

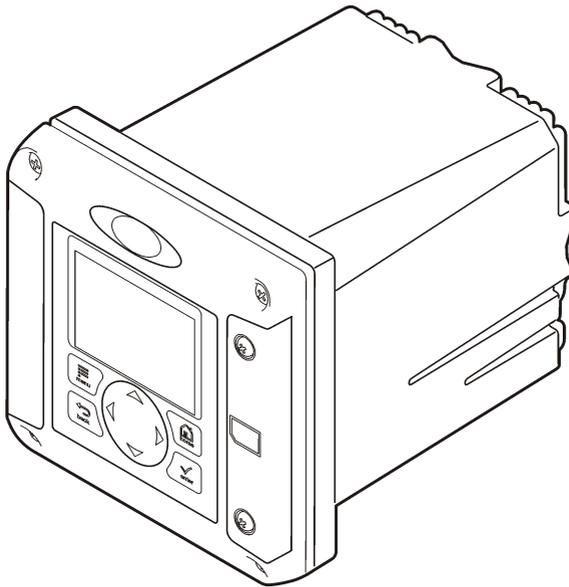


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# SC200 Controller

12/2019, Edition 10

**User Manual**





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## Section 1 Specifications

Specifications are subject to change without notice.

Specification	Details
Component description	Microprocessor-controlled and menu-driven controller that operates the sensor and displays measured values.
Operating temperature	-20 to 60 °C (-4 to 140 °F); 95% relative humidity, non-condensing with sensor load <7 W; -20 to 50 °C (-4 to 104 °F) with sensor load <28 W
Storage temperature	-20 to 70 °C (-4 to 158 °F); 95% relative humidity, non-condensing
Enclosure <sup>1</sup>	NEMA 4X/IP66 metal enclosure with a corrosion-resistant finish
Power requirements	<b>AC powered controller:</b> 100-240 VAC ±10%, 50/60 Hz; Power 50 VA with 7 W sensor/network module load, 100 VA with 28 W sensor/network module load (optional Modbus, RS232/RS485, Profibus DPV1 or HART network connection).
	<b>24 VDC powered controller:</b> 24 VDC—15%, + 20%; Power 15 W with 7 W sensor/network module load, 40 W with 28 W sensor/network module load (optional Modbus, RS232/RS485, Profibus DPV1 or HART network connection).
Altitude requirements	Standard 2000 m (6562 ft) ASL (Above Sea Level)
Pollution degree/Installation category	Pollution Degree 2; Installation Category II
Outputs	Two analog (0-20 mA or 4-20 mA) outputs. Each analog output can be assigned to represent a measured parameter such as pH, temperature, flow or calculated values. Optional module supplies three additional analog outputs (5 total).
Relays	Four SPDT, user-configured contacts, rated 250 VAC, 5 Amp resistive maximum for the AC powered controller and 24 VDC, 5A resistive maximum for the DC powered controller. Relays are designed for connection to AC Mains circuits (i.e., whenever the controller is operated with 115 - 240 VAC power) or DC circuits (i.e., whenever the controller is operated with 24 VDC power).
Dimensions	½ DIN—144 x 144 x 180.9 mm (5.7 x 5.7 x 7.12 in.)
Weight	1.7 kg (3.75 lb)
Compliance information <sup>2</sup>	CE approved (with all sensor types). Listed for use in general locations to UL and CSA safety standards by ETL (with all sensor types). Certain AC mains powered models are listed for use in general safety locations to UL and CSA safety standards by Underwriters Laboratories (with all sensor types).
Digital communication	Optional Modbus, RS232/RS485, Profibus DPV1 or HART network connection for data transmission
Data logging	Secure Digital Card (32 GB maximum) or special RS232 cable connector for data logging and performing software updates. The controller will keep approximately 20,000 data points per sensor.
Warranty	2 years

## Section 2 General information

In no event will the manufacturer be liable for direct, indirect, special, incidental or consequential damages resulting from any defect or omission in this manual. The manufacturer reserves the right to

<sup>1</sup> Units that have the Underwriters Laboratories (UL) certification are intended for indoor use only and do not have a NEMA 4X/IP66 rating.

<sup>2</sup> DC powered units are not listed by UL.

make changes in this manual and the products it describes at any time, without notice or obligation. Revised editions are found on the manufacturer's website.

## 2.1 Safety information

### NOTICE

The manufacturer is not responsible for any damages due to misapplication or misuse of this product including, without limitation, direct, incidental and consequential damages, and disclaims such damages to the full extent permitted under applicable law. The user is solely responsible to identify critical application risks and install appropriate mechanisms to protect processes during a possible equipment malfunction.

Please read this entire manual before unpacking, setting up or operating this equipment. Pay attention to all danger and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

Make sure that the protection provided by this equipment is not impaired. Do not use or install this equipment in any manner other than that specified in this manual.

### 2.1.1 Use of hazard information

#### ▲ DANGER

Indicates a potentially or imminently hazardous situation which, if not avoided, will result in death or serious injury.

#### ▲ WARNING

Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.

#### ▲ CAUTION

Indicates a potentially hazardous situation that may result in minor or moderate injury.

### NOTICE

Indicates a situation which, if not avoided, may cause damage to the instrument. Information that requires special emphasis.

### 2.1.2 Precautionary labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed. A symbol on the instrument is referenced in the manual with a precautionary statement.

	This symbol, if noted on the instrument, references the instruction manual for operation and/or safety information.
	This symbol indicates that a risk of electrical shock and/or electrocution exists.
	This symbol indicates the presence of devices sensitive to Electro-static Discharge (ESD) and indicates that care must be taken to prevent damage with the equipment.
	Electrical equipment marked with this symbol may not be disposed of in European domestic or public disposal systems. Return old or end-of-life equipment to the manufacturer for disposal at no charge to the user.

### 2.1.3 Certification

#### ▲ CAUTION

This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.

#### **Canadian Radio Interference-Causing Equipment Regulation, ICES-003, Class A:**

Supporting test records reside with the manufacturer.

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de classe A répond à toutes les exigences de la réglementation canadienne sur les équipements provoquant des interférences.

#### **FCC Part 15, Class "A" Limits**

Supporting test records reside with the manufacturer. The device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

1. The equipment may not cause harmful interference.
2. The equipment must accept any interference received, including interference that may cause undesired operation.

Changes or modifications to this equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at their expense. The following techniques can be used to reduce interference problems:

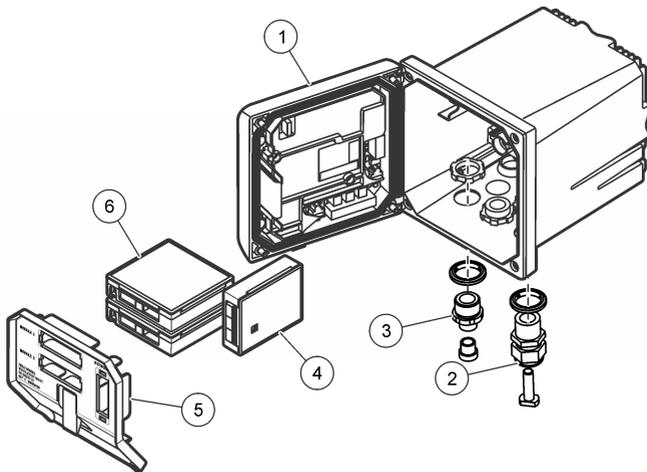
1. Disconnect the equipment from its power source to verify that it is or is not the source of the interference.
2. If the equipment is connected to the same outlet as the device experiencing interference, connect the equipment to a different outlet.
3. Move the equipment away from the device receiving the interference.
4. Reposition the receiving antenna for the device receiving the interference.
5. Try combinations of the above.

## 2.2 Product overview

The controller displays sensor measurements and other data, can transmit analog and digital signals, and can interact with and control other devices through outputs and relays. Outputs, relays, sensors and sensor modules are configured and calibrated through the user interface on the front of the controller.

Figure 1 shows the product components. Components may vary according to controller configuration. Contact the manufacturer if parts are damaged or missing.

**Figure 1 System components**



1 Controller	4 Network module (optional)
2 Strain relief assembly (optional depending on controller version)	5 High-voltage barrier
3 Digital connection fitting (optional depending on controller version)	6 Sensor modules (optional)

### 2.2.1 Sensors and sensor modules

The controller accepts up to a maximum of two sensor modules or two digital sensors (depending on the controller configuration), along with one communication module. A single digital sensor and a single sensor module can be installed in combination. A variety of sensors can be wired to the sensor modules. Sensor wiring information is given in the specific sensor manuals and in the user instructions for specific modules.

### 2.2.2 Relays outputs and signals

The controller has four configurable relay switches and two analog outputs. An optional analog output module can increase the number of analog outputs to five.

### 2.2.3 Device scans

With two exceptions, the controller automatically scans for connected devices without user input when it is powered on. The first exception is when the controller is powered on for the first time before initial use. The second exception is after the controller configuration settings have been set to their default values and the controller is powered on. In both cases, the controller first displays the language, date and time edit screens. After the language, date and time entries are accepted, the controller performs a device scan. Refer to [Connect a digital sc sensor](#) on page 20 for instructions about how to scan for devices when the controller is already powered on.

### 2.2.4 Controller enclosure

The controller enclosure is NEMA 4X/IP66-rated and has a corrosion-resistant finish designed to withstand corrosive environmental constituents such as salt spray and hydrogen sulfide. Protection against environmental damage is strongly recommended for outdoor use.

**Note:** Units that have the Underwriters Laboratories (UL) certification are intended for indoor use only and do not have a NEMA 4X/IP66 rating.

### 2.2.5 Controller mounting options

The controller can be mounted to a panel, to a wall or to a vertical or horizontal pipe. A neoprene sealing gasket is included and can be used to reduce vibration. The gasket can be used as a template for panel mounting before the inner gasket component is separated.

## Section 3 Installation

### 3.1 Mounting components and dimensions

#### ⚠ CAUTION

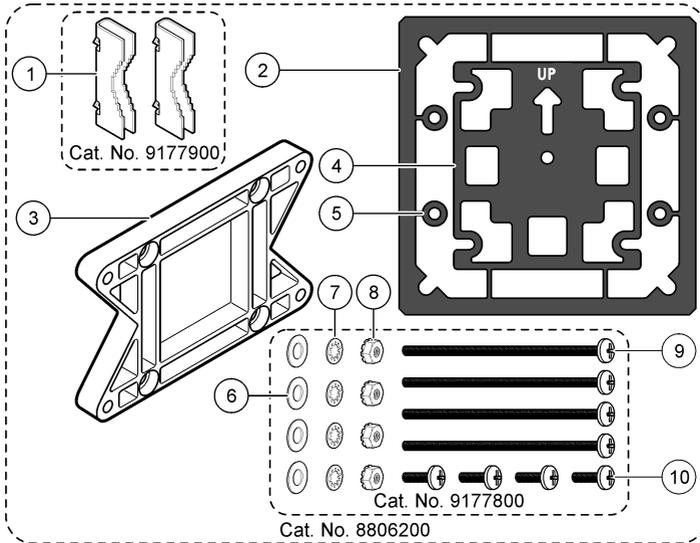
Personal injury hazard. Only qualified personnel should conduct the tasks described in this section of the manual.

The controller can be installed on a surface, panel or pipe (horizontal or vertical). For mounting options and instructions, refer to [Figure 2](#), [Figure 3](#) on page 8, [Figure 4](#) on page 9, [Figure 5](#) on page 10 and [Figure 6](#) on page 11.

