>
<tr>
<td>new power rail</td>
<td></td>
</tr>
</tbody>
</table>

2. Prepare to mount your replacement module by removing the protective boots from the power rail connector.

3. Hang the mounting bracket from the slot on the power rail.

**IMPORTANT** Power rail must be in vertical orientation before replacing modules or pins may not seat properly.

4. Align the guide pin(s) on the power rail with the guide pin hole(s) in the back of the module (refer to Figure 2.4).

Note: The IAM has two power rail connectors and guide pins, all other modules have only one connector and one guide pin.
5. Use 2.26 N-m (20 lb-in.) torque to tighten the mounting screw.

6. Re-connect the module connectors.

7. Re-apply power to the system.

8. Verify that the system is operating properly.

Note: Because IAM and AM parameters reside in the RSLogix 5000 software, you do not need to perform any tuning or setup procedures.

Removing the Power Rail

This procedure assumes you have disconnected all power from the power rail modules and removed all modules from the power rail.

To remove the power rail:

1. Disconnect the braided grounding strap from the grounding stud on the right side of the power rail, as shown in the figure below.

   **Figure 2.5**
   **Removing Ground Strap**

   ![](image)

2. Loosen the mounting bolts (removing the bolts is not necessary).

3. Lift the power rail up and off of the mounting bolts.
Replacing the Power Rail

This procedure assumes you do not need to change the location of the power rail on the panel and you intend to reuse the mounting bolts of the power rail you just removed.

1. Align the replacement power rail over the existing mounting bolts.

   **IMPORTANT** To improve the bond between the power rail and subpanel, construct your subpanel out of zinc plated (paint-free) steel.

2. Tighten the mounting bolts.

3. Re-attach the braided grounding strap to the power rail grounding stud (refer to Figure 2.5).

**IMPORTANT** If you need to change the location of the power rail, or if you are installing a power rail designed for additional or fewer modules than you removed, refer to the *Kinetix 6000 Multi-Axis Servo Drive Installation Manual* (publication 2094-IN001x-EN-P) for complete installation instructions.

**ATTENTION** To avoid damage to Power Rail during installation, do not remove the protective boots until the module for each slot is ready for mounting.
Removing the Line Interface Module

To remove the Line Interface Module (LIM):

1. Verify that all input power has been removed from the LIM.

**ATTENTION**

To avoid shock hazard or personal injury, assure that all power has been removed before proceeding. This system may have multiple sources of power. More than one disconnect switch may be required to de-energize the system.

2. Allow five minutes for the DC bus to completely discharge before proceeding.

**ATTENTION**

To avoid hazard of electrical shock, verify that all voltage on the capacitors has been discharged before attempting to service, repair, or remove this unit. This product contains stored energy devices. You should only attempt the procedures in this document if you are qualified to do so and familiar with solid-state control equipment and the safety procedures in publication NFPA 70E.

3. Label and remove all connectors and wires from the LIM. To identify each connector, refer to Chapter 1 (page 1-6).

4. Loosen the mounting bolts (removing the bolts is not necessary).

5. Lift the LIM up and off of the mounting bolts.
Replacing the Line Interface Module

This procedure assumes you do not need to change the location of the LIM on the panel and you intend to reuse the mounting bolts of the LIM you just removed.

1. Align the replacement LIM over the existing mounting bolts.

   **IMPORTANT**

   To improve the bond between the LIM and subpanel, construct your subpanel out of zinc plated (paint-free) steel.

2. Tighten the mounting bolts.

3. Re-connect the LIM wires and connectors. To locate wires and connectors, refer to Chapter 1 (page 1-6).

4. Re-apply power to the LIM.

5. Verify that the LIM is operating properly.

If you need to change the location of the LIM, refer to the Kinetix 6000 Multi-Axis Servo Drive Installation Manual (publication 2094-IN001x-EN-P) for complete installation instructions.
Appendix A

Interconnect Diagrams

Chapter Objectives

This appendix contains the following interconnect diagrams:

- Kinetix 6000 interconnect diagrams
- System block diagrams

Kinetix 6000 Interconnect Diagrams

This section provides interconnect diagrams to assist you in wiring the Kinetix 6000 system. The notes in the table below apply to the interconnect diagrams on the pages that follow.

