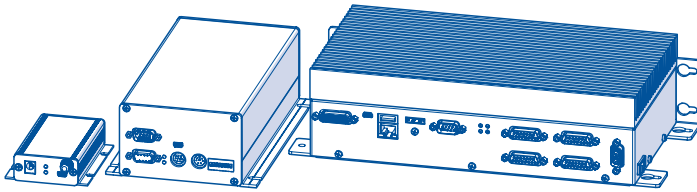# Digital Motor Controllers and Drivers

PI

Short Instructions
C-414 / C-663 / C-863 / C-867 / C-877 / C-884 / E-861 / E-871 / E-872.401 / E-873

User Information

These short instructions contain an overview of the most important safety information and handling instructions for installation and startup of motor controllers and motor drivers (hereinafter referred to as „electronics") with the above-mentioned product numbers.

Subject to change. These short instructions are superseded by any new release. The latest respective release is available for download on our website.

Downloading and Reading the Manual

The actions during installation, starting and operating, adapting the settings, and maintenance require additional information from the manuals for the electronics and/or the positioner.

Manuals may be titled as follows: „User Manual", „Technical Note".

Downloading Manual Packages as ZIP File

If you received a CD from PI with the PI Software Suite, follow the instructions in the file **Manuals\A000T0081-Downloading Manuals from PI.pdf** to download the manuals for your electronics.

Downloading Manuals from the Website

1. Open the website **www.pi.ws**.
2. Search the website for the product number (e.g., C-663.12) or the product family (e.g., PICMA® Bender).
3. Click the corresponding product to open the product detail page.
4. Click **Downloads**.
   The manuals are displayed under **Documentation**.
5. Click the desired manual and fill out the inquiry form.
   The download link will then be sent to the email address entered.

If you cannot find the manual you are looking for or if you have any questions: Contact our customer service department via service@pi.de.

⚠ General Safety Instructions

Intended Use

The electronics are a laboratory device as defined by DIN EN 61010-1. They are intended for indoor use and use in an environment which is free of dirt, oil, and lubricants.

According to their design, the electronics are intended for operating positioners from PI.

The electronics may only be used in compliance with the technical specifications and instructions in this user manual. The user is responsible for process validation.

The electronics may not be used for purposes other than those stated in the user manual. The electronics may only be installed, operated, maintained, and cleaned by authorized and appropriately qualified personnel.

Installing

Unsuitable cables can cause damage to the electronics and can affect the performance of the positioner.

▶ Use genuine PI parts only for connecting the positioner to the electronics.
▶ If you need longer cables, use extension cables from PI.

Startup

The collision of a moving part at the end of the travel range, or with an obstacle, as well as high accelerations, can cause damage to or considerable wear on the stage.

▶ Do not deactivate the limit switch evaluation by the electronics.
▶ Stop the axis in time.
▶ If you use a system for closed-loop operation: Avoid motion in open-loop operation.
▶ Set the velocity and acceleration accordingly.
▶ For drives without self-locking, make sure that unexpected motion is not possible.

Unsuitable settings can cause the positioner to oscillate. Oscillation can damage the positioner and/or the load fixed to it.

▶ If the stage is oscillating (unusual operating noise), switch off servo mode or the electronics immediately.
▶ Change the parameter settings of the electronics (see manual).
▶ If there is any oscillation during the reference move, follow the instructions under „Troubleshooting" in the manual.

Overheating can result in damage to the stage.

▶ Activate I2t monitoring if supported by the electronics.

🔧 Installation

Installing the PC Software

Installing the PC software in Windows

1. Run **PISoftwareSuite.exe** in the root directory of the PI Software Suite CD.
   The **InstallShield Wizard** window opens.
2. Follow the instructions on the screen.
3. If necessary: Use PI Update Finder to update the PC software and positioner database (see manual).

Installing the PC software in Linux

1. Unpack the tar archive from the **/linux** directory on the PI software CD to a directory on your PC.
2. Change to the directory where the tar archive was unpacked.
3. As superuser (root privileges), run the **./ INSTALL** script to start the installation.
4. Follow the instructions on the screen.
5. If necessary: Update the PC software and positioner database (see manual).

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Mounting the Electronics

🛈 **NOTICE**

High temperatures can cause the electronics to overheat.

▶ Set up the electronics with a gap of at least 10 cm to the top and rear panels and at least 5 cm to the sides. If this is not possible, make sure that the surroundings are cooled sufficiently.

▶ Ensure sufficient ventilation at the place of installation.

