

Waters Pump Control Module II Installation Guide

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Waters
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We seriously consider every customer comment we receive. You can reach us at tech_comm@waters.com.



Contacting Waters

Contact Waters[®] with enhancement requests or technical questions regarding the use, transportation, removal, or disposal of any Waters product. You can reach us via the Internet, telephone, or conventional mail.

Waters contact information

Contacting medium	Information
Internet	The Waters Web site includes contact information for Waters locations worldwide. Visit www.waters.com , and click Waters Division > Contact Waters Online.
Telephone and fax	From the USA or Canada, phone 800 252-HPLC, or fax 508 872 1990. For other locations worldwide, phone and fax numbers appear in the Waters Web site.
Conventional mail	Waters Corporation 34 Maple Street Milford, MA 01757 USA

Safety considerations

Some reagents and samples used with Waters instruments and devices can pose chemical, biological, and radiological hazards. You must know the potentially hazardous effects of all substances you work with. Always follow Good Laboratory Practice, and consult your organization's safety representative for guidance.

When you develop methods, follow the "Protocol for the Adoption of Analytical Methods in the Clinical Chemistry Laboratory," *American Journal of Medical Technology*, 44, 1, pages 30–37 (1978). This protocol addresses good operating procedures and the techniques necessary to validate system and method performance.



Safety advisories

Consult [Appendix A](#) for a comprehensive list of warning and caution advisories.

Operating the Waters Pump Control Module II

When operating the Pump Control Module II, follow standard quality-control (QC) procedures and the guidelines presented in this section.

Applicable symbols

Symbol	Definition
	Confirms that a manufactured product complies with all applicable European Community directives
 ABN 49 065 444 751	Australia C-Tick EMC Compliant

Audience and purpose

This guide is intended for use by individuals whose familiarity with HPLC ranges from novice to expert. It describes how to install the Pump Control Module II in a multi-pump gradient system with up to three pumps controlled by a Waters data control system.

Intended use of the Pump Control Module II

Waters designed the Pump Control Module II to provide programmable control through a Waters data system of up to three, 500-series high-pressure pumps.

Calibrating

To calibrate LC systems, follow acceptable calibration methods using at least five standards to generate a standard curve. The concentration range for standards should include the entire range of QC samples, typical specimens, and atypical specimens.

To calibrate mass spectrometers, consult the calibration section for the operator's guide of the instrument you are calibrating.

Quality-control

Routinely run three QC samples that represent subnormal, normal, and above-normal levels of a compound. Ensure that QC sample results fall within an acceptable range, and evaluate precision from day to day and run to run. Data collected when QC samples are out of range might not be valid. Do not report these data until you are certain that the instrument performs satisfactorily.

ISM classification

ISM Classification: ISM Group 1 Class B

This classification has been assigned in accordance with CISPR 11 Industrial Scientific and Medical, (ISM) instruments requirements. Group 1 products apply to intentionally generated and/or used conductively coupled radio-frequency energy that is necessary for the internal functioning of the equipment. Class B products are suitable for use in both commercial and residential locations and can be directly connected to a low voltage, power-supply network.

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1 Overview

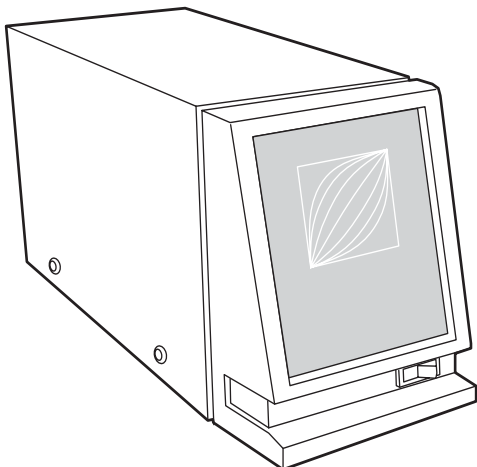
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Introduction

The Waters[®] Pump Control Module II is an HPLC pump controller. Through the medium of Waters data system software, it offers programmatic control of high-pressure-mixing pumps in HPLC and MS systems.

Pump Control Module II



Depending on your pump configuration requirements, you can attach as many as three Waters 510 or 515 HPLC Pumps to the module and regulate the solvent composition and flow rates by programming instrument method settings in Empower, Millennium, or MassLynx data control software. (For the module's firmware/software requirements, see the Waters Pump Control Module II release notes.)

A single Waters 510 or 515 Pump in an HPLC system is ideal for high-throughput isocratic analyses. When you control two or three of these pumps through a data system and external controller, you can achieve reproducible, multipump gradient delivery with exceptionally smooth concurrent-stream blending.

System configurations

When the module is under data system control, it can operate in one of these configurations:

- Where all system modules, including the Pump Control Module II, communicate with the data system via an IEEE-488 bus interface
- Where all system modules, including the Pump Control Module II, communicate with the data system via Ethernet communications

Restriction: You cannot use the module's Ethernet port at the same time you are using its IEEE-488 bus interface for communications.

Note: For details on the module's software and firmware requirements, see the Waters Pump Control Module II release notes.

