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Getting Started with NI 7340/7350 Motion Controllers and AKD Servo Drives

This document explains how to install and configure the AKD servo drives for use with the NI 7340 and NI 7350 motion controllers.



Tip If you encounter any problems during setup, refer to the *Tips and Troubleshooting* section for assistance.

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What You Need to Get Started

Caution Before installing the drive, review Chapter 2, *Safety*, in the *AKD Installation Manual* that came with your hardware or is available from `ni.com/manuals`. Failure to follow safety instructions may result in injury or damage to equipment.

You need the following items to get started.

Hardware

☐ A computer with an available PXI or PCI slot

☐ NI 7340 or NI 7350 motion controller

☐ UMI-7764 or UMI-7772/74

☐ 68-pin cable to connect your NI UMI and motion controller
- **UMI-7764**—SH68-C68-S
- **UMI-7772/74**—SHC68-C68-S

☐ UMI to AKD drive cable appropriate for the UMI you are using

☐ +24 VDC power supply for the NI UMI-7772/74 and AKD servo drive

☐ +5 V power supply for the UMI-7764

☐ Ethernet connection and cable for the AKD servo drive

☐ AKD servo drive

☐ NI or third-party servo motor and encoder

Note AKM series servo motors available from NI contain built-in encoders and come pre-wired for use with the AKD servo drive. National Instruments recommends using one of these motors for the best user experience and system performance.

Software

☐ NI-Motion 7.6 or later driver software

☐ One of the following software packages and documentation:

- LabVIEW 8.5 or later
- LabWindows™/CVI™ 8.5 or later
- Microsoft Visual C++
- Microsoft Visual Basic

☐ AKD WorkBench software

Figures 1 and 2 show the hardware connections using a UMI-7772/74 and UMI-7764, respectively.

Figure 1. UMI-7772/74 to AKD Drive Connections

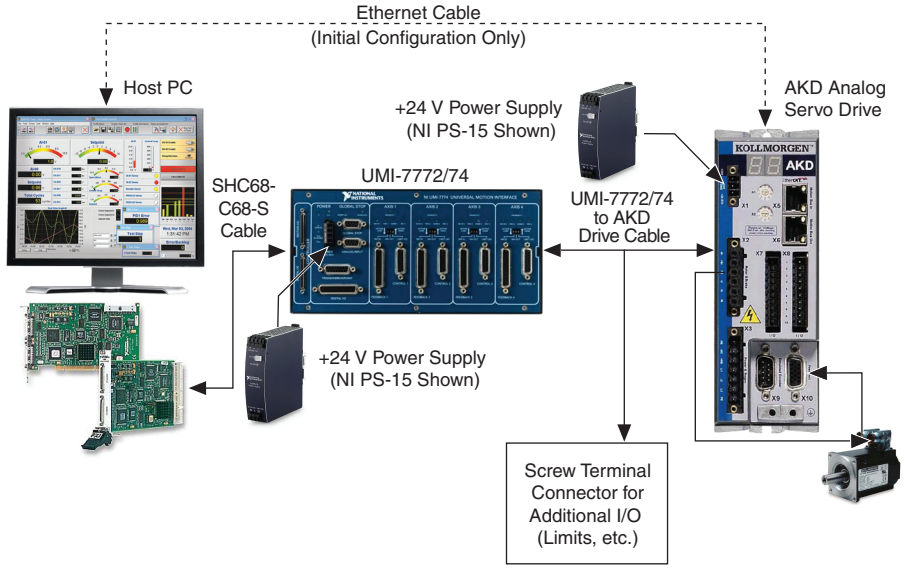
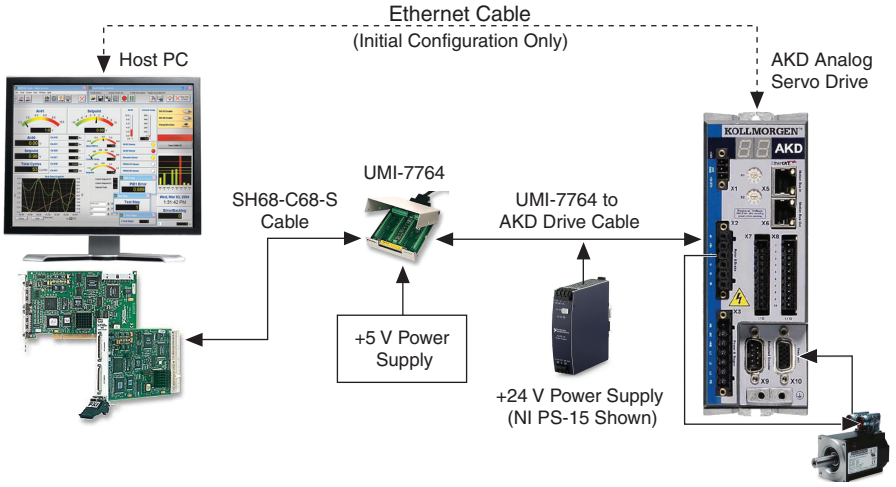


Figure 2. UMI-7764 to AKD Drive Connections



Related Documentation

The following documents contain additional information that you may find helpful. All referenced documents ship with the product and are available at `ni.com/manuals`.

- *NI 7340 User Manual or NI 7350 User Manual*—Describes the electrical and mechanical aspects of the NI 7340/7350 motion controller, and contains information about installing and operating the device.
- *Getting Started with NI-Motion for NI 73xx Motion Controllers*—Provides instructions for installing and getting started with the NI-Motion driver software and NI motion controllers.
- *AKD Installation Manual*—Provides additional information about the electrical and mechanical aspects of the AKD servo drive, including important safety information and advanced configuration information.
- *NI-Motion Help*—Contains information about designing a basic move, designing a multi-axis move, incorporating image and data acquisition into motion applications, and working with common motion concepts, such as contouring and breakpoints. This document is task-based and takes you through each phase of designing and executing a motion application.
- *NI-Motion Function Help*—Contains function reference information for C and Visual Basic and provides details about each function, including a description of the function, a list of the function parameters, illustrations, and error codes.
- *NI-Motion VI Help*—Contains LabVIEW VI reference information and provides details about each VI, including VI descriptions, lists of VI parameters, usage, illustrations, and error codes.
- *Measurement & Automation Explorer Help for Motion*—Provides information about using MAX to configure the NI motion controller as well as advanced conceptual information about topics such as Bode analysis and control loop parameters.

NI Motion Controller Configuration and Installation

Caution Before installing the NI 7340/7350 motion controller refer to the user manual appropriate to your controller for safety and specification information. Failure to follow safety instructions may result in damage to equipment.

Step 1: Install NI-Motion

You must install the NI-Motion driver software *before* installing an NI motion controller for the first time. If you are upgrading from a previous version of NI-Motion, it is not necessary to remove the NI motion controller before installing the upgrade. The upgrade does not affect the existing Microsoft Windows configuration.

Note If you are using a Real-Time OS, install LabVIEW Real-Time on the development computer before installing NI-Motion so that the RT support files install.

Complete the following steps to install the NI-Motion driver software:

1. Insert the NI-Motion CD into the CD-ROM drive to display the NI-Motion installation screen.
2. If you have autorun enabled, `autorun.exe` runs automatically. Otherwise, double-click `autorun.exe`.
3. Follow the onscreen instructions.

Note You must update the firmware on your NI motion controller(s) before you can use them with the corresponding version of NI-Motion. Refer to *Step 1: Update Firmware on the Motion Controller* in the *Software Installation and Configuration* section for detailed instructions.

Step 2: Install the NI 7340/7350 Motion Controller

The following sections explain how to install PXI and PCI motion controllers.

Note When adding or removing the motion controller, you must be logged on with administrator-level access. After you have restarted the system, you may need to refresh Measurement & Automation Explorer (MAX) to view the new controller.

PXI Controllers

1. Power off and unplug the chassis.

Caution To protect yourself and the computer from electrical hazards, the computer *must* remain unplugged until the installation is complete.

2. Choose an unused peripheral slot and remove the filler panel.
3. Touch a metal part on the chassis to discharge any static electricity that might be on your clothes or body. Static electricity can damage the controller.
4. Insert the PXI controller into the chosen slot. Use the injector/ejector handle to fully secure the device into place.
5. Attach the front panel of the PXI controller to the front panel mounting rails of the chassis with the slot screws on the chassis.

Caution Make sure you have correctly connected all safety devices before you power on the motion system. Safety devices include inhibits, limit switches, and emergency shut down circuits.

Caution Always power on the computer containing the motion controller and initialize the controller before you power on the rest of the motion system. Power off the motion system in the reverse order.

6. Plug in and power on the chassis.

PCI Controllers

1. Power off and unplug the computer.

Caution To protect yourself and the computer from electrical hazards, the computer *must* remain unplugged until the installation is complete.

2. Open the computer case to expose access to the PCI expansion slots.
3. Touch a metal part on the chassis to discharge any static electricity that might be on your clothes or body. Static electricity can damage the controller.
4. Choose an unused +3.3 V or +5 V PCI slot, and remove the corresponding expansion slot cover on the back panel of the computer.
5. Gently rock the controller into the slot. The connection may be tight, but do *not* force the controller into place.

Note Check that the bracket of the device aligns with the hole in the back panel rail of the computer chassis.

6. Secure the mounting bracket of the controller to the back panel rail of the computer.
7. Replace the cover.

Caution Make sure you have correctly connected all safety devices before you power on the motion system. Safety devices include inhibits, limit switches, and emergency shut down circuits.

Caution Always power on the computer containing the motion controller, and then initialize the controller before you power on the rest of the motion system. Power off the motion system in the reverse order.