<table>
<thead>
<tr>
<th>Note</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>For power wiring specifications, refer to Chapter 3 in the Kinetix 6000 Multi-Axis Servo Drive Installation Manual (publication 2094-IN001x-EN-P).</td>
</tr>
<tr>
<td>2</td>
<td>For input fuse and circuit breaker sizes, refer to Appendix A in the Kinetix 6000 Multi-Axis Servo Drive Installation Manual (publication 2094-IN001x-EN-P).</td>
</tr>
<tr>
<td>3</td>
<td>For AC line filter specifications, refer to Appendix A in the Kinetix 6000 Multi-Axis Servo Drive Installation Manual (publication 2094-IN001x-EN-P).</td>
</tr>
<tr>
<td>4</td>
<td>For motor cable specifications, refer to Motion Control Selection Guide (publication GMC-SG001x-EN-P).</td>
</tr>
<tr>
<td>5</td>
<td>Cable shield clamp must be used in order to meet CE requirements.</td>
</tr>
<tr>
<td>6</td>
<td>Contactor coil (M1) needs integrated surge suppressors for AC coil operation. Refer to Appendix A in the Kinetix 6000 Multi-Axis Servo Drive Installation Manual (publication 2094-IN001x-EN-P).</td>
</tr>
<tr>
<td>7</td>
<td>Jumper is factory set, indicating grounded system at user site. Ungrounded sites must jumper the bleeder resistor to prevent high electrostatic buildup. Refer to Chapter 3 in the Kinetix 6000 Multi-Axis Servo Drive Installation Manual (publication 2094-IN001x-EN-P) for more information.</td>
</tr>
<tr>
<td>8</td>
<td>The Kinetix 6000 axis module referenced is either an individual axis module (2094-Mxx) or the same axis module that resides within an integrated axis module (2094-Cxx-Mxx).</td>
</tr>
<tr>
<td>9</td>
<td>Wire colors are for flying lead cable (2090-XXNFxx-Sxx) and may vary from the premolded connector cable (2090-UXNFBxx-Sxx).</td>
</tr>
<tr>
<td>10</td>
<td>Implementation of safety circuits and risk assessment is the responsibility of the machine builder. Please reference international standards EN1050 and EN954 estimation and safety performance categories. For more information refer to Understanding the Machinery Directive (publication SHB-900).</td>
</tr>
<tr>
<td>11</td>
<td>The recommended minimum wire size for wiring the safety circuit to the contactor enable connector is 1.5 mm² (16 AWG).</td>
</tr>
<tr>
<td>12</td>
<td>2094-BCxx-Mxx (460V) IAM requires step down transformer for single-phase control power input. 2094-ACxx-Mxx (230V) IAM may require step down transformer for single-phase control power input. Refer to Chapter 2 in the Kinetix 6000 Multi-Axis Servo Drive Installation Manual (publication 2094-IN001x-EN-P) for more information.</td>
</tr>
</tbody>
</table>
Power Interconnect Diagrams

The interconnect wiring for an IAM is shown figures A.1 and A.2. The configuration below does not include a LIM. The customer must supply input power components.

Figure A.1
IAM Power Interconnect Diagram (IAM without LIM)
In the configuration below the IAM has input power, brake power, and the start/stop string wired from a LIM.

Figure A.2
IAM Power Interconnect Diagram (IAM with LIM)
In the figure below, the Shunt Module is shown wired with and without an external shunt resistor.

**Figure A.3**
Shunt Module Interconnect Diagram

This configuration is wired with the jumper set for Shunt Module operation only (factory default setting).

In this configuration the jumper is removed and the system is wired with an external shunt resistor.

**AM/Motor Interconnect Diagrams**

This section contains the motor power, brake, and feedback signal interconnect diagrams between an Axis Module and MP-, 1326AB-, H-, N-, and Y-Series servo motors.

Also included are auxiliary feedback device phasing and interconnect diagrams.
In the figure below, the Kinetix 6000 axis module (460V) is shown connected to MP-Series (low inertia and integrated gear) 460V motors.

Figure A.4
Axis Module to MP-Series (460V) Motor Interconnect Diagram
In the figure below, the Kinetix 6000 axis module (230V) is shown connected to MP-Series (230V) servo motors.

**Figure A.5**
Axis Module to MP-Series (230V) Motor Interconnect Diagram

---
In the figure below, the Kinetix 6000 axis module (460V) is shown connected to 1326AB-Bxxxx (460V) servo motors.

Figure A.6
Axis Module to 1326AB-Series Motor Interconnect Diagram
In the figure below, the Kinetix 6000 axis module (230V) is shown connected to H-Series (230V) servo motors.

**Figure A.7**
**Axis Module to H-Series Motor Interconnect Diagram**

Note 8
In the figure below, the Kinetix 6000 axis module (230V) is shown connected to N-Series (230V) servo motors.

**Figure A.8**  
Axis Module to N-Series Motor Interconnect Diagram
In the figure below, the Kinetix 6000 axis module (230V) is shown connected to Y-Series (230V) servo motors.

**Figure A.9**
Axis Module to Y-Series Motor Interconnect Diagram
In the figure below, the Kinetix 6000 (IAM/AM) auxiliary feedback connections are shown.

For TTL devices, the position count will increase when A leads B. For sinusoidal devices, the position count will increase when cosine leads sine.

**Figure A.10**
**Auxiliary Feedback Interconnect Diagrams**
This section provides block diagrams of the Kinetix 6000 modules.

A block diagram of the Inverter is shown in the figure below.

Figure A.11
Inverter Block Diagram
A block diagram of the Converter is shown in the figure below.