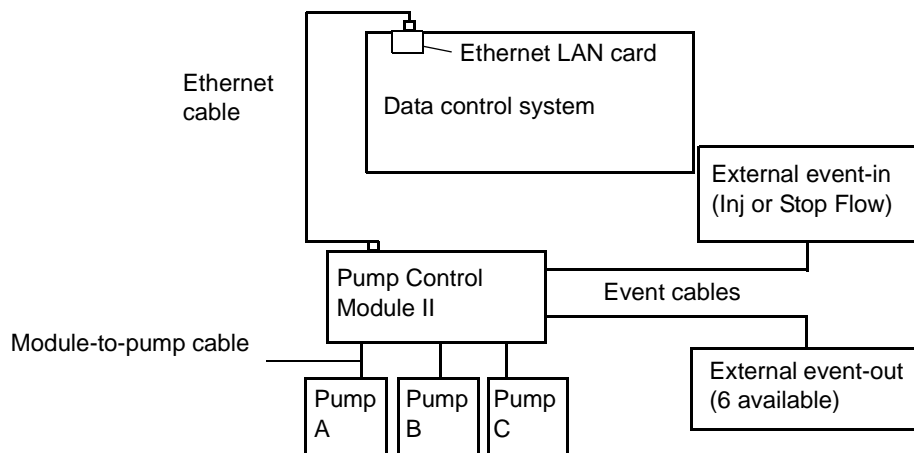
Ethernet configuration

To communicate with the Waters data control system via Ethernet, an Ethernet cable connects the module with the system's Ethernet network in one of two ways:

- Directly, through the Ethernet LAN card in the data control system
- Through a network switch

For more information, see [“Ethernet signal cable connections” on page 2-4](#).

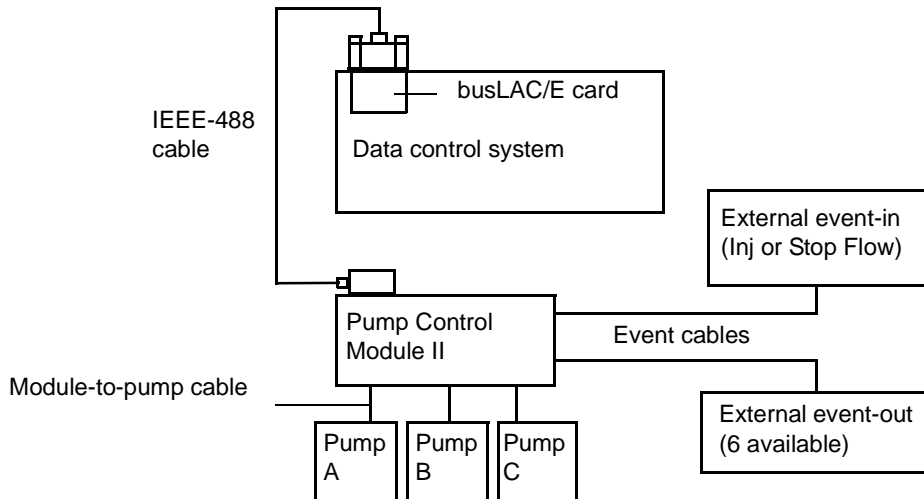
HPLC system configuration using Ethernet communications



IEEE-488 configuration

To communicate with the Waters data control system via IEEE-488, an IEEE-488 cable connects the module to an IEEE-488 controller (a busLAC/E™ card in the data control system for Millennium³² or Empower software or an NI IEEE-488 card for MassLynx software). For more information, see [“IEEE-488 signal cable connections”](#) on page 2-5.

HPLC system configuration using IEEE-488 communications



Signal conditions

Terminal strips for two event input (inject-start and stop-flow) and six event output signal connections are located on the module's rear panel (see [“Terminal strips” on page 2-8](#)). All external event connections are relay closures.

The event input signals the module to initiate a run or stop the flow using event cables (see [“Event-in connection” on page 2-10](#)). The event outputs can trigger external devices when programmed in the pump events table (see [“Event-out connections” on page 2-11](#)).

The IEEE-488 communications interface on the module's rear panel provides the means to manually set the IEEE-488 addresses via switch settings (see [“IEEE-488 signal cable connections” on page 2-5](#)).

2

Installing the Pump Control Module II

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Caution: To avoid damaging the module and voiding its warranty, perform all procedures in the order specified in this guide before you power-on the module (see [“Powering-on the module” on page 2-12](#)).

Selecting the site and unpacking

Selecting the site



Caution: Do not stack heavy devices or solvent containers atop the module.

Follow these requirements:

- When communicating with the data control system via the IEEE-488 interface, install the module within reach of the system. A 2-M IEEE-488 cable is supplied for this purpose.
Requirement: For IEEE-488 communications, the maximum allowable distance between the pumps and the module is 2 meters.
- When communicating with the data control system via the Ethernet interface, install the module within reach of the Ethernet LAN card or network switch that connects to the system. A 3-M shielded Ethernet cable is supplied.
- The module is approximately 14 cm wide by 41 cm deep by 20 cm high. Allow at least 8 cm rear clearance for the cables.
- Operating temperature is 4 to 40 °C.
- Relative humidity is 10 to 90%, noncondensing.
- Vibration and shock are negligible.
- For power requirements, see [Appendix B](#).



Warning: Always observe Good Laboratory Practices when handling solvents and performing maintenance.

Unpacking and inspecting the module

Unpack the shipment, comparing all items received to those specified in the packing list. Notify Waters immediately if you discover a discrepancy. In the case of damaged items, immediately notify the shipping agency and Waters Technical Service.

Waters recommends you save the packing materials for future transport or shipment.