8. Plug in and power on the computer.

Step 3: Install Software on and Configure the RT PXI Controller (PXI 7340/7350 Only)

Note This step is only required if you are using a PXI-7340/7350 motion controller and an RT PXI controller. If you are not using an RT PXI controller, skip to the *NI UMI and AKD Servo Drive Configuration and Installation* section.

Complete the following steps to configure the controller and install software on it.

Note The Measurement & Automation Explorer (MAX) user interface may not match these steps exactly depending on which version of MAX you are using.

1. Boot the NI PXI embedded controller into the real-time operating system. The PXI controller automatically boots into LabVIEW RT Safe Mode when no software is installed. LabVIEW RT Safe Mode loads with the basic real-time operating system and automatically attempts to connect to the network using DHCP. If DHCP is not available, the controller connects to the network with a link-local IP address.

Tip You can connect a monitor to the PXI to display startup messages such as the IP address and MAC address.

2. Launch Measurement & Automation Explorer (MAX) on the development computer by clicking the MAX icon on the desktop ( ), or by selecting **Start»All Programs» National Instruments»Measurement & Automation**.
3. Expand the **Remote Systems** branch. MAX lists the PXI controller as the model name of the controller followed by the MAC address (for example, **NI-PXI-8104 00802f108562**).

Tip Record the PXI controller MAC address, located on the side of the controller, for use in identifying the controller. The label also can be removed and placed on the front of the controller for easier access. If you have connected the PXI controller to a monitor, the MAC address also appears when the PXI system boots up.

4. Select the **System Settings** tab and type a descriptive name for the system in the **Name** field.
5. (Optional) Complete this step only if the target has an empty IP address (0.0.0.0). Select the **Network Settings** tab and select **DHCP or Link Local** from the **Configure IPv4 Address** list to assign an IP address or select **Static** to specify a static IP address in the **IPv4 Address** section.
6. Click **Save** on the toolbar and let MAX reboot the system.

7. When the new system name appears under **Remote Systems**, expand the controller item in the tree, right-click **Software**, and select **Add/Remove Software**.
8. Install the LabVIEW Real-Time software and NI-Motion on the RT target. Go to `ni.com/info` and enter `etspc` for the latest information about supported software.
9. Click **Next** to install the selected software on the controller. Click **Help** if you need information about installing recommended software sets.
10. Expand the **Devices and Interfaces** item under the PXI system.
11. Right-click the remote motion controller icon and select **Map to Local Machine**. This assigns a local board ID to the remote motion controller in the host system.

    Mapping the remote controller into the local system allows you to configure the controller through MAX exactly as you would a controller that is in the host system. You can initialize the controller, download firmware, and use the interactive and configuration panels exactly as you would on a controller installed in the host machine. You also can write VIs using the remote motion controller through the local board ID assigned to it.

    This allows you to write and debug your VIs on the host, and then download them to the remote system when you are ready. All you need to change is the board ID in your VI from the locally assigned Board ID to the ID assigned by the remote system.
12. Browse to **Devices and Interfaces** under **My System**, where there is a shortcut icon next to a new controller name.

    For example, if the motion controller on the remote system is a PXI-7354, and the remote system has an IP address of `123.45.678.9`, then the shortcut device would show a name like **PXI-7354 (X) on 123.45.678.9 (Y)**.

    X is the board ID assigned to the board by the remote system. Use this board ID for VIs that are downloaded to the remote system through LabVIEW RT.

    Y is the board ID assigned to the remote motion controller by the local system. Use this board ID for any VIs that run on the host and use the remote motion controller.
13. Close MAX.

NI UMI and AKD Servo Drive Configuration and Installation

This section covers the hardware setup for the NI UMI and AKD servo drive.

Step 1: Connect and Configure the NI UMI

Connecting a UMI-7772/74

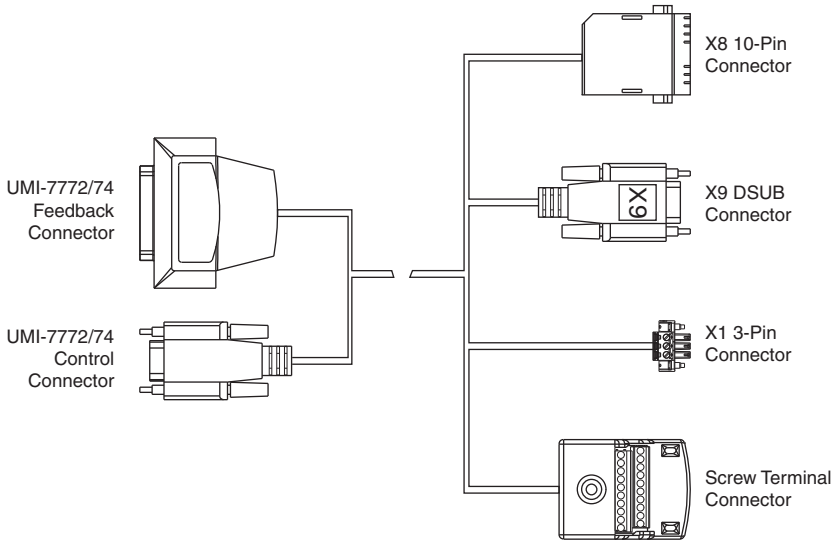
Complete the following steps to connect and configure the UMI-7772/74. If you are using a UMI-7764 refer to the *Connecting a UMI-7764* section.

Tip For more information about connecting external power, encoders, and other motion I/O signals to the UMI-7772/74, refer to the *National Instruments Universal Motion Interface (UMI)-7772/74 User Manual and Specifications*.

1. Connect the SHC68-C68-S 68-pin shielded cable between the Motion I/O connector on the NI 7340/7350 motion controller and the Motion I/O connector on the UMI-7772/74.
2. Connect the UMI-7772/74 to AKD Drive Cable to the Control and Feedback connectors on the UMI-7772/74.

   Figure 3 shows the UMI-7772/74 to AKD Drive Cable connectors.

Figure 3. UMI-7772/74 to AKD Drive Cable Connectors



The UMI-7772/74 to AKD Drive Cable contains the following connections:

- **UMI-7772/74 Feedback Connector**—25-pin DSUB connector containing encoder, limit, and home sensor signals.
- **UMI-7772/74 Control Connector**—15-pin DSUB connector containing drive command and drive enable signals.
- **X8 10-Pin Connector**—10-pin connector containing the servo command, enable, and fault signals.
- **X9 DSUB Connector**—9-pin DSUB connector containing emulated encoder output signals from the AKD servo drive.
- **X1 3-pin Connector**—+24 V power supply connection for the AKD servo drive.
- **Screw Terminal Connector**—20-pin screw terminal connector for external I/O connections. Table 1 shows the UMI-7772/74 to AKD Drive Cable screw terminal pinout.

Table 1. UMI-7772/74 to AKD Drive Cable Screw-Terminal Pinout

Pin	Signal Name
1	Forward Limit
2	Home
3	Reverse Limit
4	COM†
5	+24 V OUT
6	COM†
7	NC‡
8	NC‡
9	NC‡
10	Digital Ground†
11	+5 V (Output)
12	Reserved
13	Reserved
14	Digital Ground†
15	Reserved
16	Reserved
17	Reserved
18	Reserved
19	Reserved
20	Reserved

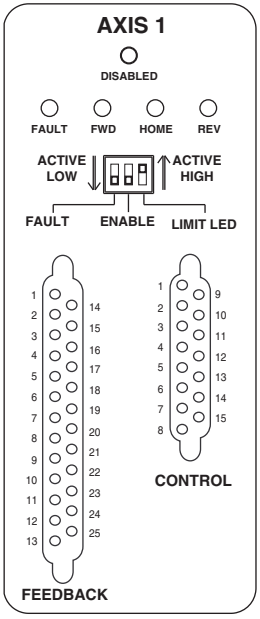
† The COM and Digital Ground signals are tied together if you connect the C and Ciso terminals on the UMI-7772/74 as shown in Figure 5.

‡ NC = Not Connected

3. Configure the UMI-7772/74 DIP switches. You must set the UMI-7772/74 switches to the following settings to match the polarity configuration for the AKD servo drive:
   - Fault—Active Low
   - Enable—Active Low

The UMI-7772/74 DIP switch configuration is shown in Figure 4.

Figure 4. UMI-7772/74 Fault and Enable DIP Switch Settings



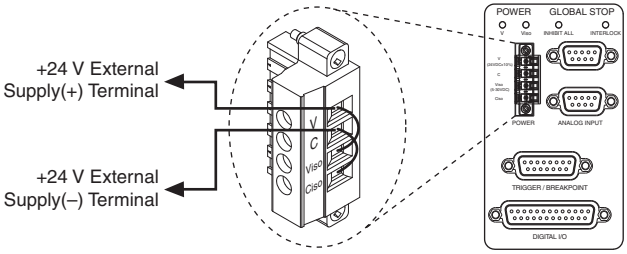
Note Configuring the limit and home status LEDs on the UMI-7772/74 does not configure the limit and home inputs themselves as active-high or active-low. You must configure the limit and home inputs separately on the National Instruments motion controller using MAX or the NI-Motion driver software. This DIP switch does not need to be configured when the UMI-7772/74 is used with the AKD servo drive.

4. Connect the positive lead of the +24 V external power supply to the V terminal and the negative lead to the C terminal, then connect the V terminal to the V_{iso} terminal and the C terminal to the C_{iso} terminal.

Note You may use the same +24 V power supply to power both the UMI-7772/74 and the AKD drive. However, ensure that the power supply is capable of delivering enough current for the application. If you require more power, connect a separate +24 V power supply to the AKD drive X1 connector as described in *Step 4: Connect the Logic Power Supply to the AKD Servo Drive*.