▶ Keep the ambient temperature at a noncritical level (5-40 °C).

When the electronics are to be used as a benchtop device:

▶ Make sure that the electronics are standing safely and securely.

If the electronics are to be mounted:

1. Bore the required holes into the underlying surface.
2. Insert a suitably sized screw into each recess to fix the electronics.

Connecting the Electronics to the Protective Earth Conductor

If a protective earth connector is available on the electronics, it must be connected to the protective earth conductor.

### Requirements

✓ The electronics are switched off.

Tools and accessories

- Suitable protective earth conductor:
  - Cable cross section ≥0.75 mm²
  - Contact resistance < 0.1 ohm at 25 A at all points relevant for attaching the protective earth conductor
- Mounting hardware for the protective earth conductor; is on the protective earth connector on delivery of the electronics
- Suitable wrench

Connecting the protective earth conductor

1. Attach a suitable cable lug to the protective earth conductor.
2. Attach the cable lug for the protective earth conductor to the protective earth connector using the mounting hardware supplied.

Connecting the protective earth conductor with a threaded bolt
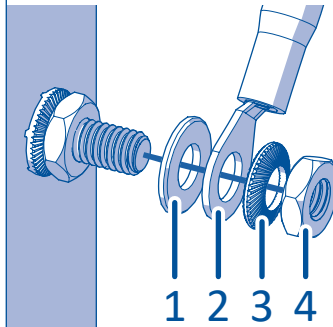
1. Flat washer
2. Cable lug with protective earth conductor
3. Lock washer
4. Nut

Connecting the Positioner

🛈 **NOTICE**

Connecting a positioner with an incompatible drive type to the electronics can cause irreparable damage to the positioner or the electronics. Even positioners with mechanically compatible connectors may not be electrically compatible with the electronics.

▶ Only connect positioners to the electronics that have a compatible drive type.

Requirements

✓ The electronics are switched off.
✓ You have read and understood the user manual for the positioner.

Tools and accessories

- Positioner with compatible drive type
- If necessary: Compatible adapter from PI
- If necessary: Suitable extension cable from PI

Connecting the positioner

1. Plug the motor connector of the positioner into the electronics.
2. If necessary: Plug the sensor connector of the positioner into the electronics.
3. If possible: Secure the connectors against unintentional removal.

Connecting the PC

> ⓘ **NOTICE**
> Connecting the USB and RS-232 inter-
> faces of the electronics to the PC at the
> same time can damage the PC or the
> electronics.
>
> ▶ Connect **either** the USB **or** the RS-
> 232 interface to the PC.

Requirements

✓ The PC is equipped with a vacant RS-232 or
USB interface.
or
✓ An network access point is available for the
electronics.

Tools and accessories

▪ Suitable cable, e.g.,

- ▪ RS-232 null modem cable
- ▪ USB cable
- ▪ Straight-through or crossover network
cable

Connecting to the USB interface

▶ Connect the USB cable to the USB socket
on the electronics and the USB interface on
the PC.

Connecting to the RS-232 interface

1. Connect the RS-232 null modem cable to
the RS-232 connector on the controller and
a vacant RS-232 interface on the PC.
2. Use the integrated screws to secure the
connector against accidental disconnection.

Connecting to a network

▶ Connect the network cable to the RJ-45
socket on the electronics and the network
access point or PC.

Connecting the Power Adapter to the Electronics

Requirements

✓ The power cord is **not** connected to the
power socket.

Tools and accessories

▪ Power adapter supplied or correctly rated
power adapter
▪ If necessary: Cable adapter supplied for the
power adapter connector or correctly rated
adapter
▪ Power cord supplied or correctly rated
power cord

Removing the Protective Cap

▶ If necessary: Remove the protective cap
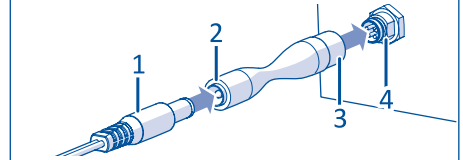from the power adapter connector on the
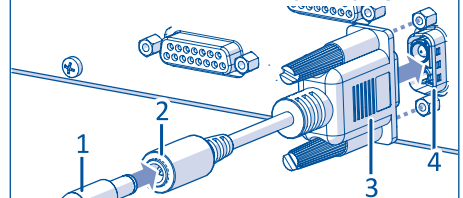electronics.