Rear-panel signal connections

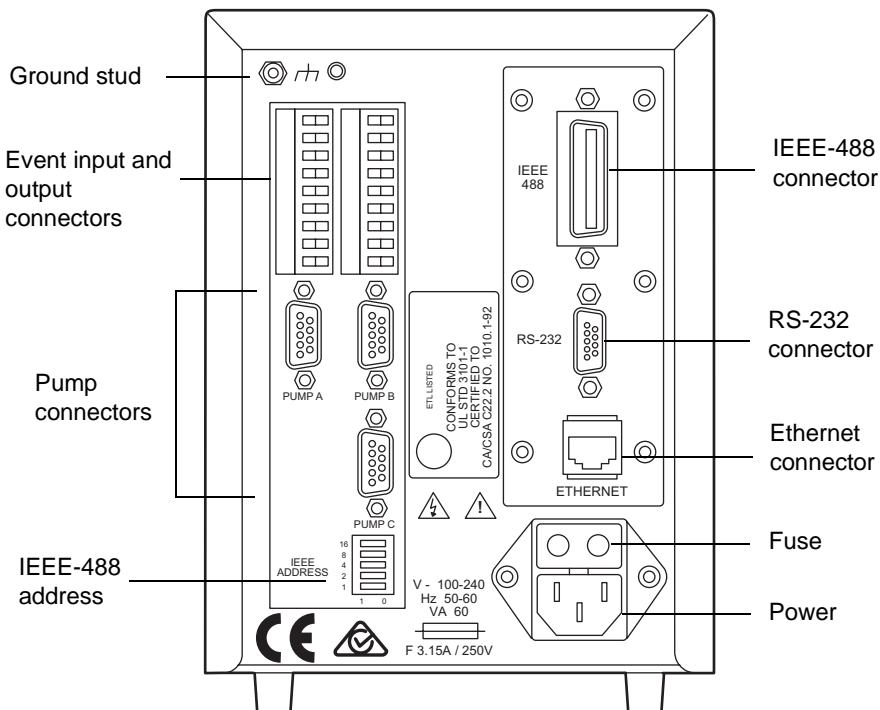
Use the signal connectors on the module's rear panel to connect the module to other HPLC system components. The following table summarizes these signal connections.

Component connector types

Connector type	Component
Ethernet	Waters data control system, such as an Empower 2 system, connected via the Ethernet network Tip: The Ethernet port also supports the Waters PC-based Autoloader utility for installing firmware (for details, see the Waters Pump Control Module II release notes).
IEEE-488	Waters data control system, such as Empower, Millennium ³² , or MassLynx system connected via the IEEE-488 bus
Analog Event inputs/outputs terminal strips	Peripheral devices, such as column select valves, column-switching valves, and manual injectors
Pump (A, B, and C)	Up to three, Waters 510 or 515 HPLC Pumps
RS-232	For firmware upgrades only

The following figure shows the rear panel locations of the signal connectors used to operate the module with external devices.

Rear panel of the Pump Control Module II



Ethernet signal cable connections

The module is equipped with a RJ-45 connector for Ethernet port communications (see the figure, above). The Ethernet port—a 10/100 Base-T networking interface—is used only for remote control, the case when Empower 2 controls its operation, and for firmware upgrades via the Waters Autoloader utility. [Appendix C](#) lists the supplied Ethernet cable.

Requirements:

- In an Ethernet configuration, all Waters HPLC system components, including the module, must communicate with the data system via Ethernet communications.
- As with IEEE-488 control, when using an autoinjector, triggering of the inject-start signal occurs over the Ethernet cable, so no external I/O cable is needed. For more information, see [“Connecting the event cables” on page 2-8](#).

Restriction: You cannot use the module's Ethernet port at the same time you are using its IEEE-488 bus interface for communications.

To make the Ethernet connections

1. Connect one end of the Ethernet cable to the Ethernet port on the module's rear panel (see the figure on [page 2-4](#)).
2. Connect the other end of the Ethernet cable to the Ethernet LAN network card in the data control system or an Ethernet switch connected to the data control system. For additional Ethernet configuration information, see the *Waters Ethernet Instrument Getting Started Guide* (P/N: 7150074403).

IEEE-488 signal cable connections

The IEEE-488 cable transmits digital data between the module and the busLAC/E card. Observe the IEEE cabling and connection requirements, and follow the IEEE specifications when adding the module to the existing IEEE-488 connections. [Appendix C](#) lists the IEEE-488 cables.

Requirements:

- In an IEEE-488 configuration, all of the Waters HPLC system components, including the module, must communicate with the data system via IEEE-488 communications.
- When using an autoinjector, triggering of the inject-start signal occurs over the IEEE-488 cable, so no external I/O cable is needed. For more information, see [“Connecting the event cables” on page 2-8](#).

Restriction: You cannot use the module's Ethernet port at the same time you are using its IEEE-488 bus interface for communications.

To make the IEEE-488 connections

1. Place the module on a level surface.
2. Insert one end of the IEEE-488 cable into the IEEE-488 port on the module's rear panel, and tighten both thumbscrews.
3. Insert and secure the other end of the cable to the IEEE-488 connection on the busLAC/E card in the data control system.

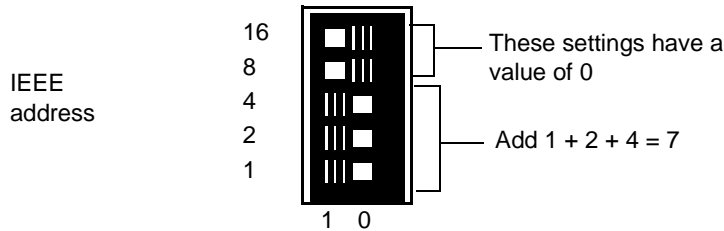
Tip: You can daisy-chain IEEE-488 cables.

Note: Each device on the IEEE communications bus requires a unique IEEE-488 address. The module's address must be a unique number from 2 to 29.

- Set a unique IEEE-488 address on the module's rear panel by moving the appropriate switches from 0 to 1 (see the table on page 2-6).

Example: For an address of 7, add the numbers of the switches in the 1 position.

Setting the address switches



The following table shows the switch positions for addresses 2 to 29.

IEEE-488 switch settings

IEEE-488 address	Switch settings				
	1	2	4	8	16
2	0	1	0	0	0
3	1	1	0	0	0
4	0	0	1	0	0
5	1	0	1	0	0
6	0	1	1	0	0
7	1	1	1	0	0
8	0	0	0	1	0
9	1	0	0	1	0
10	0	1	0	1	0
11	1	1	0	1	0
12	0	0	1	1	0
13	1	0	1	1	0

IEEE-488 switch settings (Continued)

IEEE-488 address	Switch settings				
	1	2	4	8	16
14	0	1	1	1	0
15	1	1	1	1	0
16	0	0	0	0	1
17	1	0	0	0	1
18	0	1	0	0	1
19	1	1	0	0	1
20	0	0	1	0	1
21	1	0	1	0	1
22	0	1	1	0	1
23	1	1	1	0	1
24	0	0	0	1	1
25	1	0	0	1	1
26	0	1	0	1	1
27	1	1	0	1	1
28	0	0	1	1	1
29	1	0	1	1	1

Connecting the pumps



Caution: To avoid damaging the module's electronic components, power-off the pumps before connecting cables to—or disconnecting them from—the module.