For horizontal pipe mounts, the mounting feet ([Figure 2](#)) must be attached to the mounting bracket in a vertical position.

For both horizontal and vertical pipe mounts, attach the mounting bracket to the controller as shown in [Figure 5](#) on page 10.

**Figure 2 Mounting components**

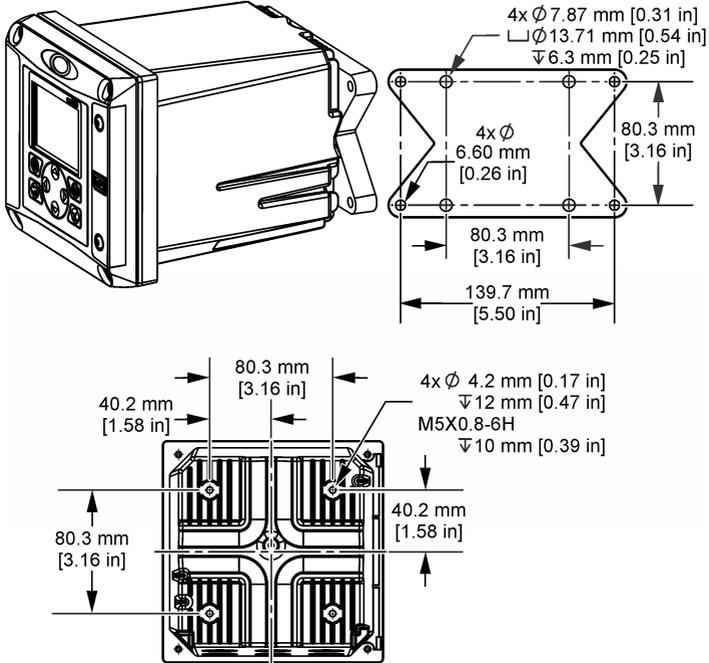


1 Mounting foot (2x)	6 Flat washer, ¼-inch ID (4x)
2 Sealing gasket for panel mount, Neoprene	7 Lock washer, ¼-inch ID (4x)
3 Bracket for wall and pipe mounting	8 M5 x 0.8 Keps hexnut (4x)
4 Vibration isolation gasket for pipe mount	9 Pan head screws, M5 x 0.8 x 100mm (4x) (Used for variable diameter pipe mount installations)
5 Vibration isolation washer for pipe mount (4x)	10 Pan head screws, M5 x 0.8 x 15 mm (4x)

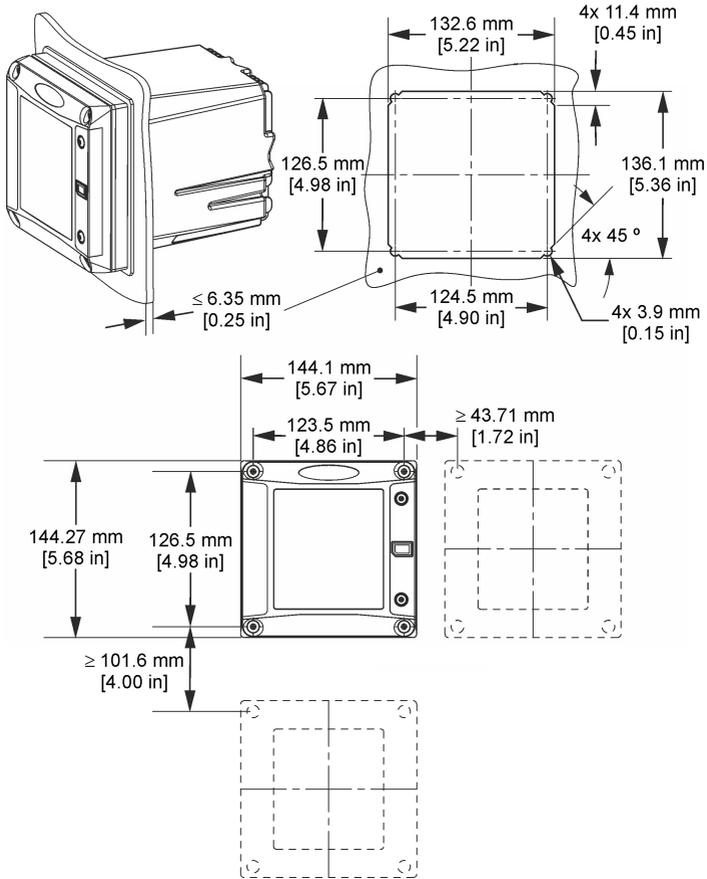
**Note:** A bracket for panel mounting is available as an optional accessory.

## 3.2 Controller mounting

Figure 3 Surface mounting dimensions

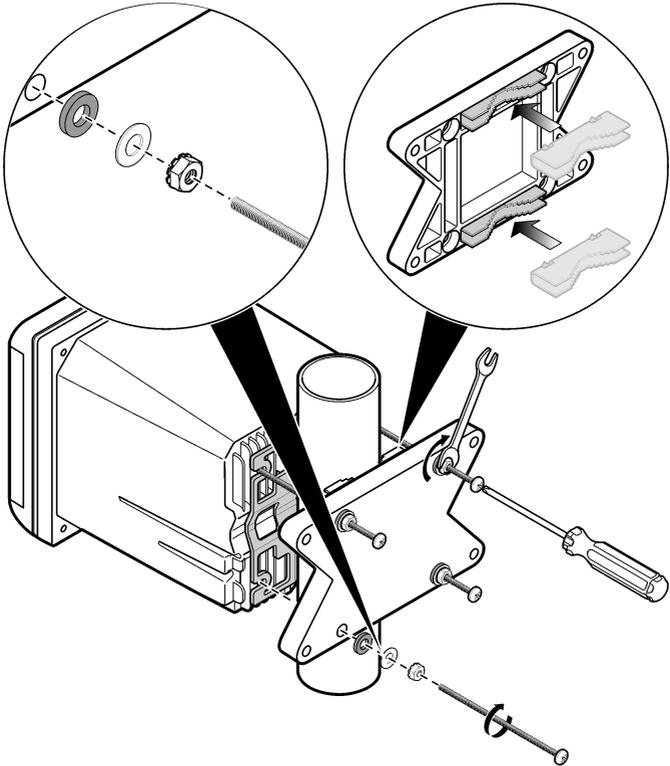


**Figure 4 Panel mounting dimensions**

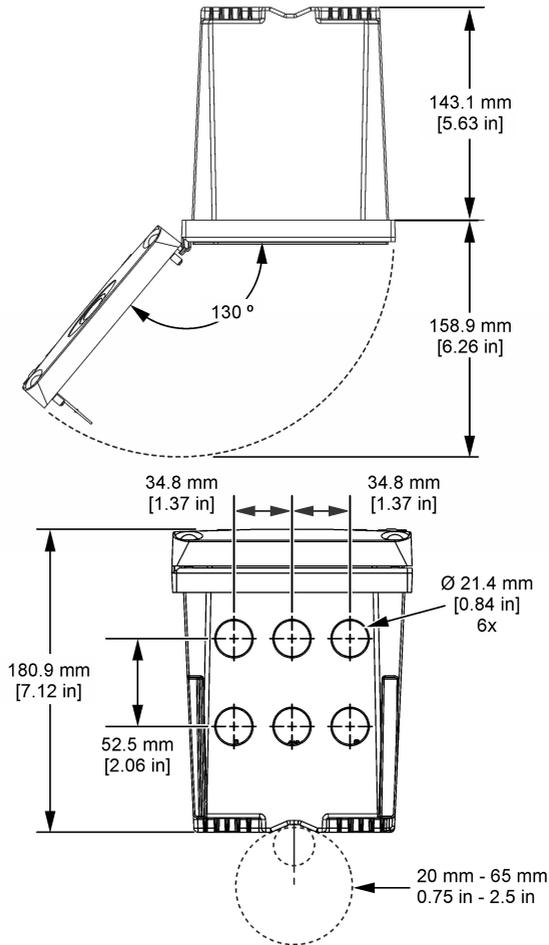


**Note:** If using the bracket (optional) for panel mounting, push the controller through the hole in the panel and then slide the bracket over the controller on the back side of the panel. Use the four 15 mm pan head screws (supplied) to attach the bracket to the controller and secure the controller to the panel.

**Figure 5 Pipe mounting (vertical pipe)**



**Figure 6 Top and bottom views**



### 3.3 High-voltage barrier

High-voltage wiring for the controller is located behind the high-voltage barrier in the controller enclosure. The barrier must remain in place except when installing modules or when a qualified installation technician is wiring for power, alarms, outputs or relays. Do not remove the barrier while power is applied to the controller.

### 3.4 Electrostatic discharge (ESD) considerations

#### **NOTICE**



Potential Instrument Damage. Delicate internal electronic components can be damaged by static electricity, resulting in degraded performance or eventual failure.

Refer to the steps in this procedure to prevent ESD damage to the instrument:

- Touch an earth-grounded metal surface such as the chassis of an instrument, a metal conduit or pipe to discharge static electricity from the body.

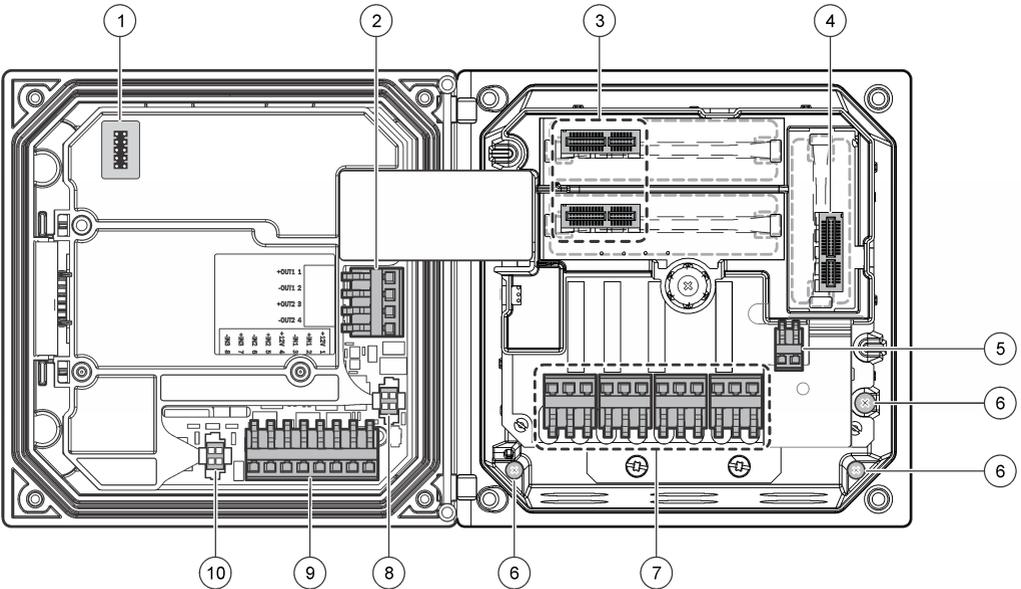
- Avoid excessive movement. Transport static-sensitive components in anti-static containers or packages.
- Wear a wrist strap connected by a wire to earth ground.
- Work in a static-safe area with anti-static floor pads and work bench pads.

### 3.5 Wiring overview

Figure 7 shows an overview of the wiring connections inside the controller with the high voltage barrier removed. The left side of the figure shows the back side of the controller cover.