Figure 5 shows the power terminal block.

Figure 5. UMI-7772/74 Power Connection



Connecting a UMI-7764

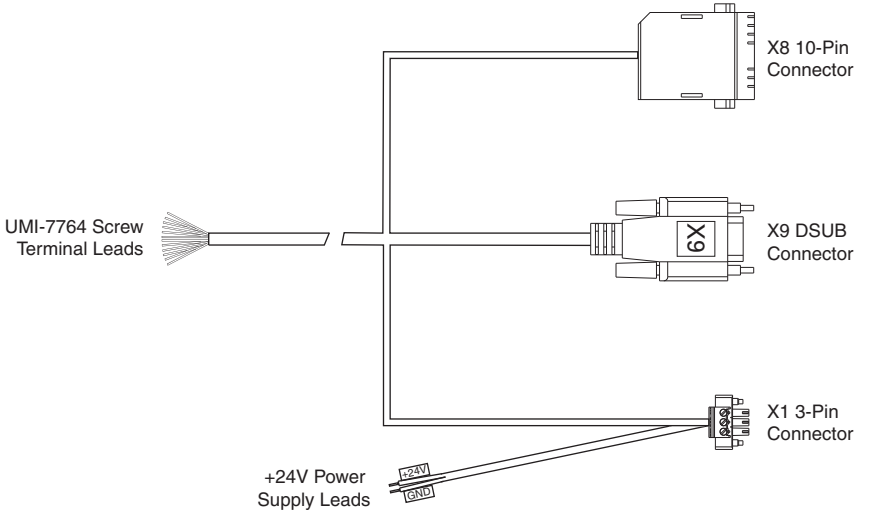
Complete the following steps to connect and configure your UMI-7764.

Tip For more information about connecting external power, encoders, and other motion I/O signals, refer to the *Universal Motion Interface (UMI)-7764 User Guide and Specifications*.

1. Connect the SH68-C68-S 68-pin shielded cable between the Motion I/O connector on the NI 7340/7350 motion controller and the Motion I/O connector on the UMI-7764.
2. Connect the UMI-7764 to AKD Drive cable to the UMI-7764 by connecting the leads from the cable to the correct screw terminal. The leads are labeled with the same signal names as the NI UMI-7764.

   Figure 6 shows the UMI-7764 to AKD Drive Cable connectors.

Figure 6. UMI-7764 to AKD Drive Cable



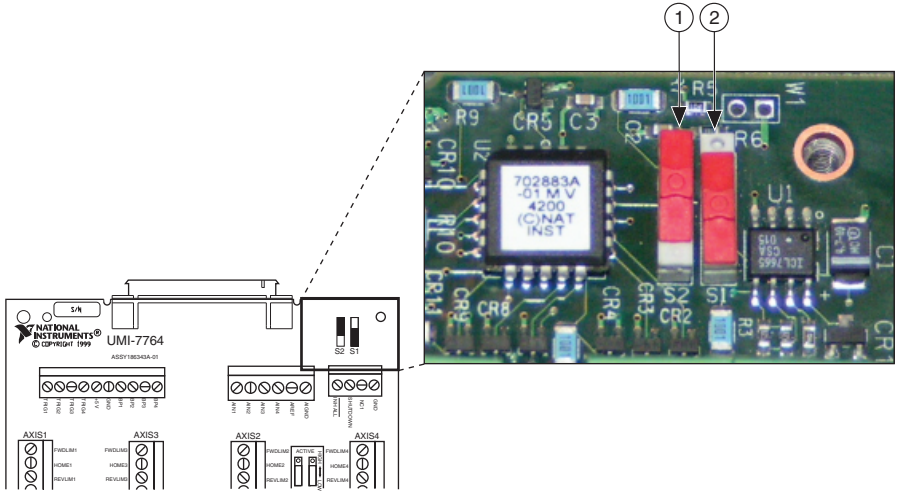
The UMI-7764 to AKD Drive Cable contains the following connections:

- **UMI-7764 Screw Terminal Leads**—Pigtail wire leads labeled with UMI-7764 signal names.
- **X8 10-Pin Connector**—10-pin connector containing the servo command, enable, and fault signals.
- **X9 DSUB Connector**—9-pin DSUB connector containing emulated encoder output signals from the AKD servo drive.
- **X1 3-pin Connector**—+24 V power supply connection for the AKD servo drive.
- **+24V Power Supply Leads**—+24 V power supply leads.

3. Configure the UMI-7764 DIP switches. You must set the DIP switches to the following settings to match the polarity configuration for the AKD servo drive:
   - Inhibit Input (S2)—Active High
   - Inhibit Output (S1)—Active Low

   The UMI-7764 DIP switch configuration is shown in Figure 7.

Figure 7. UMI-7764 Inhibit Input and Inhibit Output DIP Switch Settings

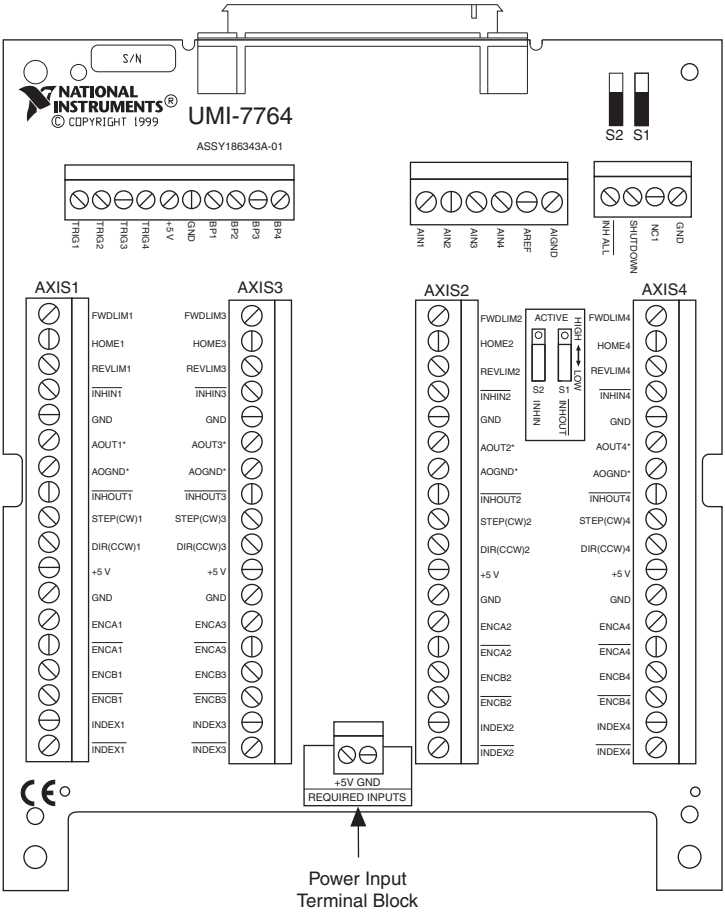


1	Inhibit Input Polarity Switch (S2)	2	Inhibit Output Polarity Switch (S1)

4. Connect an external +5 V power supply to the UMI-7764 Power Input Terminal Block. This connection is required to power the encoder circuitry that converts differential encoder signals to single-ended signals for the motion controller, as well as to power the UMI-7764 Inhibit Output signals.

Figure 8 shows the location of the UMI 7764 Power Input Terminal Block.

Figure 8. UMI-7764 Power Input Terminal Block



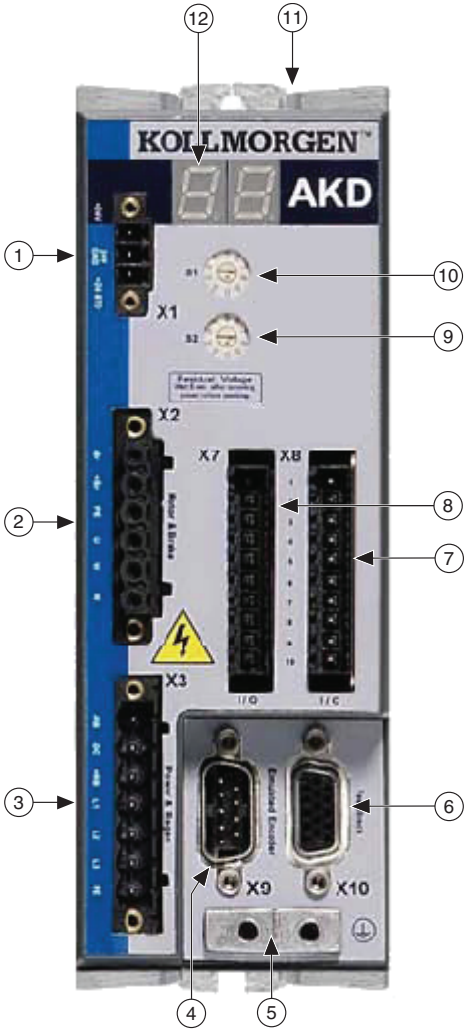
Step 2: Mount the Drive and Connect the Protective Earth

1. Mount the drive to a conductive metal plate. Refer to the *AKD Installation Manual* for dimensions and additional information specific to the drive model.
2. Connect the protective earth (PE) to either ground screw on the drive grounding lug. Figure 9 shows the location of the grounding lug on the drive.

Step 3: Connect the NI UMI to AKD Cable to the AKD Servo Drive

Connect the NI UMI to AKD cable to the AKD servo drive. Refer to Figure 9 for the location of the connectors.