To connect the pumps

1. Connect one end of the module-to-pump cable to one of the three pump connectors on the rear of the module (see the figure on [page 2-4](#)).

2. Connect the other end of the cable to the external controller connector on the rear of the pump.

Requirement: To prepare a 515 pump to receive a remote run signal, ensure that the pump is in remote mode, and then press Run/Stop on the pump display to activate Run-Rem mode (see the *Waters 515 HPLC Pump Operator's Guide* for additional information).

3. Repeat steps 1 and 2 for each pump.

Connecting the event cables



Caution: To meet the regulatory requirements of immunity from external electrical disturbances that can possibly affect the performance of this module, do not use cables longer than 3 meters when you connect the screw-type barrier terminal strips. In addition, ensure you always connect the shield of the cable to chassis ground at one instrument only.

Event cables transmit trigger signals between the module and peripheral devices such as column select valves and column switching valves. The module can trigger any device that requires a contact closure.

To start a gradient run when using a manual injector, deliver a contact closure signal at an event in port; otherwise, the pumps remain in their initial condition state.

Tip: When using an autoinjector under IEEE-488 control, a trigger cable is not necessary.

Terminal strips

Note: All event-out connections are relay connections.

Event-in and event-out signals correspond to the terminal strip positions for the left-hand and right-hand connectors. The terminal strips are removable, to facilitate cable connections.

Left terminal strip positions

Left connector	Description	I/O type
SW 1 (two)	Relay 1	Out
SW 2 (two)	Relay 2	Out

Left terminal strip positions (Continued)

Left connector	Description	I/O type
SW 3 (two)	Relay 3	Out
GND		Ground
INJECT START	Active Low	Input
GND		Ground

Right terminal strip positions

Right connector	Description	I/O type
SW 4 (two)	Relay 4	Out
SW 5 (two)	Relay 5	Out
SW 6 (two)	Relay 6	Out
GND		Ground
STOP FLOW	Active Low	Input
GND		Ground

Event cables



Caution: To avoid damaging peripheral devices, power them off before connecting to or disconnecting cables from the module.

To connect the event cables

1. Remove a terminal strip from the module by grabbing each end and carefully pulling it from the module.
2. Connect the two spade connectors at the two-wire end of a shielded event cable to one of these:
 - A manual injector, for an event in signal
 - A device to be triggered, for an event out signal
3. Cut off the spade connectors from the red and black leads on the three-wire end, and then strip 1.5 cm from the ends.

4. Connect the stripped leads to the appropriate connections on the terminal strip with the correct polarity (see [“Terminal strips” on page 2-8](#)):
 - Black to negative
 - Red to positive
5. Tighten the screws with a small, slot-head screwdriver (startup kit).
6. Repeat steps 2 through 5 for additional event-out connections.
7. Replace the terminal strip, by positioning it carefully and then snapping in each side.
8. Connect the white wire to the ground stud on the upper-left corner of the rear panel.

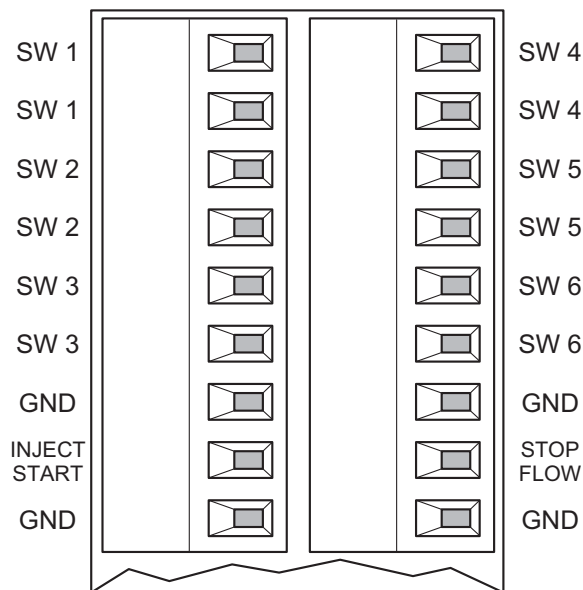
Event-in connection

To signal the module when an injection occurs, connect a shielded event cable to the INJECT START and GND connections on the left-hand terminal strip at the rear of the module (see the figure below).

Requirement: If a manual injector is used, the module requires a contact closure signal to start a gradient run.

To stop the operation of pumps connected to the module, connect a shielded event cable to the STOP FLOW and GND connections on the right-hand terminal strip. Connect the red and black cables to carry positive and negative signals, respectively. A contact closure signals the module to stop the flow.

Removable event-terminal strips



Event-out connections

You can trigger as many as six external devices. For each device, connect a shielded event cable to the SW 1 through SW 6 event-out connections on the terminal strips.

Program the event-out signals using the instrument method editor for the module in your MassLynx, Empower, or Millennium³² software (see [“Programming the module” on page 2-14](#) and the appropriate software guide).

Powering-on the module

When powering-on the module, power-on all peripheral devices first, and data control system last. Follow the instructions in the corresponding installation guide for each device for connection information or procedures.



Caution:

- To avoid damaging the module and voiding its warranty, perform all procedures in the order specified in this guide before you power-on the module.
- Do not switch on or off any Ethernet or IEEE-488 device while data are being acquired.