**Note:** Remove connector caps from the connectors before module installation.

Figure 7 Wiring connections overview



1 Service cable connection	5 AC and DC power connector <sup>3</sup>	9 Discrete input wiring connector <sup>3</sup>
2 4-20 mA output <sup>3</sup>	6 Ground terminals	10 Digital sensor connector <sup>3</sup>
3 Sensor module connector	7 Relay connections <sup>3</sup>	
4 Communication module connector (e.g., Modbus, Profibus, HART, optional 4-20 mA module, etc.)	8 Digital sensor connector <sup>3</sup>	

### 3.6 Wiring for power

**⚠ WARNING**



Potential Electrocution Hazard. Always disconnect power to the instrument when making electrical connections.

<sup>3</sup> Terminals can be removed for improved access.

## ⚠ WARNING



Potential Electrocution Hazard. If this equipment is used outdoors or in potentially wet locations, a **Ground Fault Interrupt** device must be used for connecting the equipment to its mains power source.

## ⚠ DANGER



Electrocution Hazard. Do not connect AC power to a 24 VDC powered model.

## ⚠ WARNING



Potential Electrocution Hazard. A protective earth (PE) ground connection is required for both 100-240 VAC and 24 VDC wiring applications. Failure to connect a good PE ground connection can result in shock hazards and poor performance due to electromagnetic interferences. ALWAYS connect a good PE ground to the controller terminal.

## NOTICE

Install the device in a location and position that gives easy access to the disconnect device and its operation.

The controller can be purchased as either a 100-240 VAC powered model or a 24 VDC powered model. Follow the appropriate wiring instructions for the purchased model.

The controller can be wired for line power by hard-wiring in conduit or wiring to a power cord. Regardless of the wire used, the connections are made at the same terminals. A local disconnect designed to meet local electrical code is required and must be identified for all types of installation. In hard-wired applications, the power and safety ground service drops for the instrument must be 0.82 to 1.31 mm<sup>2</sup> (18 to 16 AWG). Make sure that the field wiring insulation is rated 80 °C (176 °F) minimum.

### Notes:

- The voltage barrier must be removed before making any electrical connections. After making all connections, replace the voltage barrier before closing the controller cover.
- A sealing type strain relief and a power cord less than 3 meters (10 feet) in length with three 18-gauge conductors (including a safety ground wire) can be used to maintain the NEMA 4X/IP66 environmental rating.
- Controllers can be ordered with AC power cords pre-installed. Additional power cords may also be ordered.
- The DC power source that supplies power to the 24 VDC powered controller must maintain voltage regulation within the specified 24 VDC-15% +20% voltage limits. The DC power source must also provide adequate protection against surges and line transients.

### Wiring procedure

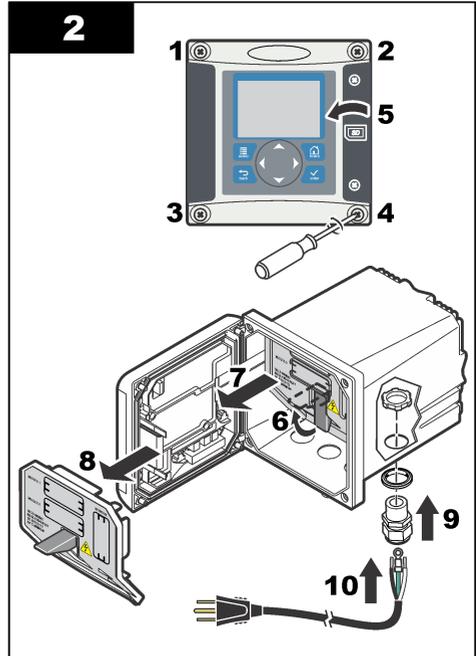
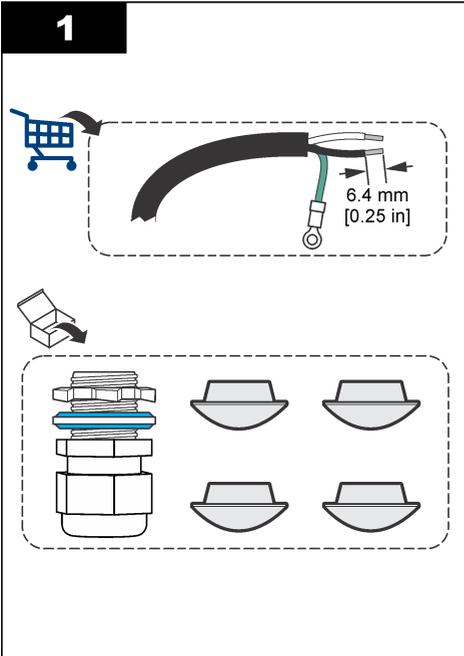
Refer to the illustrated steps that follow and [Table 1](#) or [Table 2](#) to wire the controller for power. Insert each wire into the appropriate terminal until the insulation is seated against the connector with no bare wire exposed. Tug gently after insertion to make sure that there is a secure connection. Seal any unused openings in the controller box with conduit opening sealing plugs.

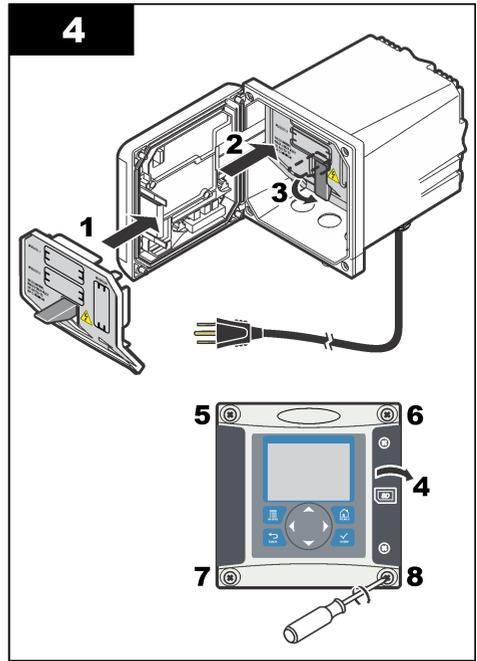
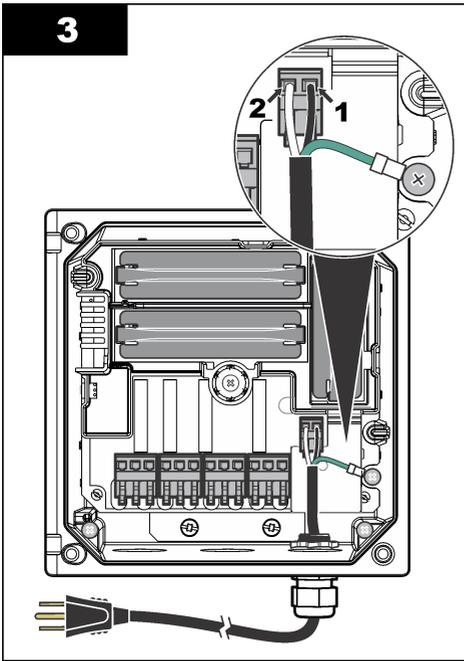
**Table 1 AC power wiring information (AC powered models only)**

Terminal	Description	Color—North America	Color—EU
1	Hot (L1)	Black	Brown
2	Neutral (N)	White	Blue
—	Protective Earth (PE) Ground lug	Green	Green with yellow stripe

**Table 2 DC power wiring information (DC powered models only)**

Terminal	Description	Color—North America	Color—EU
1	+24 VDC	Red	Red
2	24 VDC return	Black	Black
—	Protective Earth (PE) Ground lug	Green	Green with yellow stripe





### 3.7 Alarms and relays

The controller is equipped with four unpowered, single pole relays rated 100-250 VAC, 50/60 Hz, 5 amp resistive maximum. Contacts are rated 250 VAC, 5 amp resistive maximum for the AC powered controller and 24 VDC, 5A resistive maximum for the DC powered controller. The relays are not rated for inductive loads.

### 3.8 Wiring for relays

#### ▲ WARNING



Potential Electrocution Hazard. Always disconnect power to the instrument when making electrical connections.

#### ▲ WARNING



Potential fire hazard. The relay contacts are rated 5A and are not fused. External loads connected to the relays must have current limiting devices provided to limit current to < 5 A.

#### ▲ WARNING



Potential fire hazard. Do not daisy-chain the common relay connections or jumper wire from the mains power connection inside the instrument.

#### ▲ WARNING



Potential electrocution hazard. In order to maintain the NEMA/IP environmental ratings of the enclosure, use only conduit fittings and cable glands rated for at least NEMA 4X/IP66 to route cables in to the instrument.

### AC line (100—250 V) powered controllers

## ⚠ WARNING



Potential electrocution hazard. AC mains powered controllers (115 V–230 V) are designed for relay connections to AC mains circuits (i.e., voltages greater than 16 V-RMS, 22.6 V-PEAK or 35 VDC).

The wiring compartment is not designed for voltage connections in excess of 250 VAC.

### 24 VDC powered controllers

## ⚠ WARNING



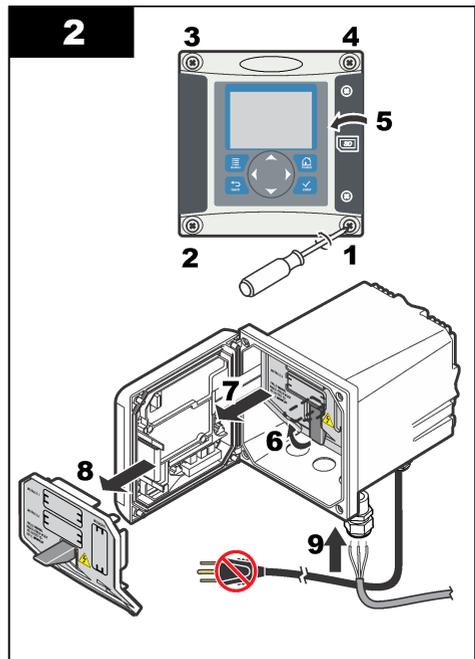
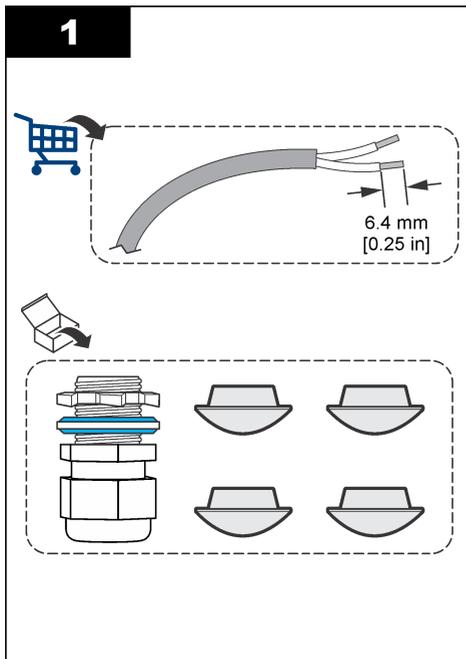
Potential electrocution hazard. 24 V powered controllers are designed for relay connections to low voltage circuits (i.e., voltages less than 16 V-RMS, 22.6 V-PEAK or 35 VDC).