Electronics with M8 panel plug
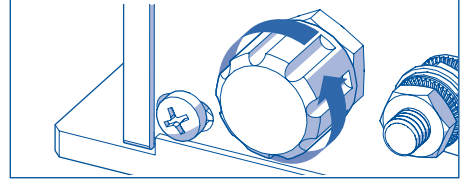
Connecting the power adapter to the electronics using the cable adapter

1. Connect the cable adapter **(3)** to the power
adapter connector **(4)** of the electronics.
2. Connect the barrel connector on the cable
adapter **(2)** to the barrel connector socket
on the power adapter **(1)**.
3. Connect the power cord to the power
adapter.

Electronics with M8 panel plug

Electronics with D-sub 2W2C panel plug

1	Barrel connector of the power adapter
2	Barrel connector on the adapter
3	Connector (f) on the adapter
4	Power adapter connector

Connecting the power adapter to the electronics without cable adapter

▶ Connect the power adapter to the power
adapter connector on the electronics.
▶ Connect the power cord to the power
adapter.

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⏻ Startup

The PIMikroMove PC software is recommended for initial startup. You can temporarily or permanently adapt the settings of the electronics to your application with PIMikroMove and start initial motion

⚡ CAUTION

If a protective earth conductor is not properly connected, touching the electronics in the case of malfunction can result in minor injuries from electric shock.

▶ Connect the electronics to a protective earth conductor before startup.

▶ Do **not** remove the protective earth conductor during operation.

▶ Pay attention to the applicable standards for the protective earth conductor connection.

Requirements

✓ You have read and understood the PIMikroMove manual and the general notes on startup. The software manuals are on the CD for the electronics.

✓ You have installed and updated the software on the PC.

✓ You have installed the positioner and electronics as they will be used in your application.

✓ You have connected the protective earth conductor, positioner, PC, and power adapter to the electronics.

✓ If you have connected the electronics to the network or PC via the TCP/IP interface:

  ▪ **Network with DHCP server**: No adjustment of the factory settings of the interface parameters is necessary.

  ▪ **Network without DHCP server or with direct connection** (electronics connected directly to the Ethernet socket on the PC):
    ▪ The startup behavior of the electronics must be changed so that the electronics use a static IP address (see manual).
    ▪ The IP addresses and subnet masks of the electronics and PC or respectively all further network devices must match accordingly (see manual).

✓ If available: You have set the DIP switches on the electronics according to your application (see manual). Electronics that are not a part of a daisy chain network must have address 1, if they are to be used in PIMikroMove.

DIP switch

Address	1	2	3	4	5	...	16
DIP 1	ON	ON	ON	ON	ON	...	OFF
DIP 2	ON	ON	ON	ON	OFF	...	OFF
DIP 3	ON	ON	OFF	OFF	ON	...	OFF
DIP 4	ON	OFF	ON	OFF	ON	...	OFF

Baud rate	9600	19200	38400	115200
DIP 5	ON	ON	OFF	OFF
DIP 6	ON	OFF	ON	OFF

Switching the Electronics On

1. Plug the power cord of the power adapter into the power socket.
2. If necessary: Move the toggle switch on the electronics to the **I** position.

Establishing Communication with PIMikroMove

1. Start PIMikroMove.
   The **Start up controller** window opens for the **Connect controller** step.
   ▶ If the **Start up controller** window does not open automatically, select the **Connections > New….** menu item in the main window.

PIMikroMove: Connect controller
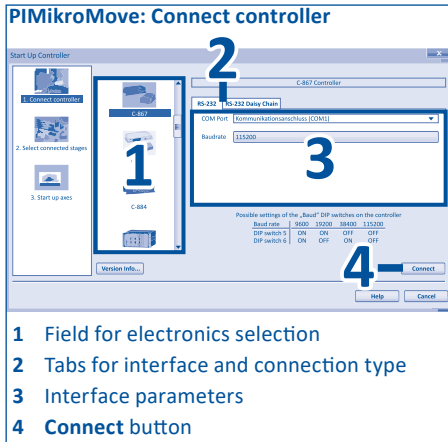
1 Field for electronics selection
2 Tabs for interface and connection type
3 Interface parameters
4 **Connect** button

2. Choose the corresponding electronics in the field listing the electronics for selection **(1)**.
3. Select the tab in the right-hand side of the window corresponding to the interface and type of connection for the electronics **(2)**.
4. If necessary: Set the interface parameters according to the electronics **(3)**.
5. If necessary: Select the electronics from the list **(3)**.
6. Click the **Connect** button (4) to establish communication.