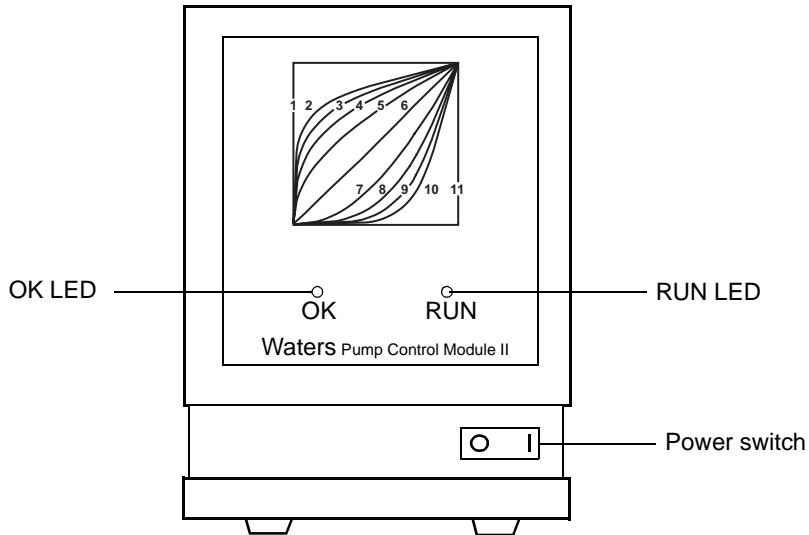
To power-on the module

1. Ensure that the Ethernet or IEEE-488 connections are made between the module and the data control system (see [“Ethernet signal cable connections” on page 2-4](#) or [“IEEE-488 signal cable connections” on page 2-5](#)).
2. Ensure that the pumps are connected to the module (see [“Connecting the pumps” on page 2-7](#)).
3. Attach the power cord to the power connector on the module’s rear panel (see the figure on [page 2-4](#)), and then connect the power cord to a wall outlet.
4. Power-on the pumps and any devices connected to the external event terminals.

Tip: Refer to each device’s installation guide for powering-on procedures.

5. Power-on the module by pressing 1 on the power switch located on the front panel.
6. Power-on the data control system.

Front panel operation



Two LED (light-emitting diode) indicators on the front panel flash as the module performs a series of diagnostic self-tests. When the OK LED remains lit, the initialization sequence is successful.

LED indicator status

LED	Status when lit	Solution
OK	Blinks once during diagnostic tests, then remains lit when initialization sequence is successful	If it does not blink or continues blinking intermittently, power-off the module; wait 2 seconds; inspect all cable and power connections, and then restart the module. If the previous behavior persists, the module requires servicing.
RUN	Blinks once during diagnostics. Remains off until an injection begins. Remains lit during an injection.	If the LED does not light during an injection, power-off the module; wait 2 seconds, and then restart the module. If the previous behavior persists, the module requires servicing.

Programming the module

Depending on the data system, program the module using these data system screens:

- In MassLynx, the Inlet Method Editor (see the *MassLynx Help*).
- In Empower, the Instrument Method Editor dialog box (see the *Empower Help*).
- In Millennium³² Chromatography Manager 3.2 and 4.0, the Pump Control Module Instrument dialog box (see the *Millennium³² Help*).

Maintenance and troubleshooting



Warning: To prevent injury to yourself or damage to the module, do not remove the module's protective panels behind which are no user-replaceable components.

Cleaning the cabinet

Use a soft cloth dampened with water to clean the module's surface if it is dirty.

Replacing the fuse

To replace the fuse

1. Power-off the module, and then disconnect the power cord.
2. Use a small screwdriver to remove the fuse holder from its socket in the rear panel.
3. Remove the faulty fuse from the fuse holder.
4. Install a new, F 3.15-A fuse in the fuse holder (see [Appendix C](#)).
5. Refit the fuse holder into its socket.

Troubleshooting

Consult the following when troubleshooting malfunctions.

Troubleshooting

Symptom	Probable cause	Solution
The OK LED does not blink, or it continues blinking.	The initialization sequence was unsuccessful or the LED is faulty.	Power-off the module, and wait 2 seconds; inspect all cable and power connections, and then restart the module. If the previous behavior persists, contact Waters Service.
The RUN LED does not light during an injection or does not blink once during diagnostics.	The LED is faulty.	Power-off the module, wait 2 seconds, and then restart the module. If the previous behavior persists, contact Waters Service.
Pumps connected to the module are not represented in the data system.	The module was powered-on before the pumps.	Power-off the module and pumps; wait 2 seconds; restart the pumps, and then restart the module.
Intermittent errors or erratic behavior	Loose cable connection or damaged cable	Inspect cables and secure any loose connections.
The 515 pump is not pumping.	The 515 pump is not in Remote mode.	Set the 515 pump to Remote, at the front panel.
	The 515 pump is not in Run mode.	Set the 515 pump to Run, at the front panel.

A Safety Advisories

Waters instruments display hazard symbols designed to alert you to the hidden dangers of operating and maintaining the instruments. Their corresponding user guides also include the hazard symbols, with accompanying text statements describing the hazards and telling you how to avoid them. This appendix presents all the safety symbols and statements that apply to the entire line of Waters products.

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Warning symbols

Warning symbols alert you to the risk of death, injury, or seriously adverse physiological reactions associated with an instrument's use or misuse. Heed all warnings when you install, repair, and operate Waters instruments. Waters assumes no liability for the failure of those who install, repair, or operate its instruments to comply with any safety precaution.

Task-specific hazard warnings

The following warning symbols alert you to risks that can arise when you operate or maintain an instrument or instrument component. Such risks include burn injuries, electric shocks, ultraviolet radiation exposures, and others.

When the following symbols appear in a manual's narratives or procedures, their accompanying text identifies the specific risk and explains how to avoid it.



Warning: (General risk of danger. When this symbol appears on an instrument, consult the instrument's user documentation for important safety-related information before you use the instrument.)



Warning: (Risk of burn injury from contacting hot surfaces.)



Warning: (Risk of electric shock.)