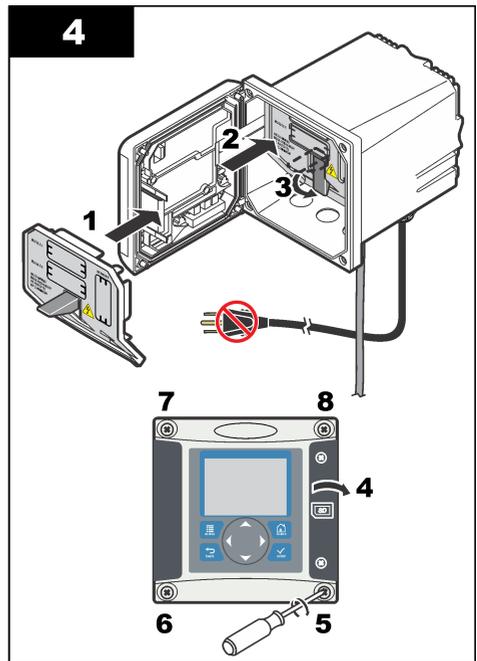
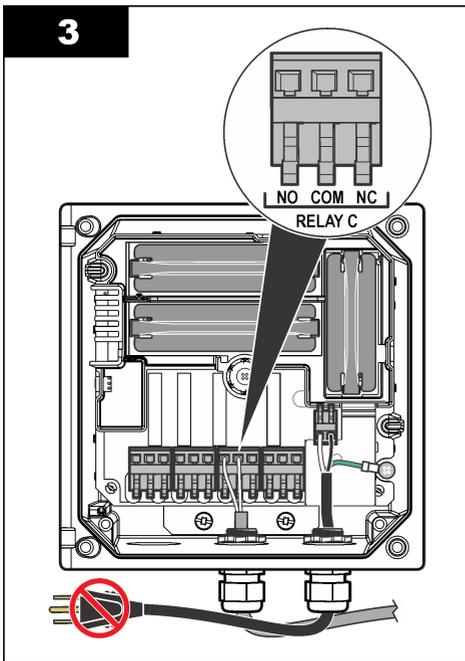
The 24 VDC controller relays are designed for the connection to low voltage circuits (i.e., voltages less than 30 V-RMS, 42.2 V-PEAK or 60 VDC). The wiring compartment is not designed for voltage connections above these levels.

The relay connector accepts 0.82 to 1.31 mm<sup>2</sup> (18 to 16 AWG) wire (as determined by load application). Wire gauge less than 18 AWG is not recommended. Make sure that the field wiring insulation is rated 80 °C (176 °F) minimum.

The Normally Open (NO) and Common (COM) relay contacts will be connected when an alarm or other condition is active. The Normally Closed (NC) and Common relay contacts will be connected when an alarm or other condition is inactive (unless the Fail Safe is set to Yes) or when power is removed from the controller.

Most relay connections use either the NO and COM terminals or the NC and COM terminals. The numbered installation steps show connection to the NO and COM terminals.





### 3.9 Analog output connections

**⚠ WARNING**

 Potential Electrocutation Hazard. Always disconnect power to the instrument when making electrical connections.

**⚠ WARNING**

 Potential electrocutation hazard. In order to maintain the NEMA/IP environmental ratings of the enclosure, use only conduit fittings and cable glands rated for at least NEMA 4X/IP66 to route cables in to the instrument.

Two isolated analog outputs (1 and 2) are provided (Figure 8). Such outputs are commonly used for analog signaling or to control other external devices.

Make wiring connections to the controller as shown in Figure 8 and Table 3.

**Note:** Figure 8 shows the back of the controller cover and not the inside of the main controller compartment.

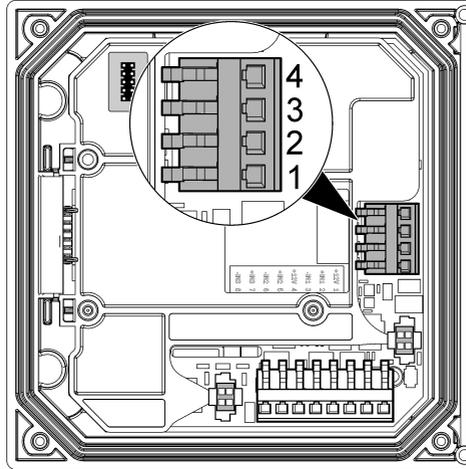
**Table 3 Output connections**

Recorder wires	Circuit board position
Output 2-	4
Output 2+	3
Output 1-	2
Output 1+	1

1. Open the controller cover.
2. Feed the wires through the strain relief.
3. Adjust the wire as necessary and tighten the strain relief.

4. Make connections with twisted-pair shielded wire and connect the shield at the controlled component end or at the control loop end.
  - Do not connect the shield at both ends of the cable.
  - Use of non-shielded cable may result in radio frequency emission or susceptibility levels higher than allowed.
  - Maximum loop resistance is 500 ohm.
5. Close the controller cover and tighten the cover screws.
6. Configure outputs in the controller.

**Figure 8 Analog output connections**



### 3.10 Discrete input wiring connections

#### ▲ WARNING



Potential Electrocution Hazard. Always disconnect power to the instrument when making electrical connections.

#### ▲ WARNING

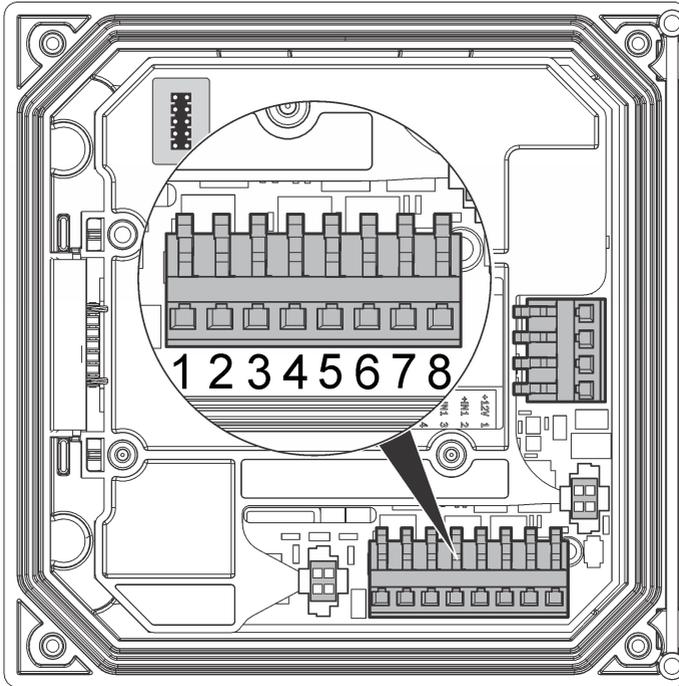


Potential electrocution hazard. In order to maintain the NEMA/IP environmental ratings of the enclosure, use only conduit fittings and cable glands rated for at least NEMA 4X/IP66 to route cables in to the instrument.

Three discrete inputs are provided for switch closure inputs or logic level voltage inputs. Make wiring connections and configure jumper settings to the controller as shown in [Figure 9](#), [Table 4](#) and [Figure 10](#).

**Note:** [Figure 9](#) shows the back of the controller cover and not the inside of the main controller compartment.

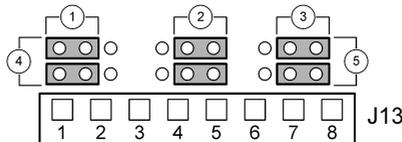
**Figure 9 Discrete input wiring connections**



**Table 4 Input connections**

Discrete inputs	Connector position - Switch input	Connector position - Voltage input
Input 1+	3	2
Input 1-	2	3
Input 2+	6	5
Input 2-	5	6
Input 3+	8	7
Input 3-	7	8

**Figure 10 Jumper settings**



1 Input 1 configuration jumpers	4 Jumpers positioned to the left for switch inputs
2 Input 2 configuration jumpers	5 Jumpers positioned to the right for voltage inputs
3 Input 3 configuration jumpers	

1. Open the controller cover.
2. Feed the wires through the cable gland.
3. Adjust the wire as necessary and tighten the cable gland.
4. The jumpers are positioned immediately behind the connector. Remove the connector for improved access to the jumpers and configure the jumper settings according to the type of input as shown in [Figure 10](#).
5. Close the controller cover and tighten the cover screws.
6. Configure inputs in the controller.

**Note:** In **switch input** mode the controller supplies 12 volts to the switch and is not isolated from the controller. In **voltage input** mode the inputs are isolated from the controller (user input voltage from 0 to 30 volts).

### 3.11 Connect a digital sc sensor

**Note:** To connect an analog sensor, refer to the instructions supplied in the module or sensor manual.

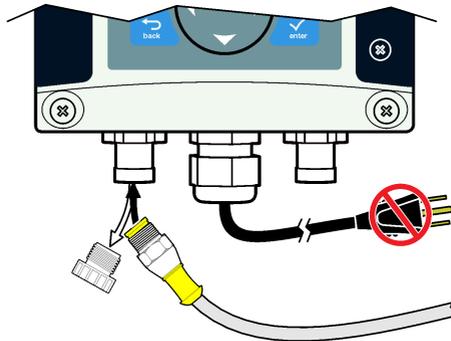
A digital sc sensor can be connected to the controller using the keyed quick-connect fitting ( [Figure 11](#)). A digital sensor can be connected with the controller powered on or off.

When a sensor is connected with the controller powered on, the controller does not automatically perform a device scan. To make the controller perform a device scan, navigate to the Test/Maintenance menu and select Scan Devices. If a new device is found, the controller performs the installation process without further user action.

When a sensor is connected with the controller powered off, the controller will perform a device scan when it is powered on again. If a new device is found, the controller performs the installation process without further user action.

Retain the connector cap to seal the connector opening in case the sensor must be removed.

**Figure 11 Digital sensor quick connect**



### 3.12 Connect the optional digital communication output

The manufacturer supports Modbus RS485, Modbus RS232, Profibus DPV1 and HART communication protocols. The optional digital output module is installed in the location indicated by item 4 in [Figure 7](#) on page 12. Refer to the instructions supplied with the network module for more details.

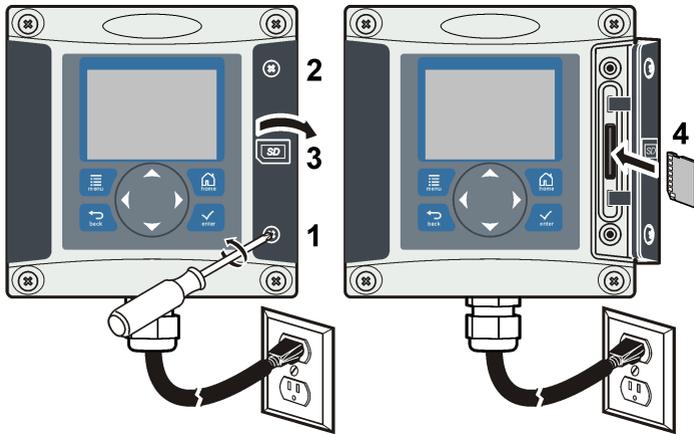
For information about Modbus registers, go to <http://www.de.hach.com> or <http://www.hach.com> and search *Modbus registers* or go to any sc200 product page.

### 3.13 Install a Secure Digital (SD) memory card

For instructions on how to install an SD card in the controller, refer to [Figure 12](#). Information on how to use the SD memory card can be found in [Using the secure digital memory \(SD\) card](#) on page 42.

To remove an SD card, push down on the edge of the card and release, then pull the card up and out of the slot. After the card is removed, close the slot cover and tighten the cover screws.