Figure 9. AKD Servo Drive Connectors



1	24 V Supply, STO (X1)	5	Drive Grounding Lug	9	Static IP Addressing Switch (S2)
2	Motor, Brake (X2)	6	Feedback (X10)	10	Static IP Addressing Switch (S1)
3	AC Input Power (X3)	7	I/O Connector (X8)	11	Drive Communication (X11)
4	Encoder Emulation (X9)	8	I/O Connector (X7)	12	LED Indicators

1. Connect the cable X9 DSUB connector to the AKD servo drive X9 DSUB connector.
2. Connect the cable X8 10-pin connector to the AKD servo drive X8 10-pin connector.

Note You can use the X7 I/O connector for additional I/O but it is not used for connection to the NI UMI.

Step 4: Connect the Logic Power Supply to the AKD Servo Drive

Using a UMI-7772/74

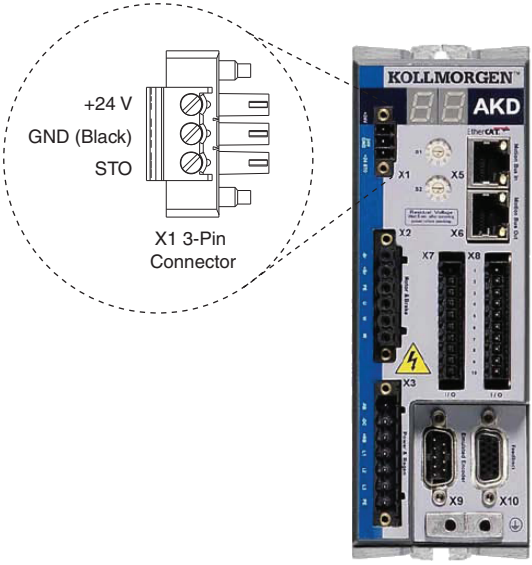
Note You may use the same +24 V power supply to power both the UMI-7772/74 and the AKD drive. However, ensure that the power supply is capable of delivering enough current for the application. If you require more power, connect a separate +24 V power supply to the AKD drive X1 connector as described in this section.

1. Connect the +24 V power supply (+) terminal to the +24V connection on the X1 3-pin connector.
2. Connect the +24 V power supply return (–) terminal to the GND connection on the X1 3-pin connector. The X1 connector is connected to the UMI-7772/74 cable by the GND wire. Do not remove this wire when connecting the +24 V power supply GND wire.
3. Connect the cable X1 3-pin connector to the AKD servo drive X1 3-pin connector.
4. Connect the STO input to the +24 V input, or connect it to the output of an external safety relay or security control.

Note The STO input *must* be powered by +24V for proper drive operation. If you need to use the STO functionality connect the STO terminal and GND terminal to the output of a safety relay or security control. The safety relay must comply with the requirements of the SIL 2 according to IEC 61800-5-2, PL d according to ISO 13849-1, or Category 3 according to EN-954. Refer to the *AKD Installation Manual* for more information.

Figure 10 shows the X1 connector pin assignment and wire colors.

Figure 10. UMI-7772/74 to AKD Cable X1 Connector



Using a UMI-7764

The +24 V power supply provides the logic power to the AKD servo drive.

Complete the following steps to connect the +24 V power supply to the UMI-7764 to AKD cable. Figure 6 shows the UMI-7764 to AKD Drive Cable +24V power supply leads.

Note Do not plug in or turn on the +24 V power supply until after you complete *Step 7: Connect the Drive Communication* in the *NI UMI and AKD Servo Drive Configuration and Installation* section.

1. Connect the +24 V power supply (+) terminal to the wire labeled +24V on the UMI-7764 to AKD cable.
2. Connect the +24 V power supply return (–) terminal to the wire labeled GND on the UMI-7764 to AKD cable.

The +24 V logic power supply also powers the safe torque output (STO) input on the X1 connector. The STO input must be powered by +24V for proper drive operation. If you need to use the STO functionality complete the following additional steps:

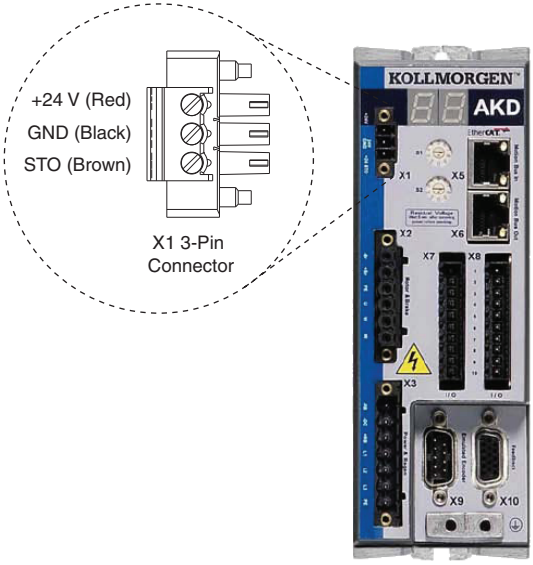
1. Disconnect the STO wire from UMI-7764 to AKD cable from the from the X1 connector and insulate it.

Note The STO and +24V wires are internally connected in the UMI-7774 to AKD cable. You *must* insulate the STO wire if you disconnect it from the X1 connector.

2. Connect the STO terminal and GND terminal to the output of a safety relay or security control. The safety relay must comply with the requirements of the SIL 2 according to IEC 61800-5-2, PL d according to ISO 13849-1, or Category 3 according to EN-954. Refer to the *AKD Installation Manual* for more information.

   Figure 11 shows the X1 connector pin assignment and wire colors.

Figure 11. UMI-7764 to AKD Cable X1 Connector



Step 5: Connect the Motor and Encoder to the Drive

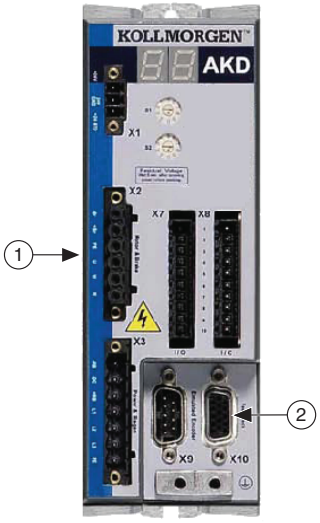
All servo motors available from NI come pre-wired for direct connection to the AKD servo drive X2 motor connector and X10 feedback connector. Refer to Figure 12 for the location of the connectors.

1. Connect the motor 6-pin connector to the AKD servo drive X2 motor connector.

Note The X2 connector also provides connection for the drive to control the +24 V holding brake for motors that have a brake. Refer to the *AKD Installation Manual* for information about using the holding brake.

2. Connect the motor DSUB feedback connector to the AKD servo drive X10 feedback connector.

Figure 12. Motor and Encoder Connections



1	Motor Connector (X2)	2	Feedback Connector (X10)

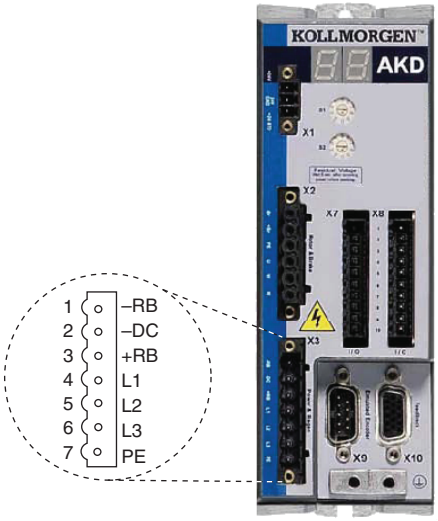
Step 6: Connect the AC Input Power

Connect the X3 mains supply connector to AC input power. Pins 4 through 7 contain the AC power signals. The X3 connector also provides signals for an external brake (regen) resistor (±RB) and DC bus link (–DC). Refer to the *AKD Installation Manual* for information about using these terminals.

Note Do not turn on AC power until after you complete *Step 7: Connect the Drive Communication* in the *NI UMI and AKD Servo Drive Configuration and Installation* section.

Figure 13 shows the location and pin assignment for the X3 connector.

Figure 13. AKD Servo Drive X3 Connector



AC input power can be connected for either a three-phase or single-phase operation.

Note External filtering and fusing are optionally provided by the user. Refer to the *AKD Installation Manual* for information about filter and fuse requirements.

Figure 14 shows three-phase connection.

Figure 14. AC Input Power Three-Phase Connection

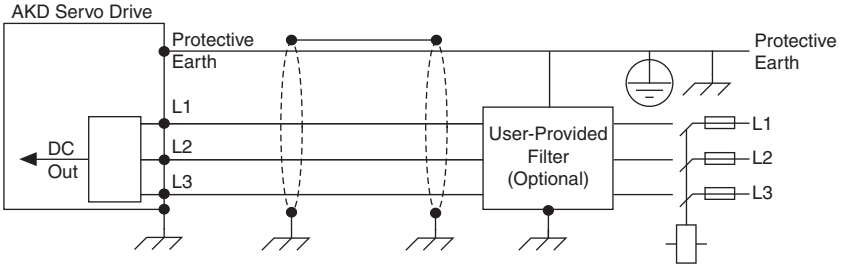
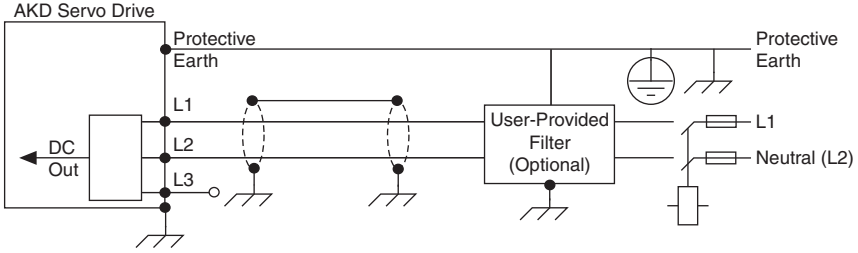


Figure 15 shows single-phase connection.