Warning: (Risk of fire.)



Warning: (Risk of needle puncture.)



Warning: (Risk of injury caused by moving machinery.)



Warning: (Risk of exposure to ultraviolet radiation.)



Warning: (Risk of contacting corrosive substances.)



Warning: (Risk of exposure to a toxic substance.)



Warning: (Risk of personal exposure to laser radiation.)



Warning: (Risk of exposure to biological agents that can pose a serious health threat.)

Warnings that apply to particular instruments, instrument components, and sample types

The following warnings can appear in the user manuals of particular instruments and on labels affixed to them or their component parts.

Burst warning

This warning applies to Waters instruments fitted with nonmetallic tubing.



Warning: Pressurized nonmetallic, or polymer, tubing can burst. Observe these precautions when working around such tubing:

- Wear eye protection.
- Extinguish all nearby flames.
- Do not use tubing that is, or has been, stressed or kinked.
- Do not expose nonmetallic tubing to incompatible compounds like tetrahydrofuran (THF) and nitric or sulfuric acids.
- Be aware that some compounds, like methylene chloride and dimethyl sulfoxide, can cause nonmetallic tubing to swell, which significantly reduces the pressure at which the tubing can rupture.

Mass spectrometer flammable solvents warning

This warning applies to instruments operated with flammable solvents.



Warning: Where significant quantities of flammable solvents are involved, a continuous flow of nitrogen into the ion source is required to prevent possible ignition in that enclosed space.

Ensure that the nitrogen supply pressure never falls below 690 kPa (6.9 bar, 100 psi) during an analysis in which flammable solvents are used. Also ensure a gas-fail connection is connected to the LC system so that the LC solvent flow stops if the nitrogen supply fails.

Mass spectrometer shock hazard

This warning applies to all Waters mass spectrometers.



Warning: To avoid electric shock, do not remove the mass spectrometer's protective panels. The components they cover are not user-serviceable.

This warning applies to certain instruments when they are in Operate mode.



Warning: High voltages can be present at certain external surfaces of the mass spectrometer when the instrument is in Operate mode. To avoid non-lethal electric shock, make sure the instrument is in Standby mode before touching areas marked with this high voltage warning symbol.

Biohazard warning

This warning applies to Waters instruments that can be used to process material that might contain biohazards: substances that contain biological agents capable of producing harmful effects in humans.



Warning: Waters's instruments and software can be used to analyze or process potentially infectious human-sourced products, inactivated microorganisms, and other biological materials. To avoid infection with these agents, assume that all biological fluids are infectious, observe Good Laboratory Practices and, consult your organization's biohazard safety representative regarding their proper use and handling. Specific precautions appear in the latest edition of the US National Institutes of Health (NIH) publication, *Biosafety in Microbiological and Biomedical Laboratories* (BMBL).

Chemical hazard warning

This warning applies to Waters instruments that can process corrosive, toxic, flammable, or other types of hazardous material.



Warning: Waters instruments can be used to analyze or process potentially hazardous substances. To avoid injury with any of these materials, familiarize yourself with the materials and their hazards, observe Good Laboratory Practices (GLP), and consult your organization's safety representative regarding proper use and handling. Guidelines are provided in the latest edition of the National Research Council's publication, *Prudent Practices in the Laboratory: Handling and Disposal of Chemicals*.

Caution symbol

The caution symbol signifies that an instrument's use or misuse can damage the instrument or compromise a sample's integrity. The following symbol and its associated statement are typical of the kind that alert you to the risk of damaging the instrument or sample.



Caution: To avoid damage, do not use abrasives or solvents to clean the instrument's case.

Warnings that apply to all Waters instruments

When operating this device, follow standard quality control procedures and the equipment guidelines in this section.



Attention: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Important: Toute modification sur cette unité n'ayant pas été expressément approuvée par l'autorité responsable de la conformité à la réglementation peut annuler le droit de l'utilisateur à exploiter l'équipement.

Achtung: Jedwede Änderungen oder Modifikationen an dem Gerät ohne die ausdrückliche Genehmigung der für die ordnungsgemäße Funktionstüchtigkeit verantwortlichen Personen kann zum Entzug der Bedienungsbefugnis des Systems führen.

Avvertenza: qualsiasi modifica o alterazione apportata a questa unità e non espressamente autorizzata dai responsabili per la conformità fa decadere il diritto all'utilizzo dell'apparecchiatura da parte dell'utente.

Atencion: cualquier cambio o modificación efectuado en esta unidad que no haya sido expresamente aprobado por la parte responsable del cumplimiento puede anular la autorización del usuario para utilizar el equipo.

注意: 未經有關法規認證部門允許對本設備進行的改變或修改,可能會使使用者喪失操作該設備的權利。

注意: 未经有关法规认证部门明确允许对本设备进行的改变或改装,可能会使使用者丧失操作该设备的合法性。

주의: 규정 준수를 책임지는 당사자의 명백한 승인 없이 이 장치를 개조 또는 변경할 경우, 이 장치를 운용할 수 있는 사용자 권한의 효력을 상실할 수 있습니다.

注意: 規制機関から明確な承認を受けずに本装置の変更や改造を行うと、本装置のユーザーとしての承認が無効になる可能性があります。



Warning: Use caution when working with any polymer tubing under pressure:

- Always wear eye protection when near pressurized polymer tubing.
- Extinguish all nearby flames.
- Do not use tubing that has been severely stressed or kinked.
- Do not use nonmetallic tubing with tetrahydrofuran (THF) or concentrated nitric or sulfuric acids.
- Be aware that methylene chloride and dimethyl sulfoxide cause nonmetallic tubing to swell, which greatly reduces the rupture pressure of the tubing.