**Figure 12 SD card installation**

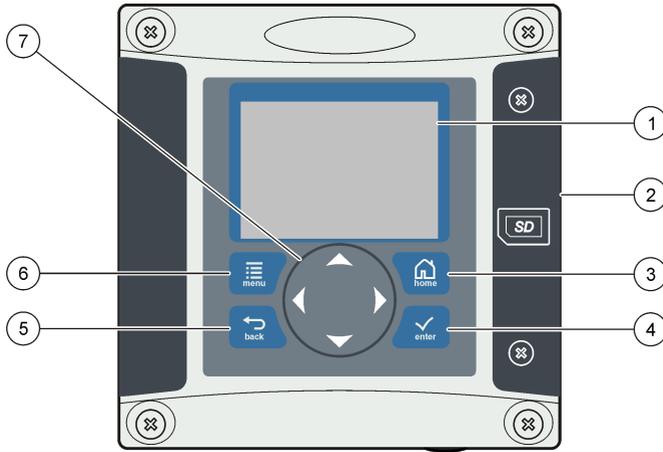


## Section 4 User interface and navigation

### 4.1 User interface

The keypad has four menu keys and four directional keys as shown in [Figure 13](#).

**Figure 13 Keypad and front panel overview**



1 Instrument display	5 <b>BACK</b> key. Moves back one level in the menu structure.
2 Cover for secure digital memory card slot	6 <b>MENU</b> key. Moves to the Settings Menu from other screens and submenus.
3 <b>HOME</b> key. Moves to the Main Measurement screen from other screens and submenus.	7 Directional keys. Used to navigate through the menus, change settings, and increment or decrement digits.
4 <b>ENTER</b> key. Accepts input values, updates, or displayed menu options.	

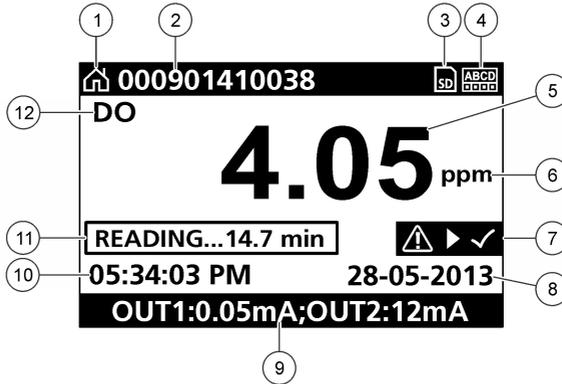
Inputs and outputs are set up and configured through the front panel using the keypad and display screen. This user interface is used to set up and configure inputs and outputs, create log information and calculated values, and calibrate sensors. The SD interface can be used to save logs and update software.

## 4.2 Display

Figure 14 shows an example of the main measurement screen with a DO sensor connected to the controller.

The front panel display screen shows sensor measurement data, calibration and configuration settings, errors, warnings and other information.

**Figure 14 Example of Main Measurement screen**



1 Home screen icon	7 Warning status bar
2 Sensor name	8 Date
3 SD Memory card icon	9 Analog output values
4 Relay status indicator	10 Time
5 Measurement value	11 Progress bar
6 Measurement unit	12 Measurement parameter

**Table 5 Icon descriptions**

Icon	Description
Home screen	The icon may vary depending on the screen or menu being displayed. For example, if an SD card is installed, an SD card icon appears here when the user is in the SD Card Setup menu.
SD memory card	This icon appears only if an SD card is in the reader slot. When a user is in the SD Card Setup menu, this icon appears in the upper left corner.
Warning	A warning icon consists of an exclamation point within a triangle. Warning icons appear on the right of the main display below the measurement value. Push the <b>ENTER</b> key then select the device to view any problems associated with that device. The warning icon will no longer be displayed once all problems have been corrected or acknowledged.
Error	An error icon consists of an exclamation point within a circle. When an error occurs, the error icon and the measurement screen flash alternately in the main display. To view errors, push the <b>MENU</b> key and select <b>Diagnostics</b> . Then select the device to view any problems associated with that device.

**4.2.1 Additional display formats**

- From the Main Measurement screen push the **UP** and **DOWN** arrow keys to switch between measurement parameters
- From the Main Measurement screen push the **RIGHT** arrow key to switch to a split display of up to 4 measurement parameters. Push the **RIGHT** arrow key to include additional measurements. Push the **LEFT** arrow key as needed to return to the Main Measurement screen
- From the Main Measurement screen push the **LEFT** arrow key to switch to the graphical display (see [Graphical display](#) on page 23 to define the parameters). Push the **UP** and **DOWN** arrow keys to switch measurement graphs

**4.2.2 Graphical display**

The graph shows concentration and temperature measurements for each channel in use. The graph supplies easy monitoring of trends and shows changes in the process.

1. From the graphical display screen use the up and down arrow keys to select a graph and push the **HOME** key.
2. Select an option:

Option	Description
<b>MEASUREMENT VALUE</b>	Set the measurement value for the selected channel. Select between Auto Scale and Manually Scale. For manual scaling enter the minimum and maximum measurement values
<b>DATE &amp; TIME RANGE</b>	Select the date and time range from the available options

## Section 5 System startup

When initially powered up, the Language, Date Format and Date/Time screens appear in order. After these options are set, the controller performs a device scan and displays the message **Scanning for devices. Please wait...** If a new device is found, the controller performs an installation process before displaying a main measurement screen.

If the scan finds previously installed devices without configuration changes, the main measurement screen of the device in the number one position appears immediately after the scan is complete.

If a device has been removed from the controller or is not found during the next power-cycled or menu-driven scan, the controller displays a **Device missing** message and prompts to delete the missing device.

If no sensor is connected to an installed analog module, the controller will indicate an error. If devices are connected but not found by the controller, refer to [Troubleshooting](#) on page 46.

### 5.1 Set the language, date and time for the first time

The controller displays the language, date and time edit screens when the controller is powered on for the first time, and when it is powered on after the configuration settings have been set to their default values.

After the language, date and time options are set for the first time, update the options as necessary through the sc200 setup menu.

1. In the Language screen, highlight a language in the options list and push the **ENTER** key. English is the default language for the controller.  
The selected language is saved. The Date Format screen appears.
2. In the Date Format screen, highlight a format and push the **ENTER** key.  
The date and time format is saved. Next, the Date /Time screen appears.
3. In the Date/Time screen, push the **RIGHT** or **LEFT** arrow keys to highlight a field, then push the **UP** and **DOWN** arrow keys to update the value in the field. Update the other fields as necessary.
4. Push the **ENTER** key.  
The changes are saved and the controller performs a start-up scan for devices. If connected devices are found, the controller displays the main measurement screen for the device in the number one position. If the controller fails to find connected devices, refer to [Troubleshooting](#) on page 46.

### 5.2 Controller configuration information

General information about configuration options is listed in the table.

1. To navigate to the menu options, from the Settings Menu, select sc200 Setup.

Option	Description
<b>Security setup</b>	Sets the passcode preferences (refer to <a href="#">Security setup</a> on page 25)
<b>Output setup</b>	Configures the controller analog outputs (refer to <a href="#">Configure the controller analog outputs</a> on page 27)

Option	Description
<b>Relay setup</b>	Configures the controller relays (refer to <a href="#">Configure relays</a> on page 30)
<b>Display setup</b>	Configures the controller display (refer to <a href="#">Display setup</a> on page 39)
<b>Set Date/Time</b>	Sets the controller time and date (refer to <a href="#">Update the date and time</a> on page 40)
<b>Datalog setup</b>	Configures data logging options. Available only if Calculation has been setup. At least one sensor must be attached to enter a calculation (refer to <a href="#">Set the datalog mode and interval</a> on page 40)
<b>Manage Data</b>	Select the device from the list of installed components to view the data or event log
<b>Error Hold Mode</b>	<b>Hold Outputs</b> —Holds outputs at last known value when controller loses communication with the sensor. <b>Transfer Outputs</b> —Switches to transfer mode when controller loses communication with the sensor. Outputs transfer to a pre-defined value.
<b>Calculation</b>	Configures the controller math function (refer to <a href="#">Set up a calculation</a> on page 40)
<b>sc200 Information</b>	<b>S/W VER:</b> —Displays the current version of controller software <b>Bootloader VER:</b> —Displays the current Bootloader version. The Bootloader is a file that loads the main operating system for the controller <b>S/N:</b> —Displays the controller serial number <b>Version:</b> —Displays the current version of controller hardware
<b>Discrete Input Setup</b>	Configures three discrete input channels (refer to <a href="#">Set up the discrete inputs</a> on page 41)
<b>Language</b>	Assigns the language used in the controller (refer to <a href="#">Update the display language</a> on page 42)

2. Select an option and push **ENTER** to activate the menu item.

## Section 6 Advanced operation

### 6.1 Security setup

#### 6.1.1 Enable or disable the passcode

By default the passcode option is disabled and all configuration settings and calibrations can be changed. When the passcode function is enabled, access to Sensor calibration and Test/Maint menus requires a passcode.

To enable the passcode:

1. From the Settings Menu, select sc200 Setup and push the **ENTER** key.
2. Select Security Setup and push the **ENTER** key.
3. Select Set Passcode and push the **ENTER** key.
4. Select Disabled or Enabled and push the **ENTER** key.  
The passcode is enabled.
5. Push the **BACK** key to return to the sc200 Setup Menu, or push the **MENU** key to return to the Settings Menu.

#### 6.1.2 Edit the passcode

The passcode is factory set to SC200. The Edit Passcode menu option appears in the Security Setup menu only after the passcode feature is enabled and a valid passcode has been entered.

A passcode consists of up to six upper or lower-case alpha, numeric and special characters. Passcodes are case-sensitive.

To edit the passcode:

1. Make sure the passcode is enabled. Refer to [Enable or disable the passcode](#) on page 25 for information on how to enable the passcode.
2. From the Settings menu, select Security Setup and push **ENTER**.
3. Use the arrow keys to enter the current valid passcode and push **ENTER**. The Edit Passcode option appears in the Security Setup menu.
4. Select Edit Pass Code and push **ENTER**. The Edit Pass Code screen appears.
5. Use the arrow keys to edit the passcode and push **ENTER**. The new passcode is saved and the Security Setup menu appears.  
*Note: All menus stay accessible until the HOME key is pushed or the controller is restarted.*
6. Push the **HOME** key or perform a controller restart. The new passcode settings are saved, and the new passcode is required to enter the Security Setup, Datalog Setup and Test/Maint menus.

### 6.1.3 Protect features

This option is only displayed if an analyzer or sensor that supports this feature is connected to the controller. Security categories are displayed that are defined by the connected analyzer or sensor. The user can then enable or disable password protection against individual menu options within these categories.

## 6.2 Configure a 4-20 mA input module

An analog module must be installed in the controller.

1. Determine what output the connected device is using (0-20 mA or 4-20 mA). This information will be used to set the scale.
2. Determine what the 20 mA value is equal to (e.g., 100 psi).
3. Determine what the low end (0 or 4 mA) value is equal to (e.g., 10 psi). This information will be used to set the display range.
4. From the Settings Menu, select Sensor Setup.
5. Select Configure.
6. Update the options.
  - a. Highlight an option and push **ENTER**.
  - b. Make a selection or update the entries.
  - c. Push **ENTER** to save the changes.

Option	Description
<b>Edit name</b>	Edits the module name
<b>Edit units</b>	Edits the measurement units
<b>Edit parameter</b>	Edits the parameter name
<b>Display range</b>	Sets the values used for the selected scale (0-20 mA or 4-20 mA)
<b>For the 0-20 mA scale:</b>	
• <b>Set the 20 mA value</b>	
• <b>Set the 0 mA value</b>	
<b>For the 4-20 mA scale:</b>	
• <b>Set the 20 mA value</b>	
• <b>Set the 4 mA value</b>	

Option	Description
<b>Signal average</b>	Sets how often signals are averaged. Higher values produce a smoother signal but increase the time it takes for a signal to respond to a change in the process value.
<b>Set resolution— X.XXX, XX.XX, XXX.X, XXXX</b>	Sets the number of decimal places used in the display.
<b>Select scale— 4-20 mA or 0-20 mA</b>	Sets scale used for the 4-20 mA input
<b>Data log interval—5 sec, 30 sec, 1 min, 2 min, 5 min, 10 min, 15 min, 30 min, 60 min</b>	Sets how often data is logged to the internal controller memory.
<b>Reset defaults—Push ENTER to reset configuration settings or push the BACK key to cancel.</b>	Resets configuration settings to the default values.