Figure 15. AC Input Power Single-Phase Connection



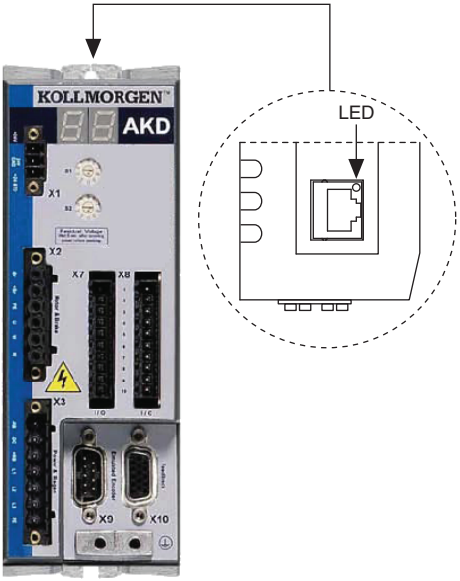
Step 7: Connect the Drive Communication

Complete the following steps to set up the drive for software configuration using Ethernet. These steps assume you are connecting the AKD servo drive using a hub, switch, or router using DHCP. If you cannot use DHCP, refer to *Connecting to the PC Using a Static IP* in the *Tips and Troubleshooting* section for instructions about direct connection using a static IP address.

1. Set S1 and S2 on the drive to 0 to configure the drive for DHCP mode. The drive obtains an IP address from an external DHCP server if one exists on the network. If no DHCP server is present, the drive assumes an automatic private IP address in the form of `169.254.x.x`. This process may take up to a minute to complete. Figure 9 shows the locations of S1 and S2.
2. Connect the AKD servo drive X11 service port to a hub, switch, or router using an Ethernet cable.

Figure 16 shows the location of the X11 service port on the drive.

Figure 16. AKD Servo Drive X11 Connector



Step 8: Confirm Drive Connections

After all hardware connections have been made complete the following steps to confirm the AKD hardware setup.

1. Apply AC power.
2. Turn on the +24 V power supply. After logic power is supplied to the drive, the drive displays the following sequence of flashes in the LED indicators. Figure 9 shows the location of the LED indicators on the AKD servo drive.
   a. – –
   b. []
   c. Drive IP address, flashed sequentially
   d. Drive status, either current operation mode or the fault code if there is a fault condition. The operation modes are as follows:
      - o0—torque mode (current mode)
      - o1—velocity mode
      - o2—position mode

Note If the drive shows a fault code, click the **Clear Faults** button on the AKD WorkBench software toolbar after you install the AKD WorkBench software in *Step 3: Install AKD WorkBench and Configure the Drive* in the *Software Installation and Configuration* section and connect to the drive to clear the fault state. If the fault

reappears, refer to the *AKD Fault and Warning Messages Card* that came with the drive for more information about the fault, including possible solutions. After resolving the cause of the fault, click the **Clear Faults** button on the toolbar again. Figure 19 shows the location of the **Clear Faults** toolbar button in the AKD WorkBench software.

Software Installation and Configuration

This section covers installing and configuring the software for the AKD servo drive and NI 7340/7350 motion controller.

Step 1: Update Firmware on the Motion Controller

Firmware is software that is loaded onto the motion controller. Firmware allows you to update the motion controller with new features and updates. The latest firmware is automatically installed on the computer when you install the latest version of NI-Motion. You must download the firmware to the motion controller.

Complete the following steps to download firmware to an NI motion controller:

1. Click the MAX icon on the desktop ( ), or select **Start»All Programs» National Instruments»Measurement & Automation** to open MAX.
2. Expand **Devices and Interfaces**, and then expand **NI Motion Devices** in the configuration tree.
3. Select the motion controller for which you want to download firmware. An exclamation point on the NI 7340/7350 motion controller icon ( ) indicates that the firmware is outdated and must be updated.
4. Click the **Firmware** tab at the bottom of the window. An exclamation point appears for each firmware sector that requires an update.
5. Click the **Update Firmware** button at the top of the window to update all the firmware files on your device.

Step 2: Configure the NI Motion Controller

Complete the following steps to configure the NI 7340/7350 motion controller for use with the AKD servo drive.

1. Open MAX, if it is not already open.
2. Expand **Devices and Interfaces**, expand **NI Motion Devices**, and then select the appropriate motion controller in the configuration tree.
3. Expand **Default xxxx Settings**, and then expand the axis associated with the AKD servo drive.
4. Click **Axis Configuration** and set **Type** to **Servo**.
5. Click **Motion I/O Settings** and select **Disabled** for the **Forward Limit Switch**, **Reverse Limit Switch**, and **Home Switch**.

Note These configuration settings disable limits for initial setup and testing purposes. National Instruments recommends connecting and enabling limits in your final application.

6. Set the limit and home input active state. This prevents the limit active error from occurring when no limits are connected.
   a. **UMI-7764**—Active Low Polarity
   b. **UMI-7772/74**—Active High Polarity
7. Set **Inhibit Output Settings** to **Active Low Polarity**.
8. Click **Control Loop Settings** and make the following changes:
   a. Set **Kp** to **50**.
   b. Set **Kd** to **300**.
   c. Set **Ki** to **0**.

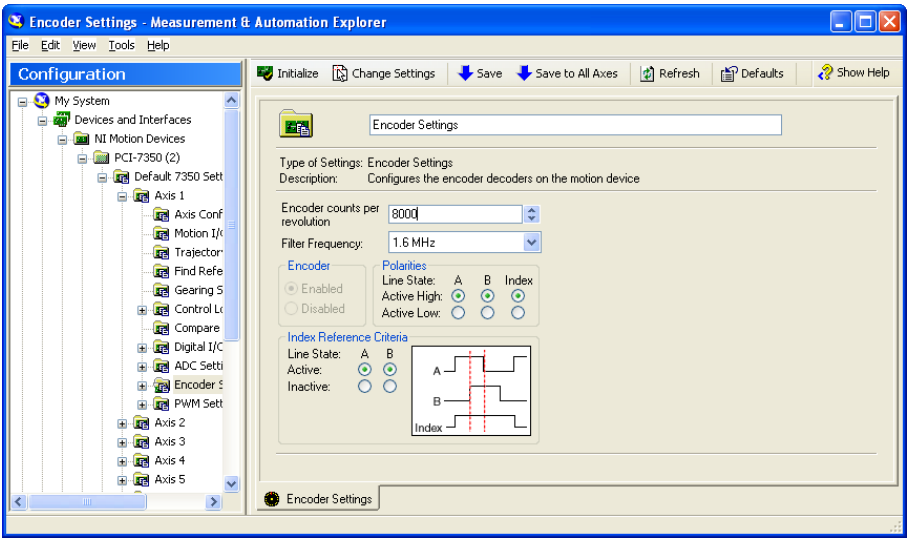
Note These values do not result in a properly tuned motor, but may allow you to perform a simple move for testing purposes. After connecting the other mechanical elements of the system, use the **Servo Tune Main** tab to tune the control loop settings and determine the relative stability of the servo axis. Refer to *Manually Tuning a System From Scratch* in the *Measurement & Automation Explorer Help for Motion* for information about using the Servo Tune tabs to tune your motor.

9. Click **Encoder Settings**.
   a. In the **Polarities** section confirm that the **Line State** for **A**, **B**, and **Index** is set to **Active High**.
   b. In the **Index Reference Criteria** section confirm that the **Line State** for **A** and **B** is set to **Active**.
   c. Set Encoder counts per revolution to 8,000. This setting is the encoder resolution in quadrature counts per revolution and must correspond to the AKD WorkBench emulated encoder output **Resolution** setting in lines per revolution multiplied by four. You may want to choose a different resolution depending on your application needs.

Note You configure the emulated encoder output **Resolution** setting in *Step 3: Install AKD WorkBench and Configure the Drive* in the *Software Installation and Configuration* section.

When you are finished the Encoder Settings page will look similar to Figure 17.

Figure 17. MAX Encoder Settings Page



10. Click **Initialize** on the toolbar to send the updated settings to the motion controller. Initializing the motion controller resets it to a known starting state so that it is ready for commands.

Step 3: Install AKD WorkBench and Configure the Drive

AKD WorkBench is available on the CD that came with the AKD servo drive and is also available from `ni.com/updates`. Complete the following steps to install AKD WorkBench.

1. Insert the AKD WorkBench CD in the CD-ROM drive.
2. Double-click `Full Setup.exe` to launch the installer.
3. Follow the onscreen instructions to complete the installation.

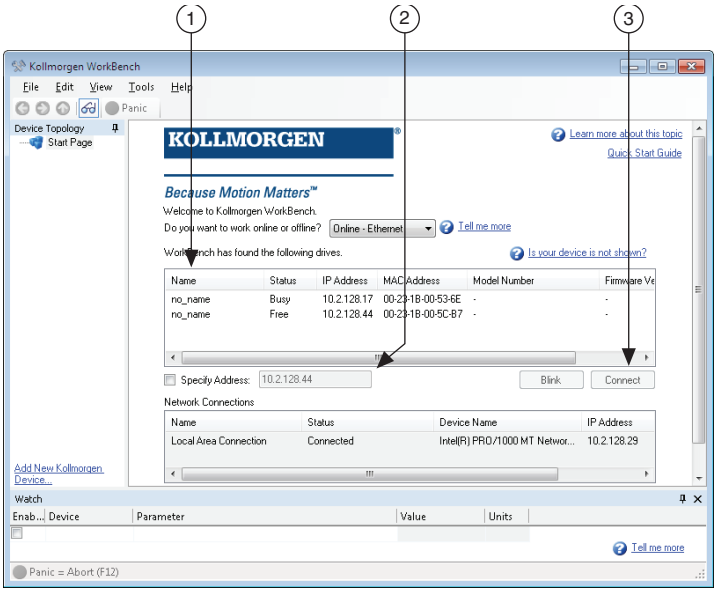
Complete the following steps to configure the drive settings with AKD WorkBench.