Starting Motion

🛈 **NOTICE**

Selecting an incorrect positioner type in the PC software can damage the positioner.

▶ Make sure that the type of positioner selected in the PC software matches the positioner.

If the **Stage Type Configuration** window opens:
▶ Click the **Yes, configure for ...** button to load the appropriate parameter set from the positioner database.

If the **Select connected stages** step is displayed in the **Start up controller** window:

PIMikroMove®: Select connected stages
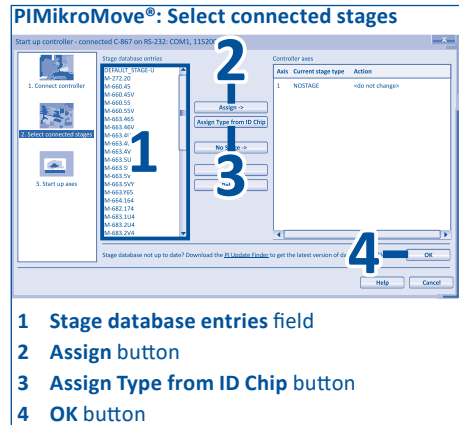
1 **Stage database entries** field
2 **Assign** button
3 **Assign Type from ID Chip** button
4 **OK** button

1. Select the matching positioner type.
   a. Mark matching positioner type in the **Stage database entries (1)** field.
   b. Click **Assign (2)**.
   or
   ▶ Click **Assign Type from ID Chip (3)**
2. Confirm with OK (4) to load the parameter settings for the selected positioner type from the positioner database.
3. In the **Save all changes permanently?** window, select whether the settings for the electronics should be stored temporarily or permanently:
   ▪ **Keep the changes temporarily**: The settings are reset when the electronics are rebooted.
   ▪ **Save all settings permanently on controller**: All settings are stored in the permanent memory of the electronics and are available after rebooting or for use with other software.

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4. If necessary: Do the reference move during the **Start up axes** step and if necessary, the autozero procedure for the axis.
    a. Click the corresponding button to start the reference move:
        ▪ **Ref. switch**: Reference move to the reference switch
        ▪ **Neg. limit**: Reference move to the negative physical limit of the travel range
        ▪ **Pos. limit**: Reference move to the positive physical limit of the travel range
    b. If a message appears warning that the servo mode is switched off: Click the **Switch on servo** button to switch the servo mode on (closed-loop operation).
    c. Click **OK** after a successful reference move.

    d. If available, click **Auto Zero** to start an autozero procedure (compensates the weight force for drives without self-locking).
    e. After a successful autozero procedure, click **OK**.
    f. Click **Close**.

The main window of PIMikroMove opens.
▶ Test the motion of the axis several times.
    a. If necessary, Switch servo mode on again (**Servo**, **column 1**).
    b. Set the step size to a sensible value for your test motion (**Step size**, column **2**).
    c. Click the arrow buttons (< and >, **3**) to start motion in the corresponding direction with the selected step size.

Depending on the drive type and the load, parameter changes may be necessary for fast, precision positioning (see manual).

PIMikroMove: Main window

1 **Servo** field
2 **Step size** field
3 Arrow buttons

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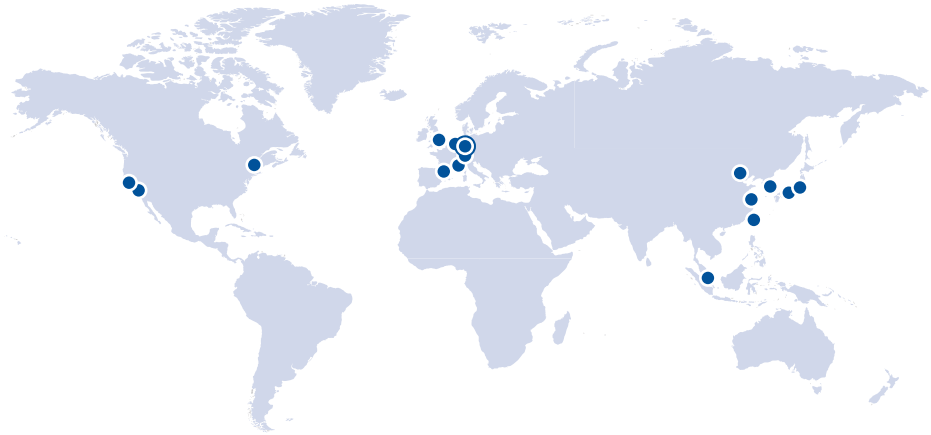
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