For additional information, refer to the *sc200 4–20 Analog Input Module User Manual*.

### 6.3 Configure a 4-20 mA output module

The Network Setup option appears in the Settings Menu only if an analog output module or other network module such as Modbus or Profibus is installed in the controller.

Outputs for analog output modules are set at 4-20 mA. Outputs can be assigned to represent a measured parameter such as pH, temperature, flow or calculated values.

1. From the Settings menu, select Network Setup.
2. Select Edit Name and enter a name for the module. Push **ENTER** to save the name.
3. Select an output (A, B, C, D) and push **ENTER**.
  - a. Highlight an option and push **ENTER**.
  - b. Make a selection from the list or update the entries.
  - c. Push **ENTER** to save the changes.

Option	Description
<b>Select Source</b>	Selects the output to configure—None, sensor 1 name, sensor 2 name, calculation (if set up). For sensor output, Select Parameter sets the measurement options. When the measurement is autorange, Set Range sets the range.
<b>Set Low Value</b>	Sets the 4 mA value (default: 0.000). (Range and units depend on sensor)
<b>Set High Value</b>	Sets the 20 mA value (default: 1.000). (Range and units depend on sensor)
<b>Set Transfer</b>	Sets the transfer value. Range 3.0 to 25.0 mA (default 4.000).
<b>Set Filter</b>	Sets a time-average filter value of 0 (default) to 120 seconds.

For additional information, refer to the *sc200 4-20 Output Module User Manual*.

### 6.4 Configure the controller analog outputs

The controller analog outputs can be assigned to represent the measured parameter or secondary measurements such as temperature and calculations. To configure the options, highlight a menu option, push **ENTER** and select an option or update the entries. Push **ENTER** after an option is selected or the entries are updated.

1. From the Settings menu, select sc200 Setup.
2. Select Output Setup.
3. Select Output 1 or Output 2.

4. Choose Select Source and select a source from the list. Typically the source is one of the sensors attached to the system. If an analog input card is installed, the analog input may be used as a source.
5. From the Output Setup menu, choose Select Parameter and choose an option from the list. Parameters will vary depending on the type of sensors installed.
6. From the Output Setup menu, select Set Function and choose a function. Further setup options will vary depending on which function is chosen.

Option	Description
<b>Linear</b>	Signal is linearly dependent on the process value
<b>PID</b>	Signal works as a PID (Proportional, Integral, Derivative) controller
<b>Logarithmic</b>	Signal is represented logarithmically within the process variable range
<b>Bilinear</b>	Signal is represented as two linear segments within the process variable range

7. From the Output Setup menu, select Activation. Use the information in the table below the chosen function to configure the options.
8. If Transfer is or will be selected as the Error Hold Mode, or if the Transfer will be used during calibration or other functions within the sensor menu, select Set Transfer from the Output Setup menu and enter the transfer value.
9. From the Output Setup menu, select Set Filter and enter the filter value.
10. From the Output Setup menu, select Scale and choose the scale (0-20 mA or 4-20 mA).

- **Linear**

Option	Description
<b>Set low value</b>	Sets the low endpoint of the process variable range
<b>Set high value</b>	Sets the high endpoint of the process variable range

- **PID**

Option	Description
<b>Set mode (Auto or Manual)</b>	Auto—the signal is automatically controlled by the algorithm within the analyzer using proportional, integral, and derivative inputs. Manual—the signal is controlled by the user through manual adjustment of the % change value. This option is shown as Manual Output after the manual set mode is selected.
<b>Phase (Direct or Reverse)</b>	The direction in which the signal responds to process change. Direct—signal increases as the process increases. Reverse—signal increases as process decreases.
<b>Set setpoint</b>	Creates a desired control point of process
<b>Prop band</b>	A function of the difference between the measured signal and the desired setpoint.
<b>Integral</b>	The period of time from the injection point of a reagent to contact with the measuring device.
<b>Derivative</b>	Used to compensate for the 2 <sup>nd</sup> order effects of the process. The majority of applications can be controlled without the use of the derivative setting.
<b>Transit time</b>	Stops all PID control for a selected period of time as the sample travels from the control pump to the measurement sensor.

- **Logarithmic**

Option	Description
<b>Set 50% value</b>	Sets the value corresponding to 50% of the process variable range.
<b>Set high value</b>	Sets the upper value of the process variable range.

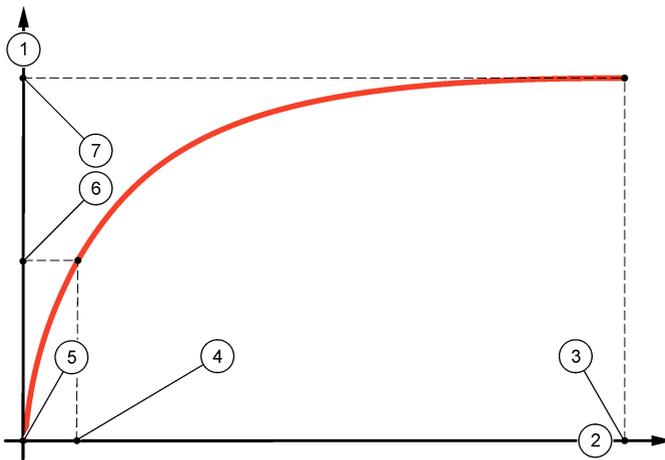
- **Bilinear**

Option	Description
<b>Set low value</b>	Sets the low endpoint value of the process variable range.
<b>Set high value</b>	Sets the high endpoint value of the process variable range.
<b>Set knee point value</b>	Sets the value at which the process variable range divides into another linear segment.
<b>Set knee point current</b>	Sets the value of the current at the knee point value.

### 6.4.1 Logarithmic output mode

Figure 15 shows in graph form the operation of the logarithmic output mode.

**Figure 15 Logarithmic output**

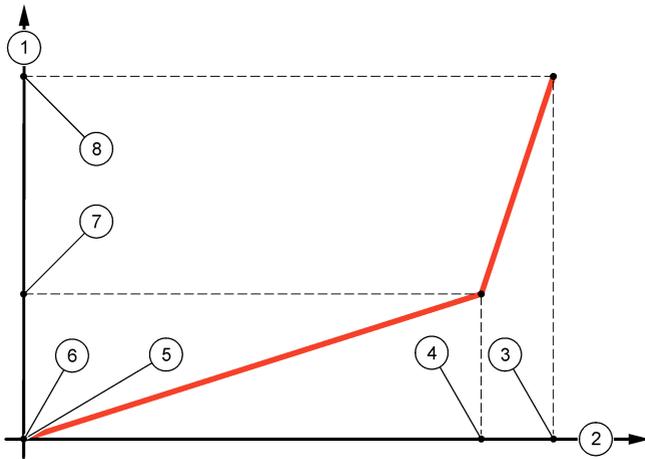


1 Output current axis	5 Minimum output current (0-4 mA)
2 Source value axis	6 50% output current
3 High value	7 Maximum output current (20 mA)
4 50% value	

### 6.4.2 Bilinear output mode

Figure 16 shows in graph form the operation of the bilinear output mode.

**Figure 16 Bilinear output**



1 Output current axis	5 Low value
2 Source value axis	6 Minimum output current (0-4 mA)
3 High value	7 Knee point current
4 Knee point value	8 Maximum output current (20 mA)

## 6.5 Configure relays

The Normally Open (NO) and Common (COM) relay contacts will be connected when an alarm or other condition is active. The Normally Closed (NC) and Common relay contacts will be connected when an alarm or other condition is inactive (unless the Fail Safe is set to Yes), or when power is removed from the controller. To select a menu option, highlight the option and push **ENTER**.

1. From the sc200 Setup menu, select Relay Setup.
2. Select a relay from the list.
3. From the Relay Setup menu, choose Select Source and push **ENTER**. Normally, a source is one of the sensors attached to the system, but the controller can also function as a source. If an analog input module is installed, the source may be the analog input.
4. From the Relay Setup menu, select Set Parameter and choose from the list of parameters. The list of parameter options will vary with the type of attached sensor.
5. From the Relay Setup menu, select Set Function and choose from the list. Further setup will depend on the function chosen.

Option	Description
<b>Scheduler Function (available if the controller is selected as the relay source)</b>	Relay switches at certain times independently of any process value
<b>Alarm Function</b>	Relay activates when upper or lower alarm value is exceeded
<b>Feeder Control Function</b>	Relay indicates if a process value exceeds or falls below a setpoint
<b>Event Control Function</b>	Relay toggles if a process value reaches an upper or lower limit
<b>Pulse Width Modulation (PWM) Control Function</b>	Relay uses a Pulse Width Modulation control depending on a process value

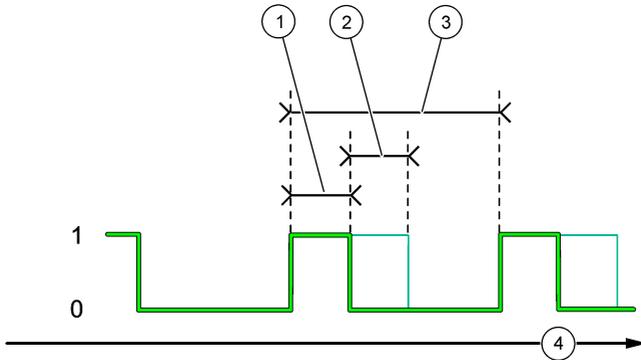
Option	Description
<b>Frequency control</b>	Relay switches with a frequency depending on a process value
<b>Warning</b>	Relay indicates warning and error conditions in probes

6. From the Relay Setup menu, select Set Transfer and choose Active or Inactive.
7. From the Relay Setup menu, select Fail Safe and choose Yes or No.
8. From the Relay Setup menu, select Activation.  
The activation options for the selected function appear. Use the information in the table below each function to update the options.
9. Test the relay function to make sure it is properly energizing the connected device. To do relay testing, go to the Setting menu, then select **Test/Maint>Test Relay**.

- **Scheduler Function (refer to [Figure 17](#))**

Option	Description
<b>Hold outputs</b>	Holds outputs in the present ON or OFF state
<b>Run days</b>	Sets the weekday(s) that the relay operates. Options: Sunday, Monday, Tuesday., Wednesday, Thursday, Friday, Saturday
<b>Start time</b>	Sets the start time.
<b>Interval</b>	Sets the time between activation cycles (Default value: 5 min).
<b>Duration</b>	Sets the period of time the relay is energized (Default value: 30 sec).
<b>Off delay</b>	Sets the time for additional hold/output time after the relay has been turned off.