1. Launch the AKD WorkBench software by clicking the AKD WorkBench icon on the desktop ( ), or by selecting **Start»All Programs»Kollmorgen»AKD WorkBench**.
2. Select the drive to configure from the list and click **Connect**.

Note If the drive is not in the list, refer to the *Tips and Troubleshooting* section of this document for possible solutions.

Figure 18 shows the AKD WorkBench start page.

Figure 18. AKD WorkBench Start Page

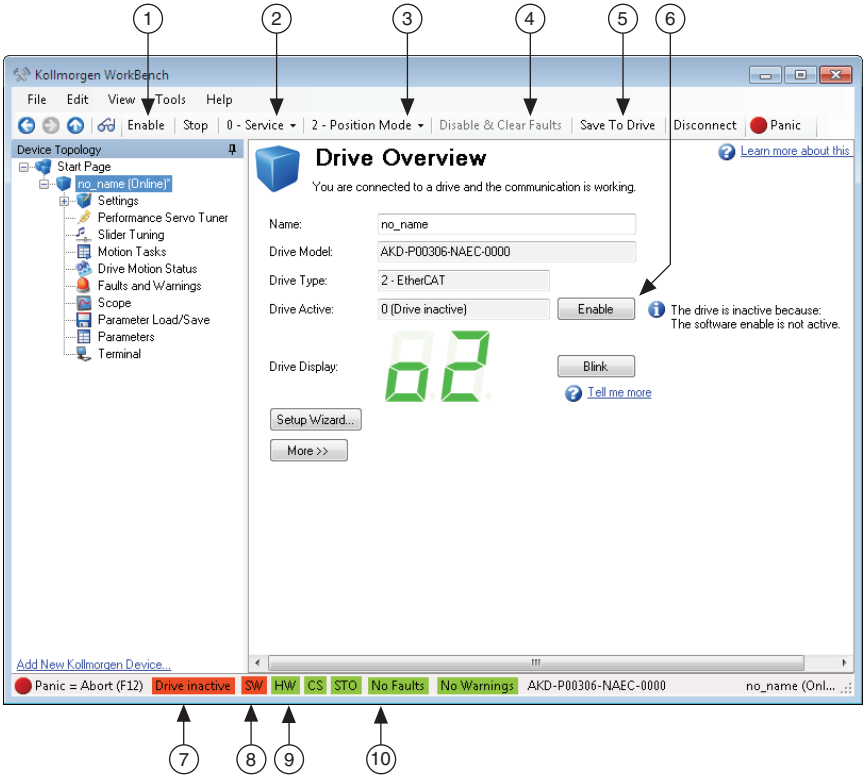


1	Available Drives	2	Specify Address	3	Connect to Drive

3. (Optional) Change the name of the drive from the default name of `no_name` on the **AKD Overview** page to a more descriptive name.

   Figure 19 shows the AKD Overview page.

Figure 19. AKD WorkBench Overview Page

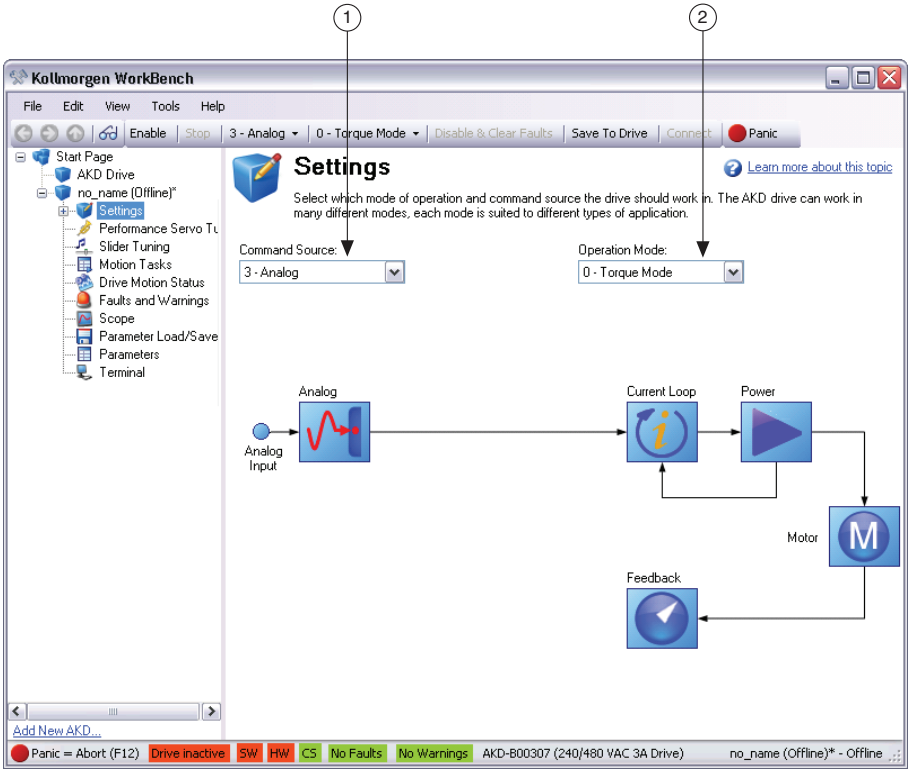


1	Software Enable/Disable	6	Software Enable/Disable
2	Command Source	7	Drive Active Indicator
3	Operation Mode	8	Software Enable Status Indicator
4	Clear Faults	9	Hardware Enable Status Indicator
5	Save Configuration Settings to Drive	10	Fault Indicator

4. Configure the command source and operation mode.
   a. Open the **Settings** page and set the **Command Source** to **3 - Analog**.
   b. Set the **Operation Mode** to **0 - Torque Mode**.

When you have updated these settings the **Settings** page should look similar to the following figure.

Figure 20. AKD WorkBench Settings Page



1	Command Source Setting	2	Operation Mode Setting

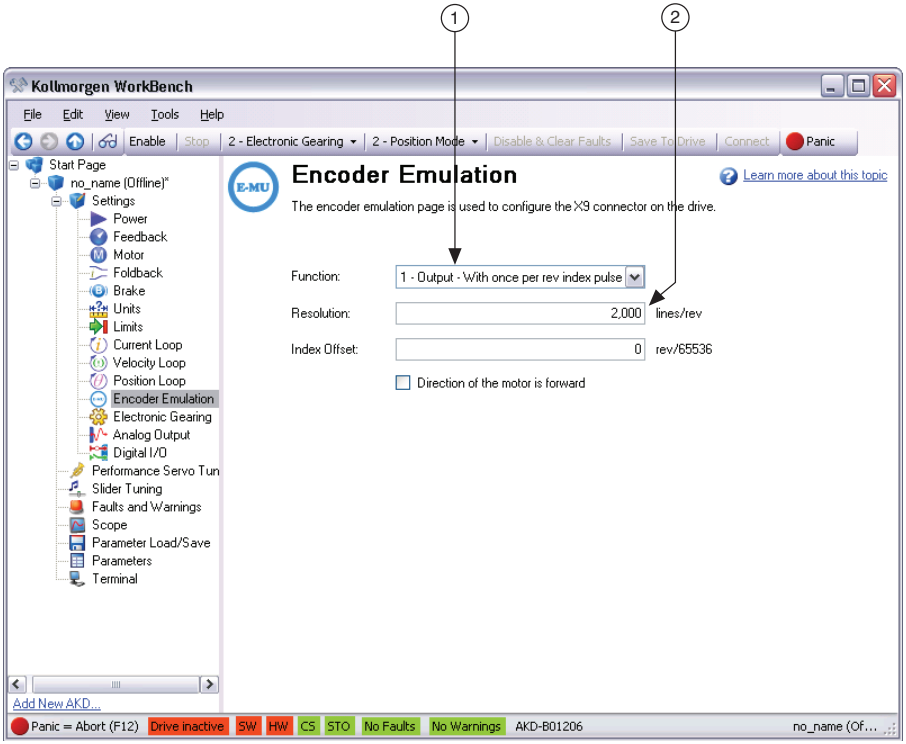
5. Configure the emulated encoder output.
   a. Expand the **Settings** tree item and open the **Encoder Emulation** page.
   b. Select **1 - Output - With once per rev index pulse** from the **Function** dropdown list.
   c. Set the **Resolution** to 2,000 lines/rev.

Note The encoder resolution output value determines the equivalent resolution of an incremental encoder in pulses per revolution (PPR). A resolution of 2,000 lines/rev is the same as 8,000 quadrature counts per revolution. You may want to choose a different value depending on your application needs. In general, higher resolution values result in more difficult servo loop tuning; lower resolution values provide less accuracy. If you select a different value for **Resolution**, remember to update the **Encoder counts per revolution** setting in MAX.

   d. Set the **Index Offset** to 0.

Figure 21 shows the AKD WorkBench Encoder Emulation page.