Figure A.12
Converter Block Diagram
A block diagram of the Line Interface Module (LIM) is shown in the figure below.

**Figure A.13**
LIM Block Diagram
Appendix B

Upgrading Firmware

Chapter Objectives

This appendix provides a procedure to follow when upgrading the Kinetix 6000 firmware. The following topics are covered:

- Before you begin
- Selecting axis modules to upgrade
- HyperTerminal configuration
- Flashing firmware

Before You Begin

Upgrading axis module firmware involves setting the Axes to Flash parameter, configuring a HyperTerminal session, and flashing the firmware.

Before you begin this procedure, make sure you have the following:

<table>
<thead>
<tr>
<th>Description</th>
<th>Catalog Numbers:</th>
<th>Firmware Revision:</th>
</tr>
</thead>
<tbody>
<tr>
<td>DriveExplorer Software¹</td>
<td>9306-4KSOEFF</td>
<td>2.01 or above</td>
</tr>
<tr>
<td>Serial to SCANport Adapter</td>
<td>1203-SSS (Series B)</td>
<td>3.005 or above</td>
</tr>
<tr>
<td>RSLogix 5000 Software</td>
<td>9324-RLD300NE</td>
<td>11.0 or above</td>
</tr>
<tr>
<td>Firmware upgrade file for Kinetix 6000</td>
<td>N/A²</td>
<td>N/A²</td>
</tr>
<tr>
<td>Personal computer with HyperTerminal</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

¹ Refer to DriveExplorer Getting Results Manual (publication 9306-GR001 x-EN-E) for instructions.
² Contact Rockwell Automation Technical Support at (440) 646-5800 for firmware upgrade file.
Selecting Axis Modules to Upgrade

In this procedure you will use DriveExplorer software to set the Axes to Flash parameter (x708) and allow selective axis module upgrading.

Note: You will save time by selecting only the axis module(s) that require a firmware upgrade.

To set the Axes to Flash parameter:

1. Apply 95-264V AC to the IAM control power (CPD) connector.

2. Connect the 1203-SSS serial cable to the appropriate COM port on your personal computer.

3. Connect the 1203-SSS SCANport cable to the SCANport/DPI connector on your IAM.

4. Verify that the 1203-SSS has power by observing the LED indicated in Figure B.1.

**Figure B.1**
1203-SSS SCANport Adapter

5. Start the DriveExplorer software. Click on Explore\Connect. DriveExplorer proceeds to read your system.
6. Double-click on **2094D SERVO Config 0000**. The linear list of parameters appears, as shown in the window below.

7. Scroll down to parameter \(x:x\) 30 (Version Data) and record the version (VERS: \(xx.xxxx\)) of each axis module.

8. Double-click on **Configuration**. The following window opens.

9. Double-click on **Axes to Flash**. The Axis to Flash window opens.

10. Check each axis to flash (example above shows two axes to flash).

11. Select **OK**. The Axes to Flash parameter is set.

12. Close DriveExplorer.
To open and begin a new HyperTerminal session:

1. From the Windows® Start menu, select Programs\Accessories\HyperTerminal\HyperTerminal. The New Connection window opens.

   - Name the new HyperTerminal file
   - Choose an icon for the connection

2. Select OK. The following window opens.

   - Select the appropriate COM port
3. Select **OK**. The following window opens. Select the following properties as shown or as appropriate for your 1203-SSS SCANport adapter.

**IMPORTANT** Bits per second of HyperTerminal must match the 1203-SSS SCANport adapter setting for connection to occur.

4. Select **OK**. HyperTerminal configuration is complete.

**Flashing Firmware**

This procedure assumes you have identified which axis module(s) require flashing, have set the Axes to Flash parameter, and have configured a HyperTerminal session.

**IMPORTANT** You must also know where to find your firmware upgrade file.

1. Press **ENTER**. The HyperTerminal main menu opens.
2. Enter 3. The following window opens.

3. Enter 0. The following window opens.

4. Enter Y. As indicated in the text, the program begins displaying the character C.

   Note: Program times-out after 60 seconds. If program times-out before you complete steps 5 - 7, return to step 1.


Firmware upgrade file, as provided by Rockwell Automation Technical Support at (440) 646-5800.

Publication 2094-IN002A-EN-P — August 2002
6. Select **Xmodem** protocol.

7. Select **Send**. The flash upgrade operation begins and the following window opens.

![Image of Xmodem window](image)

8. The flash operation completes and the following window opens.

![Image of completed flash operation window](image)

**ATTENTION**

To avoid unrecoverable fault to modules, do not interrupt control power to IAM, power to the 1203-SSS SCANport adapter, or power to your PC while the flash upgrade operation is in progress.

9. Close the HyperTerminal session.

To verify that parameter 30 for each axis module is now upgraded to the new firmware revision, return to DriveExplorer (refer to Selecting Axis Modules to Upgrade, step 6 to see the linear list of parameters).
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