**Figure 17 Scheduler function**



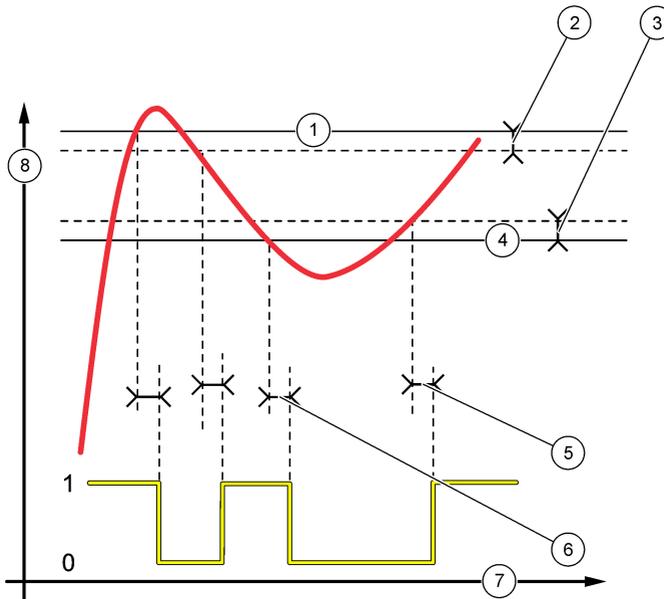
1 Duration	3 Interval
2 OFF delay	4 Time (x-axis)

- **Alarm Function (refer to [Figure 18](#))**

Option	Description
<b>Low alarm</b>	Sets the value where the relay will turn on in response to decreasing measured value. For example, if the low alarm is set for 1.0 and the measured value drops to 0.9, the relay activates.
<b>High alarm</b>	Sets the value where the relay will turn on in response to increasing measured value. For example, if the high alarm is set for 1.0 and the measured value increases to 1.1, the relay activates.

Option	Description
<b>Low deadband</b>	Sets the range where the relay remains on after the measured value increases above the low alarm value. For example, if the low alarm is set for 1.0 and the low deadband is set for 0.5, the relay remains on between 1.0 and 1.5. Default is 5% of the range.
<b>High deadband</b>	Sets the range where the relay remains on after the measured value decreases below the high alarm value. For example, if the high alarm is set for 4.0 and the high deadband is set for 0.5, the relay remains on between 3.5 and 4.0. Default is 5% of the range.
<b>Off delay</b>	Sets a time (0-300 seconds) to delay the relay from normally turning off (Default: 0 seconds).
<b>On delay</b>	Sets a delay time for the relay to turn on (Default: 0 seconds).

**Figure 18 Alarm function**



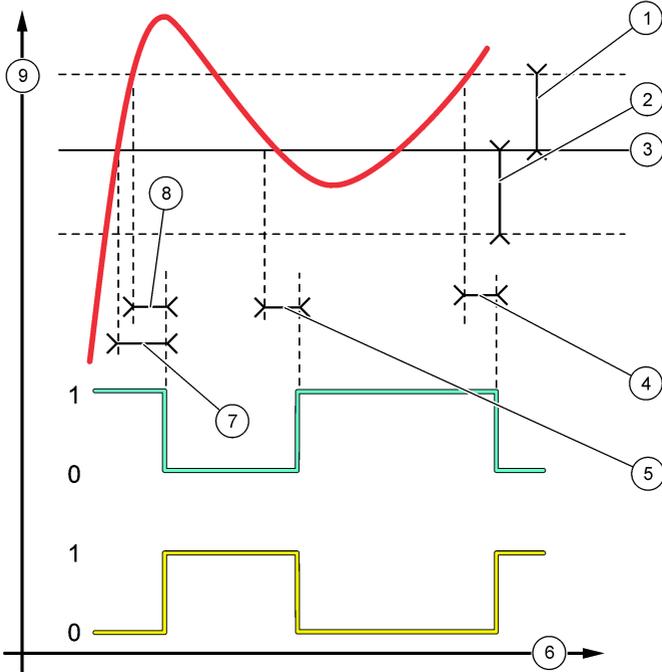
1 High alarm	5 ON delay
2 High deadband	6 OFF delay
3 Low deadband	7 Time (x-axis)
4 Low alarm	8 Source (y-axis)

• **Feeder Control Function (refer to [Figure 19](#) and [Figure 20](#))**

Option	Description
<b>Phase</b>	Defines the relay status if the process value exceeds the setpoint. High (default)—turns the relay on when the process value exceeds the setpoint. Low—turns the relay on when the process value falls below the setpoint.
<b>Set setpoint</b>	Sets the process value at which the relay toggles. The default value is different for each sensor.
<b>Deadband</b>	Sets the area for an amount of change necessary after the relay setpoint is reached in order to satisfy a condition.

Option	Description
<b>Overfeed timer</b>	Sets a time period for de-activating an active relay if the process setpoint cannot be reached. Once an overfeed alarm is present, it must be manually reset.
<b>Off delay</b>	Sets a delay time for the relay to turn off (default: 0 seconds).
<b>On delay</b>	Sets a delay time for the relay to turn on (default: 0 seconds).

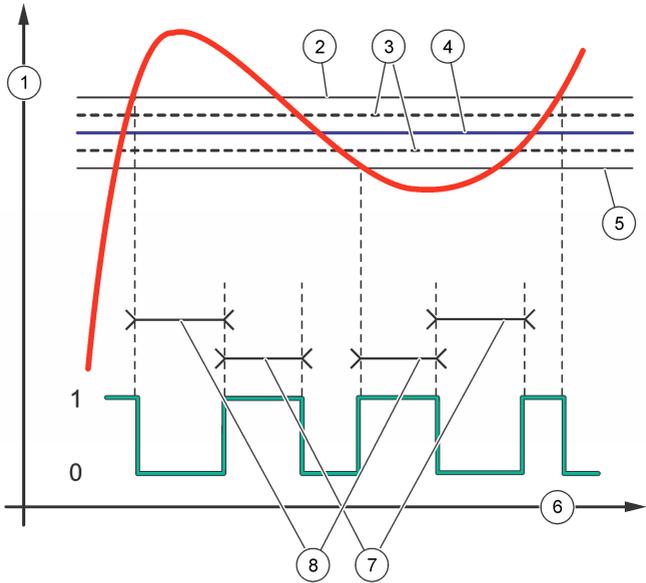
**Figure 19 Feeder control function**



1 Deadband (Phase = Low)	6 Time (x-axis)
2 Deadband (Phase = High)	7 ON delay (phase set high)
3 Setpoint	8 OFF delay (phase set low)
4 OFF delay (phase set high)	9 Source (y-axis)
5 ON delay (phase set low)	

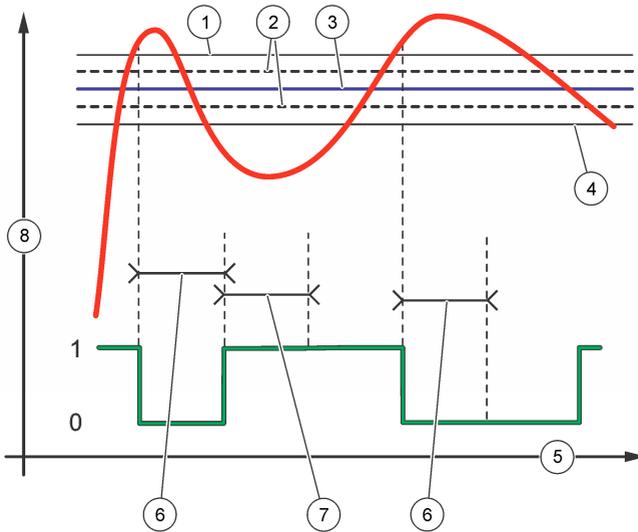


**Figure 21 Event control function (no delay)**



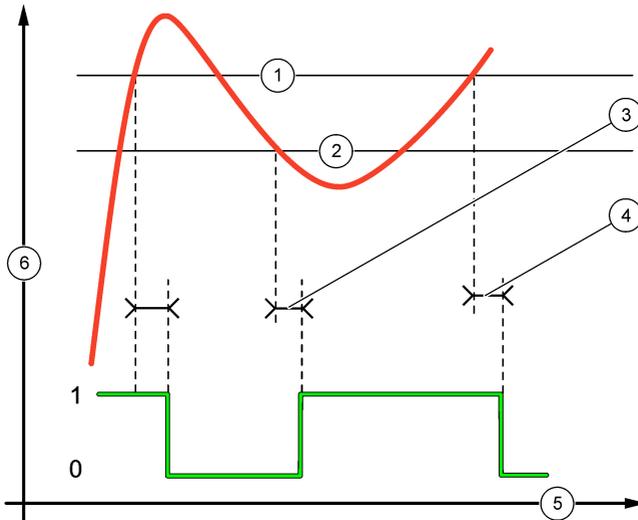
1 Source (y-axis)	5 Low alarm
2 High alarm	6 Time (x-axis)
3 Deadband	7 OnMax-time
4 Setpoint	8 OffMax-time

**Figure 22 Event control function (OnMin timer, OffMin timer)**



1 High alarm	5 Time (x-axis)
2 Deadband	6 OffMin timer
3 Setpoint	7 OnMin timer
4 Low alarm	8 Source (y-axis)

**Figure 23 Event control function (ON/OFF delay)**

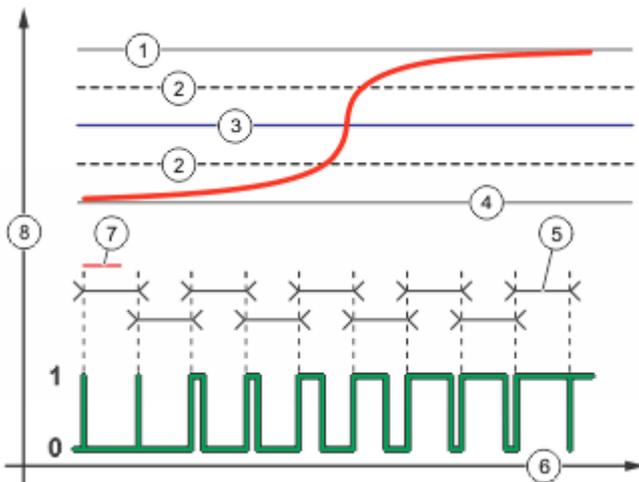


1 High alarm	4 OFF delay
2 Low alarm	5 Time (x-axis)
3 ON delay	6 Source (y-axis)

• **Pulse Width Modulation Control Function (refer to [Figure 24](#))**

Option	Description
<b>Set mode</b>	Auto—the relay output works as a PID controller. Manual—the signal is controlled by the user through manual adjustment of the % change value. This option is shown as Manual Output after the manual set mode is selected.
<b>Phase</b>	Reverses the leading sign of the control deviation for the PID controller (default: Reverse). The phase selects whether the relay will operate at the first part of a cycle (direct phase) or the second part (reverse phase).
<b>Set setpoint</b>	Creates a setpoint value.
<b>Dead zone</b>	The range above and below the setpoint. In this set range, the PID controller does not take action to change the Pulse Width Modulation On/Off Ratio output signal until the limits of the dead zone are reached.
<b>Period</b>	Sets the cycle duration of the PWM output signal (default: 5 seconds).
<b>Min width</b>	Sets the minimum PWM ratio (default: 1.0 second).
<b>Max width</b>	Sets the maximum PWM ratio (default: 4.0 seconds).
<b>Prop band</b>	Sets the proportional part of the PID controller. The proportional part of the controller supplies an output signal which is linearly dependent to the control deviation. The proportional part reacts on any changes at the input but starts to oscillate easily if the value is set high. The proportional part cannot completely compensate for disturbances.
<b>Integral</b>	Sets the integral part of the PID controller (default: 000 minutes). The integration part of the controller supplies an output signal. The output signal increases linearly if the control deviation is constant. The integration part responds slower than the proportional part and can completely compensate disturbances. The higher the integration part, the slower it responds. If the integration part is set too low, it starts to oscillate.