Figure 21. AKD WorkBench Encoder Emulation Page



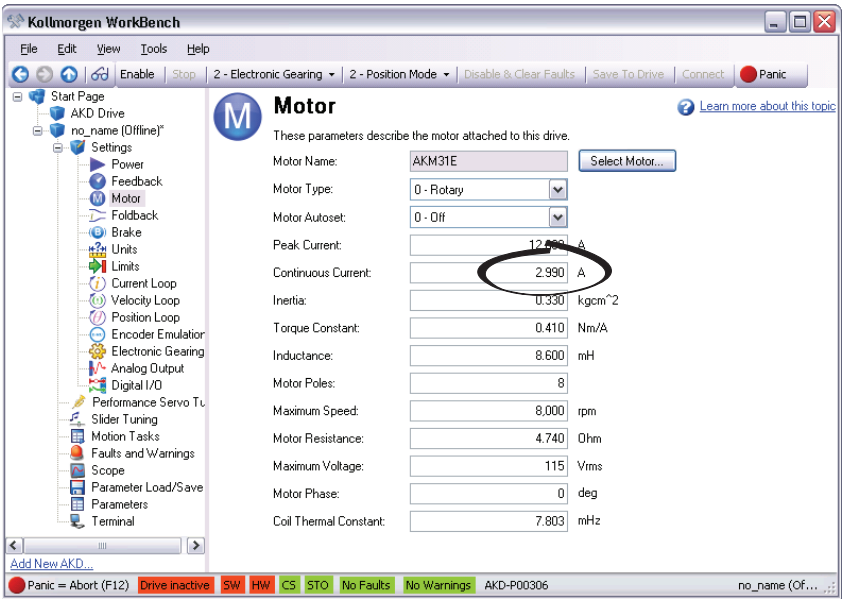
1	Function Setting	2	Resolution Setting

6. Configure the analog input command scaling.
   a. Expand the **Settings** tree item and open the **Motor** page.
   b. Write down the motor **Continuous Current** value.

Note Motor continuous current is in Arms.

Figure 22 shows the AKD WorkBench **Motor** page.

Figure 22. AKD WorkBench Motor Page



c. Expand the **Settings** tree item and open the **Analog Input** page.

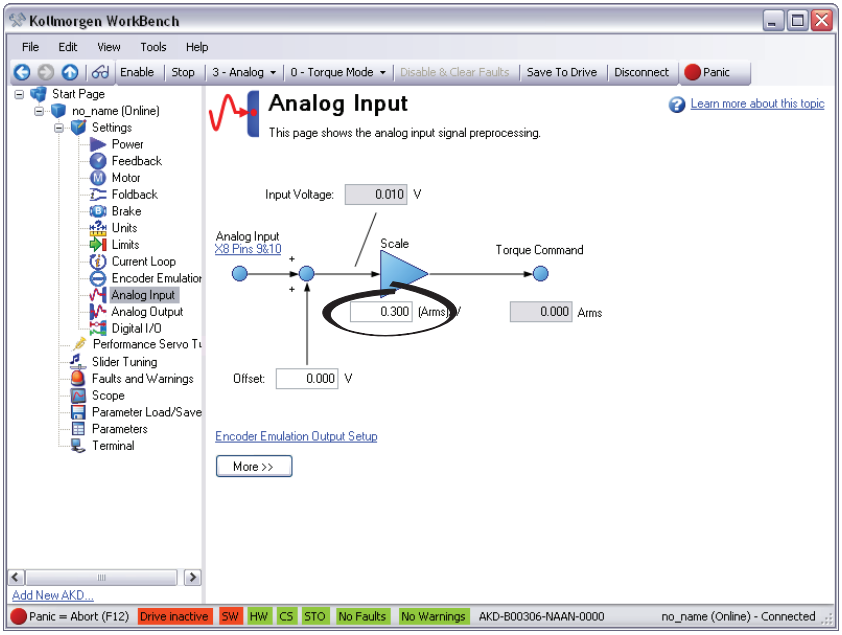
d. Set the **Scale** to the appropriate Arms/V value based on the following equation:

$$Scale = Motor\ continuous\ current / 10$$

For example, if you have a motor with a maximum current of 3.00 Arms set **Scale** to 0.3 Arms/V.

Figure 23 shows the analog input scaling setting.

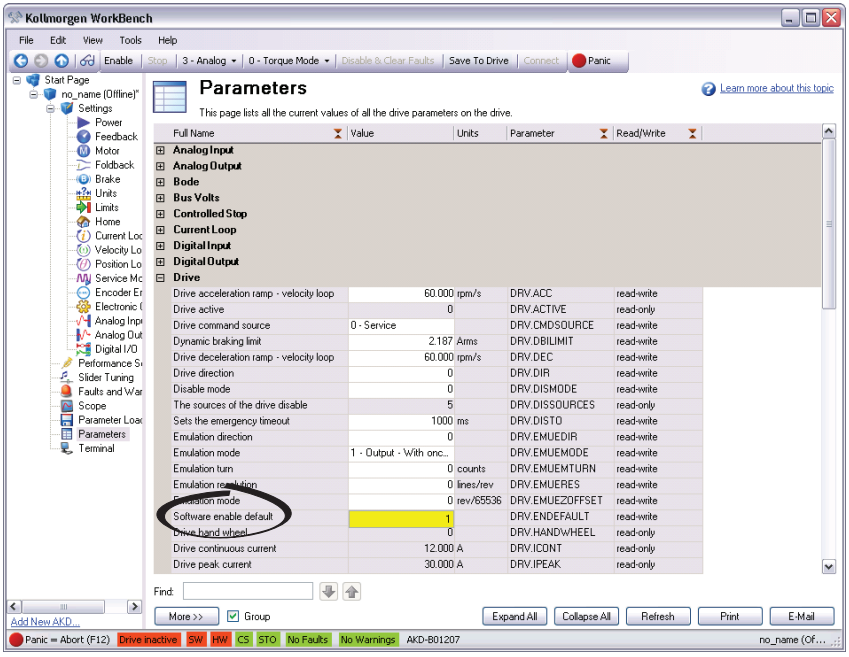
Figure 23. AKD WorkBench Analog Input Scale Setting



7. Configure the software enable signal:
   a. Click the **Parameters** tree icon to list all configurable drive parameters.
   b. Expand the **Drive** section.
   c. Set the **Software enable default** parameter to 1.

Figure 24 shows the AKD WorkBench parameters page.

Figure 24. AKD WorkBench Parameters Page



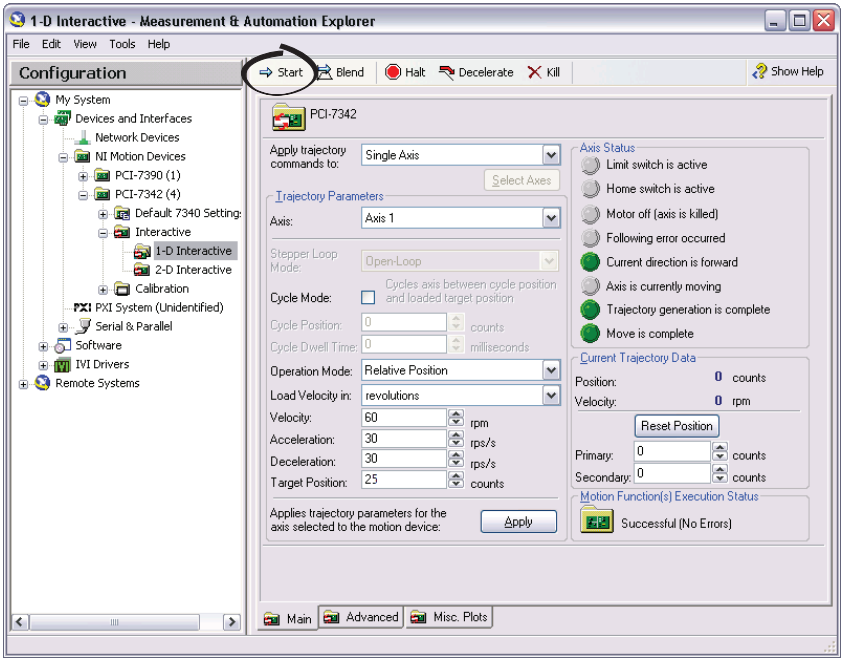
Note If you are using an EtherCAT AKD drive in analog mode, refer to *Using an EtherCAT AKD Drive in Analog Mode* in the *Tips and Troubleshooting* section for additional settings you may need to apply.

8. Activate the software enable on the drive by clicking the **Enable** button on the **AKD Overview** page or on the toolbar. Figure 19 shows the location of the **Enable** button.
9. Save all configuration changes to the drive by clicking the **Save to Drive** toolbar button shown in Figure 19.

Step 4: Test the Motor In MAX

You will now move the motor using the NI motion controller and MAX. Select the **1-D Interactive** panel in the Configuration tree and change the settings to match those shown in Figure 25. Change the axis if you are not using Axis 1.

Figure 25. 1-D Interactive Panel Settings



10. Click **Start**. Your motor should rotate 25 times at 60 rpm.
11. Finalize your motion system setup by connecting and configuring additional I/O such as limits as required by your application.
    - If using the UMI-7764, use the available screw-terminal connections on the same axis terminal block as the AKD servo drive connections.
    - If using the UMI-7772/74, use the screw-terminal connections on the UMI-7772/74 to AKD drive cable. Table 1 shows the screw-terminal connector pinout.
12. Tune the motor with a load connected using the **Servo Tune Main** tab in MAX. Refer to *Manually Tuning a System From Scratch* topic in the *Measurement & Automation Explorer Help for Motion* for information about using the Servo Tune tabs to tune your motor.