Attention: Manipulez les tubes en polymère sous pression avec précaution:

- Portez systématiquement des lunettes de protection lorsque vous vous trouvez à proximité de tubes en polymère pressurisés.
- Éteignez toute flamme se trouvant à proximité de l'instrument.
- Évitez d'utiliser des tubes sévèrement déformés ou endommagés.
- Évitez d'utiliser des tubes non métalliques avec du tétrahydrofurane (THF) ou de l'acide sulfurique ou nitrique concentré.
- Sachez que le chlorure de méthylène et le diméthylesulfoxyde entraînent le gonflement des tuyaux non métalliques, ce qui réduit considérablement leur pression de rupture.

Vorsicht: Bei der Arbeit mit Polymerschläuchen unter Druck ist besondere Vorsicht angebracht:

- In der Nähe von unter Druck stehenden Polymerschläuchen stets Schutzbrille tragen.
- Alle offenen Flammen in der Nähe löschen.
- Keine Schläuche verwenden, die stark geknickt oder überbeansprucht sind.
- Nichtmetallische Schläuche nicht für Tetrahydrofuran (THF) oder konzentrierte Salpeter- oder Schwefelsäure verwenden.
- Durch Methylenchlorid und Dimethylsulfoxid können nichtmetallische Schläuche quellen; dadurch wird der Berstdruck des Schlauches erheblich reduziert.



Attenzione: fare attenzione quando si utilizzano tubi in materiale polimerico sotto pressione:

- Indossare sempre occhiali da lavoro protettivi nei pressi di tubi di polimero pressurizzati.
- Spegnere tutte le fiamme vive nell'ambiente circostante.
- Non utilizzare tubi eccessivamente logorati o piegati.
- Non utilizzare tubi non metallici con tetraidrofurano (THF) o acido solforico o nitrico concentrati.
- Tenere presente che il cloruro di metilene e il dimetilsolfossido provocano rigonfiamenti nei tubi non metallici, riducendo notevolmente la pressione di rottura dei tubi stessi.

Advertencia: se recomienda precaución cuando se trabaje con tubos de polímero sometidos a presión:

- El usuario deberá protegerse siempre los ojos cuando trabaje cerca de tubos de polímero sometidos a presión.
- Si hubiera alguna llama las proximidades.
- No se debe trabajar con tubos que se hayan doblado o sometido a altas presiones.
- Es necesario utilizar tubos de metal cuando se trabaje con tetrahidrofurano (THF) o ácidos nítrico o sulfúrico concentrados.
- Hay que tener en cuenta que el cloruro de metileno y el sulfóxido de dimetilo dilatan los tubos no metálicos, lo que reduce la presión de ruptura de los tubos.

警告: 當在有壓力的情況下使用聚合物管線時，小心注意以下幾點。

- 當接近有壓力的聚合物管線時一定要戴防護眼鏡。
- 熄滅附近所有的火焰。
- 不要使用已經被壓癟或嚴重彎曲管線。
- 不要在非金屬管線中使用四氫呋喃或濃硝酸或濃硫酸。
- 要了解使用二氯甲烷及二甲基亞楓會導致非金屬管線膨脹，大大降低管線的耐壓能力。



警告: 当有压力的情况下使用管线时, 小心注意以下几点:

- 当接近有压力的聚合物管线时一定要戴防护眼镜。
- 熄灭附近所有的火焰。
- 不要使用已经被压瘪或严重弯曲的管线。
- 不要在非金属管线中使用四氢呋喃或浓硝酸或浓硫酸。

要了解使用二氯甲烷及二甲基亚砜会导致非金属管线膨胀, 大大降低管线的耐压能力。

경고: 가압 폴리머 튜브로 작업할 경우에는 주의하십시오.

- 가압 폴리머 튜브 근처에서는 항상 보호 안경을 착용하십시오.
- 근처의 화기를 모두 끄십시오.
- 심하게 변형되거나 꼬인 튜브는 사용하지 마십시오.
- 비금속(Nonmetallic) 튜브를 테트라히드로푸란(Tetrahydrofuran: THF) 또는 농축 질산 또는 황산과 함께 사용하지 마십시오.

염화 메틸렌(Methylene chloride) 및 디메틸설폭시드(Dimethyl sulfoxide)는 비금속 튜브를 부풀려 튜브의 과열 압력을 크게 감소시킬 수 있으므로 유의하십시오.

警告: 圧力のかかったポリマーチューブを扱うときは、注意してください。

- 加圧されたポリマーチューブの付近では、必ず保護メガネを着用してください。
- 近くにある火を消してください。
- 著しく変形した、または折れ曲がったチューブは使用しないでください。
- 非金属チューブには、テトラヒドロフラン(THF)や高濃度の硝酸または硫酸などを流さないでください。

塩化メチレンやジメチルスルホキシドは、非金属チューブの膨張を引き起こす場合があります、その場合、チューブは極めて低い圧力で破裂します。



Warning: The user shall be made aware that if the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Attention: L'utilisateur doit être informé que si le matériel est utilisé d'une façon non spécifiée par le fabricant, la protection assurée par le matériel risque d'être défectueuses.

Vorsicht: Der Benutzer wird darauf aufmerksam gemacht, dass bei unsachgemäßer Verwendung des Gerätes die eingebauten Sicherheitseinrichtungen unter Umständen nicht ordnungsgemäß funktionieren.

Attenzione: si rende noto all'utente che l'eventuale utilizzo dell'apparecchiatura secondo modalità non previste dal produttore può compromettere la protezione offerta dall'apparecchiatura.

Advertencia: el usuario deberá saber que si el equipo se utiliza de forma distinta a la especificada por el fabricante, las medidas de protección del equipo podrían ser insuficientes.

警告: 使用者必須非常清楚如果設備不是按照製造廠商指定的方式使用，那麼該設備所提供的保護將被削弱。

警告: 使用者必須非常清楚如果設備不是按照製造廠商指定的方式使用，那麼該設備所提供的保護將被削弱。

경고: 제조업체가 명시하지 않은 방식으로 장비를 사용할 경우 장비가 제공하는 보호수단이 제대로 작동하지 않을 수 있다는 점을 사용자에게 반드시 인식시켜야 합니다.

警告: ユーザーは、製造元により指定されていない方法で機器を使用すると、機器が提供している保証が無効になる可能性があることに注意して下さい。



Warning: To protect against fire, replace fuses with those of the type and rating printed on panels adjacent to instrument fuse covers.



Attention: pour éviter tout risque d'incendie, remplacez toujours les fusibles par d'autres du type et de la puissance indiqués sur le panneau à proximité du couvercle de la boîte à fusible de l'instrument.



Vorsicht: Zum Schutz gegen Feuer die Sicherungen nur mit Sicherungen ersetzen, deren Typ und Nennwert auf den Tafeln neben den Sicherungsabdeckungen des Geräts gedruckt sind.



Attenzione: per garantire protezione contro gli incendi, sostituire i fusibili con altri dello stesso tipo aventi le caratteristiche indicate sui pannelli adiacenti alla copertura fusibili dello strumento.



Advertencia: Para evitar incendios, sustituir los fusibles por aquellos del tipo y características impresos en los paneles adyacentes a las cubiertas de los fusibles del instrumento.



警告: 為了避免火災，更換保險絲時，請使用與儀器保險絲蓋旁面板上所印刷之相同類型與規格的保險絲。



警告: 為了避免火災，應更換與儀器保險絲蓋旁邊面板上印刷的類型和規格相同的保險絲。



경고: 화재의 위험을 막으려면 기기 퓨즈 커버에 가까운 패널에 인쇄된 것과 동일한 타입 및 정격의 제품으로 퓨즈를 교체하십시오.







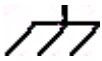
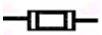



警告: 火災予防のために、ヒューズ交換では機器ヒューズカバー脇のパネルに記載されているタイプおよび定格のヒューズをご使用ください。

Electrical and handling symbols





Electrical symbols

These can appear in instrument user manuals and on the instrument's front or rear panels.

	Electrical power on
	Electrical power off
	Standby
	Direct current
	Alternating current
	Protective conductor terminal
	Frame, or chassis, terminal
	Fuse
	Recycle symbol: Do not dispose in municipal waste.

Handling symbols

These handling symbols and their associated text can appear on labels affixed to the outer packaging of Waters instrument and component shipments.

	Keep upright!
	Keep dry!
	Fragile!
	Use no hooks!

B Specifications

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Physical and environmental specifications

Physical and environmental specifications

Parameter	Allowed values
Dimensions	14 cm wide × 41 cm deep × 20 cm high
Weight	Approximately 2.7 kg
Operating temperature	4 to 40 °C (39 to 104 °F)
Operating humidity	10 to 90%, noncondensing

Accuracy and precision

Pump pressure specifications

Parameter	Allowed values
Input range	-10 to 0 VDC, representing a pressure range from 0 to 41365 kPa (413.7 bar, 6000 psi)
Pressure update rate	10 kHz

Note: Flow precision and accuracy is determined by the type of pumps that the module controls (Waters 510 or 515 HPLC pumps).

Electrical specifications

Protection Class 1

Protection Class 1 is the insulating scheme used in the module to protect from electrical shock. Class I identifies a single level of insulation between live parts (wires) and exposed conductive parts (metal panels) in which the exposed conductive parts are connected to a grounding system. In turn, this grounding system is connected to the third pin (ground pin) on the electrical power cord plug.

Overvoltage Category II

Overvoltage Category II pertains to instruments that receive their electrical power from a local level such as an electrical wall outlet.


Pollution Degree 2

Pollution Degree 2 is a measure of pollution on electrical circuits, which may produce a reduction of dielectric strength or surface resistivity. Degree 2 refers only to normally nonconductive pollution. Occasionally, however, expect a temporary conductivity caused by condensation.

Moisture protection – Normal (IPXO)

IPXO means that no ingress protection against any type of dripping or sprayed water exists. The X is a placeholder that identifies protection against dust, if applicable.

Electrical specifications

Item	Specification
 Line Voltages, nominal	100/120 VAC, grounded 220/240 VAC, grounded
Operating Temperature	4 to 40 ° C (39 to 104 °F)
Relative Humidity	20 to 80%, noncondensing
Acoustic noise	<65 dB(A)

Electrical specifications (Continued)

Item	Specification
Line voltage	85 to 264 VAC
Frequency	47 to 63 Hz

Analog-to-Digital converter

Parameter	Allowed values
Input VA rating	60 VA
Fuse rating	F 3.15 A / 250 V
ADC input range	0 to 4.95 V, 0 to 45505 kPa (455 bar, 6600 psi)
ADC transfer function	10 kHz
ADC resolution	16 bits

AC-to-DC power specifications

Open Frame, AC to DC, for power supply

Parameter	Allowed values
Input	100 to 240 VAC, auto adjusting; 50/60 Hz
Output	+5 VDC, 24 VDC, +/-12 VDC
Max Watts	80 W
Cooling	Convection
EMI Compliance	Meets FCC 20870 Class B and VDE 0871 Class B limits for conducted emissions requirements

C Spare Parts

Spare parts in the following table constitute only those parts replaceable by the user. Parts not listed require replacement by a Waters field service representative.

Pump Control Module II spare parts

Item	Part number
Pump Control Module II with Startup kit	186002449
Module-to-data system IEEE-488 cable:	
1 m	WAT087198
2 m with two standard IEEE connectors	WAT087141
2 m with one standard and one inline IEEE connector	WAT200491
4 m	WAT087191
Module-to-data system Ethernet cable:	
3 m, Ethernet patch cord, shielded	441000372
Module-to-pump cable, 1.8 m	441000470
Shielded event cable, 1.5 m	WAT048918
Flat-blade screwdriver	WAT022532
Terminal strips	WAT024211
Startup kit (all cables and screwdriver)	200000193
Fuse, F 3.15 A/250 V	WAT163-16

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