Tips and Troubleshooting

The Drive Does Not Enable

If, after going through all steps in this document, the AKD servo drive does not enable, verify the following settings:

- The Inhibit Output from the NI 7340/7350 must not be active. Figure 19 shows the location of the hardware enable indicator in the AKD WorkBench software.
- The software enable must be enabled. This setting is available on the upper toolbar in the AKD WorkBench software. Figure 19 shows the location of the software enable indicator and toolbar button.
- The drive must not be in a fault state. Click the **Clear Faults** button on the toolbar to clear the fault state after determining and fixing the source of the fault. Figure 19 shows the location of the Fault indicator and **Clear Faults** toolbar button.

Tip Refer to the *AKD Fault and Warning Messages* card that came with the drive for fault information and solutions.

Cannot Communicate With the Drive Using Ethernet

Confirm that the link LEDs on the drive and PC are both illuminated. Figure 16 shows the location of the link LED on the drive.

UMI-7772/74 Does Not Turn On

Confirm that the V terminal is connected to the V_{iso} terminal and the C terminal is connected to the C_{iso} terminal. Figure 5 shows the power terminal block.

Drive Does Not Turn On

Confirm that the +24 power supply is properly connected and that the STO input is powered by either +24 V or connected to an external safety relay. Refer to *Step 4: Connect the Logic Power Supply to the AKD Servo Drive* for more information.

Connecting to the PC Using a Static IP

1. Use the S1 and S2 rotary switches on the drive to set a static IP address. The IP address is `192.168.0.S1S2`. For example, if S1 is set to 2 and S2 is set to 3 the IP address is `192.168.0.23`.

Note If you change S1 or S2 when the +24 V power supply is powered on, you must unplug the network cable from the drive for at least three seconds to reset the IP address.

2. Connect the AKD servo drive to the computer directly using an Ethernet cable. Figure 16 shows the location of the X11 service port on the drive.

3. Complete the following steps to configure the static IP based on your operating system version.

   (Windows XP)

   a. Select **Start»Control Panel»Network Connections** to open the **Network Connections** dialog box.

   b. Select the network connection type corresponding to the port you used to connect the AKD servo drive. This will most likely be **Local Area Connection *x***, where x corresponds to the number of the connection.

   c. Click **Properties** to open the **Local Area Connection Properties** dialog box.

   d. Select **Internet Protocol (TCP/IP)** from the list and click **Properties**.

   e. In the **Internet Protocol (TCP/IP)** dialog box, select **Use the following IP address**.

   f. Change **IP address** to `198.168.0.100`.

   g. Change **Subnet mask** to `255.255.255.0`.

   (Windows Vista or Later)

   a. Select **Start»Control Panel»Network and Sharing Center.**

   b. Select the network connection type corresponding to the port you used to connect the AKD servo drive. This will most likely be **Local Area Connection *x***, where x corresponds to the number of the connection.

   c. Click **Properties** to open the **Local Area Connection Properties** dialog box.

   d. Select **Internet Protocol Version 4 (TCP/IPv4)** from the list and click **Properties**.

   e. In the **Internet Protocol Version 4 (TCP/IPv4)** dialog box, select **Use the following IP address**.

   f. Change **IP address** to `198.168.0.100`.

   g. Change **Subnet mask** to `255.255.255.0`.

Verify that S1 and S2 are set to non-zero values.

The Motor Responds Poorly

Use the Servo Tune tabs in MAX to change the control loop settings for the motor. Refer to *Manually Tuning a System From Scratch* topic in the *Measurement & Automation Explorer Help for Motion* for information about using the Servo Tune tabs to tune your motor.

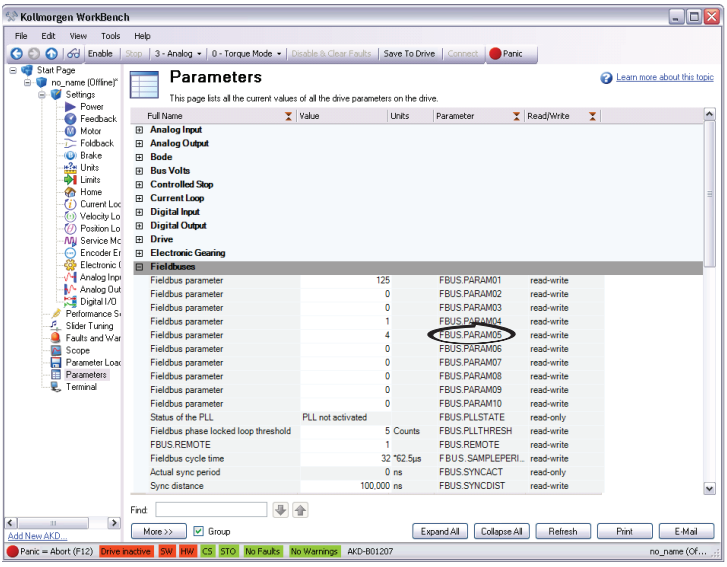
Using an EtherCAT AKD Drive in Analog Mode

If you are using an EtherCAT AKD drive in Analog mode with firmware version M_01-04-00-003 or later, you must set FBUS.PARAM05 to 4. Complete the following steps to set this parameter.

1. Click the **Parameters** tree icon to list all configurable drive parameters.
2. Expand the **Fieldbuses** section.
3. Set the FBUS.PARAM05 parameter to 4.
4. Save all configuration changes to the drive by clicking the **Save to Drive** toolbar button shown in Figure 19.

Figure 26 shows the Fieldbuses section of the AKD WorkBench parameters page.

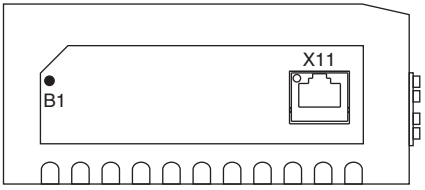
Figure 26. AKD WorkBench Fieldbuses Section



Cannot See the AKD Servo Drive in the AKD WorkBench Software

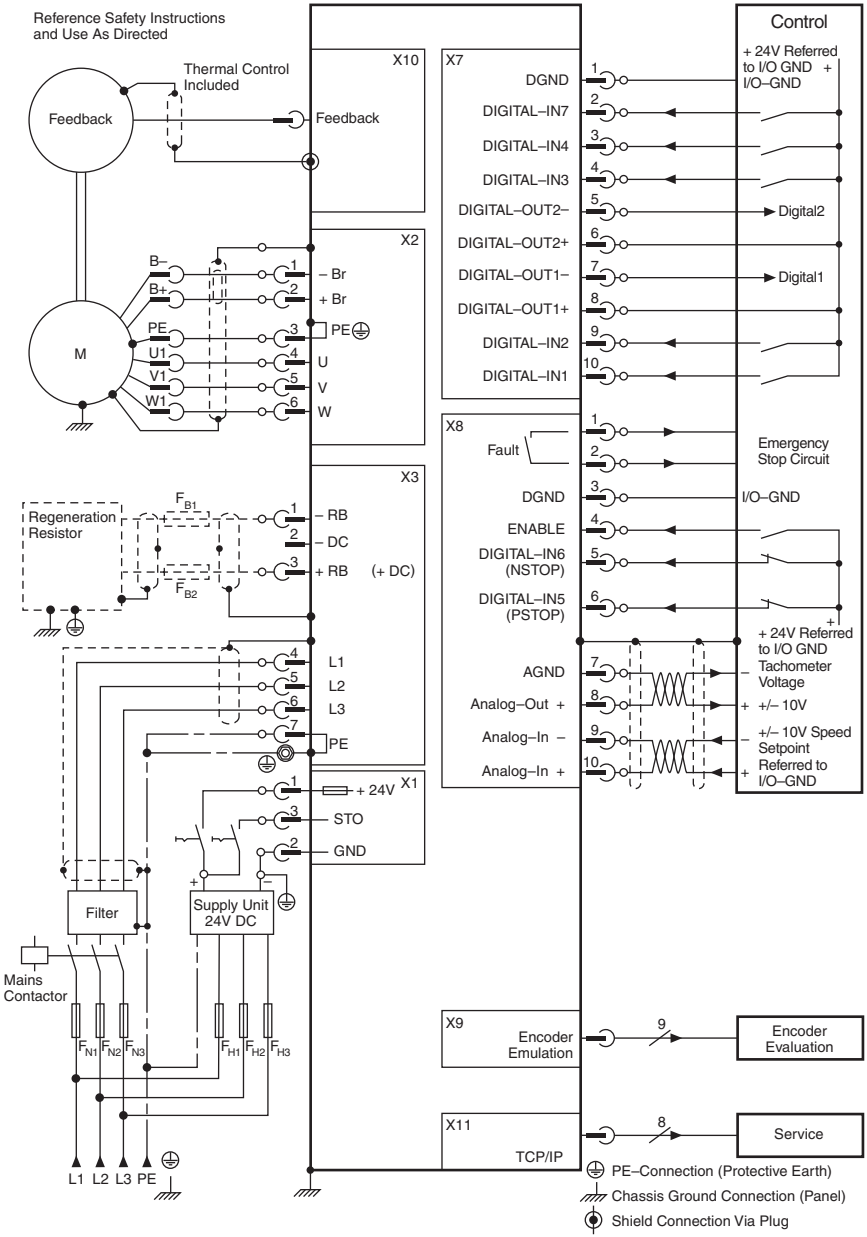
Manually enter the drive IP address by enabling the **Specify Address** checkbox on the AKD WorkBench software Start Page shown in Figure 18. To obtain the drive IP address either press the B1 button on the top of the drive or disconnect and reconnect the Ethernet cable. In either case, the LED displays the digits and dots of the IP address in sequence. Figure 27 shows the location of the B1 button.

Figure 27. AKD Servo Drive B1 Button



Wiring Diagram

Figure 28. AKD Wiring Diagram



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