**Figure 24 Pulse Width Modulation function (linear mode)**

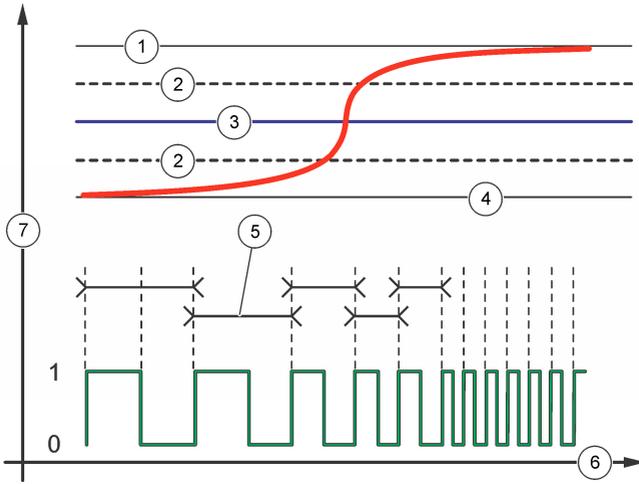


1 High alarm	5 Period
2 Deadband	6 Time (x-axis)
3 Setpoint	7 Phase
4 Low alarm	8 Selected source (y-axis)

• **Frequency Control Function (refer to [Figure 25](#))**

Option	Description
<b>Set mode</b>	<p>Auto—The relay works as a PID controller.</p> <p>Manual—the signal is controlled by the user through manual adjustment of the % change value. This option is shown as Manual Output after the manual set mode is selected.</p>
<b>Phase</b>	<p>Reverses the leading sign of the control deviation for the PID controller (default: Reverse). The phase selects whether the relay will operate at the first part of a cycle (direct phase) or the second part (reverse phase).</p>
<b>Set setpoint</b>	<p>Sets the process value which is controlled by the PID controller.</p>
<b>Dead zone</b>	<p>In this set range, the PID controller does not take action to change the output frequency until within the limits of the dead zone.</p>
<b>Pulse width</b>	<p>Sets the cycle duration (0-600 seconds) of the PWM output signal. (default: 0.5 seconds) The cycle duration is equal to the duty cycle of the output signal.</p>
<b>Minimum pulses</b>	<p>Sets the minimum number of pulses per minute at which the relay can operate. Range: 0.001–4.000 (default: 1.000)</p>
<b>Maximum pulses</b>	<p>Sets the maximum number of pulses per minute at which the relay can operate. Range: 0.001–60.000 (default: 04.000). This value cannot be set lower than Minimum Pulses value.</p>
<b>Prop band</b>	<p>Sets the proportional part of the PID controller. The proportional part of the controller supplies an output signal which is linearly dependent to the control deviation. The proportional part reacts on any changes at the input but starts to oscillate easily if the value is set high. The proportional part cannot fully compensate for disturbances.</p>
<b>Integral</b>	<p>Sets the derivative part of the PID controller (default: 000 minutes). The integration part of the controller generates an output signal. The output signal increases linearly if the control deviation is constant. The integration part responds slower than the proportional part and can fully compensate disturbances. The higher the integration part, the slower it responds. If the integration part is set too low, it starts to oscillate.</p>

**Figure 25 Frequency control function**



1 High limit	5 Cycle duration
2 Deadband	6 Time (x-axis)
3 Setpoint	7 Selected source (y-axis)
4 Low limit	

• **Warning Function**

Option	Description
<b>Warning</b>	Sets the level for warning activation. Refer to the sensor manual for the numbers for individual warning messages.

**6.6 Display setup**

Configures the controller display.

1. From the Settings menu, select sc200 Setup and push **ENTER**.
2. Select Display Setup and push **ENTER**.

Option	Description
<b>Adjust Order</b>	View and modify the measurement display order. <ul style="list-style-type: none"> <li>• <b>See Current Order</b>—View the current display order</li> <li>• <b>Add Measurements</b>—Add selected measurements to the display</li> <li>• <b>Remove Measurements</b>—Remove selected measurements from the display</li> <li>• <b>Reorder List</b>—Select one or more measurements and change their order in the display</li> <li>• <b>See Default Order</b>—View the default display order</li> <li>• <b>Set to Default</b>—Set the display order to the default configuration</li> </ul> <p><i>Note: Some of the above will not be available if no adjustment is possible for that option (e.g. <b>Reorder List</b> and <b>Remove Measurements</b> will not be available if only one measurement is selected for display).</i></p>
<b>Display Contrast</b>	Adjust the contrast to a value between the minimum of +1 and the maximum of +9
<b>Edit Name</b>	Assigns a name to the controller

## 6.7 Update the date and time

1. From the Settings menu, select sc200 Setup and push **ENTER**.
2. Select Set Date/Time and push **ENTER**.
3. Select Date Format from the Set Date/Time screen and push **ENTER**.
4. Select a format and push **ENTER**.
5. Select Date/Time from the Set Date/Time screen and push **ENTER**.
6. Update the entries.
  - a. Use the right and left arrow keys to highlight a field.
  - b. Use the up and down arrow keys to change the values in the field and push **ENTER**.
  - c. At the end of the date field, push the right arrow to wrap down to the time fields.
  - d. Use the up and down and arrow keys to update the time fields.
7. Push **ENTER** to save the changes.  
The controller returns to the Set Date/Time menu.

## 6.8 Set the datalog mode and interval

Datalog Setup is available if a calculation has been set up.

1. From the Settings menu, select sc200 Setup and push **ENTER**.
2. Select Datalog Setup and push **ENTER**.
3. Select Set Mode and push **ENTER**.
4. Select an option (Snap Shot, Average, Maximum, Minimum) and push **ENTER**.
5. From the Datalog Setup menu, select Set Interval and push **ENTER**.
6. Select an interval from the list and push **ENTER**.

## 6.9 Set up a calculation

1. From the Settings menu, select sc200 Setup and push **ENTER**.
2. Select Calculation and push **ENTER**. Select a menu option and choose from the displayed list or update the entry. Refer to the table below for more information about each option.

Option	Description
<b>Set variable X</b>	Selects the sensor for the x variable
<b>Set parameter X</b>	Selects the sensor measurement for the x variable
<b>Set variable Y</b>	Selects the sensor for the y variable
<b>Set parameter Y</b>	Selects the sensor measurement for the y variable
<b>Set formula</b>	Select the math function to implement: <ul style="list-style-type: none"><li>• <b>None</b>—Disables the math function</li><li>• <b>X-Y</b>—Subtraction function</li><li>• <b>X+Y</b>—Addition function</li><li>• <b>X/Y</b>—Division function</li><li>• <b>[X/Y]%</b>—Percentage function</li><li>• <b>[X+Y]/2</b>—Average function</li><li>• <b>[X*Y]</b>—Multiplication function</li><li>• <b>[X-Y]%/X</b>—Difference function</li></ul>
<b>Display format</b>	Selects the number of digits and decimal points

Option	Description
Set units	Selects the units for the calculated reading
Set parameter	Selects the parameter for the calculated reading

3. Push **ENTER** to save the selection or setting and return to the Calculation menu.

## 6.10 Set up the discrete inputs

Use these inputs to switch closure inputs or logic level voltage inputs.

1. Press the **MENU** key.
2. Select sc200 Setup and push **ENTER**.
3. Select Discrete Input Setup and push **ENTER**.
4. Select the desired channel (Input 1, Input 2 or Input 3) and push **ENTER**.
5. Select a control logic option and push **ENTER**.

Option	Description
Disable	This channel is disabled and not used.
On/High	This channel is active when either the switch input is On (or closed), or the logic level voltage input is at a High level.
Off/Low	This channel is active when either the switch input is Off (or opened), or the logic level voltage input is at a Low level.

6. Select a warning option and push **ENTER**.

Option	Description
Off	An active discrete input does not trigger a device warning.
On	An active discrete input triggers a device warning.

7. Select an output mode option and push **ENTER**.

Option	Description
Active	Output level continues to represent operating conditions.
Hold	Output level is held static.
Transfer	Output level moves to a pre-configured value.

8. Select the sensors that will have their outputs (analog and relay) affected when one of the discrete inputs becomes active. Push **ENTER**.
9. Use the arrows to select the On Delay value (the duration time delay between the discrete input activation and the configured response of the controller). Push **ENTER**.
10. Use the arrows to select the Off Delay value (the duration time delay between the discrete input de-activation and the configured response of the controller). Push **ENTER**.
11. Repeat steps 4–10 for each desired channel.
12. If a discrete input needs to be changed after initially set up:
  - a. Repeat steps 1–4 and an Input Settings menu appears with the following options:
    - Control Logic
    - Set Warning
    - Output Mode
    - On Delay
    - Off Delay
  - b. Select the desired option and push **ENTER**.

- c. Make the desired changes and push **ENTER** to save the changes and return to the Inputs Setting menu.

## 6.11 Update the display language

The display language can be changed through the Setup menu.

1. From the Settings Menu, select sc200 Setup and push **ENTER**.
2. Select Language and push **ENTER**.  
The list of language options appears. English is the default language for the controller.
3. Highlight the language to be used for the controller and push **ENTER**.  
The selected language is saved and is used for the controller display. The display returns to the sc200 Setup menu.

## 6.12 Using the secure digital memory (SD) card

An SD card must be installed in the controller.

- The SD card can be used to update software and firmware and to download event and data logs. If the SD card is installed while the controller is in the Settings Menu, push the **HOME** key and then the **MENU** key to verify the option is visible. The SD icon will also be visible in the upper status bar of the main measurement screen when a card is installed.
- Data log files on the SD card are available in XML and binary formats.
- DataCom is used to convert files from binary to CSV format. Refer to the DataCom manual for more information on how to use the application. For a copy of the DataCom manual, software updates or other downloadable resources, go to <http://www.de.hach.com> or <http://www.hach.com>. Search *DataCom* or go to any sc200 product page.

### 6.12.1 Updating software

#### Notes:

- The controller does not automatically transfer information to or from an SD card.
- When the SD card is put in multiple controllers, each controller has a separate set of folders in the SD card memory. To make sure software updates are in the correct folder for the controller in use, it is best to use a separate dedicated SD card for each controller.

1. From the Settings Menu, select SD Card Setup and push the **ENTER** key.
2. Select Upgrade Software and push the **ENTER** key.

*Note: If the Upgrade Software option does not appear, do the steps in [Firmware updates with SD cards](#) on page 44.*

3. Select a device from the list and push the **ENTER** key. The list of options includes the controller and all connected devices that have software placed in the appropriate folder on the SD card.
4. If more than one version of the upgrade software is available, select the version with the highest number and push the **ENTER** key.
5. Push the **ENTER** key to begin the software transfer.  
The display will show "Transferring files. Please wait..." The percentage of completion appears in the bottom left corner of the display. The upgrade cannot be halted once it has begun.
  - When the transfer is successful, the display will show "Transfer complete" along with a prompt to push **ENTER** to restart the controller or to push the **BACK** key and exit to the SD Card Setup menu. Controller updates take effect when the controller is restarted. A restart is not necessary for sensor updates.
  - If the transfer is unsuccessful, the display will show "Transfer failed" and an error message. Press the **ENTER** key to acknowledge the warning and exit out of the menu. Error messages are different for each sensor. Refer to the applicable sensor manual.

## 6.12.2 Saving data and event logs with SD cards

### Notes:

- Data and event logs can be downloaded to an SD card and viewed with any device capable of reading an SD card.
- Data logs store the measurement data at selected intervals in a packed binary format (.flg file).
- Event logs store a variety of events that occur on the devices such as configuration changes, alarms and warning conditions. Event logs are set up during the sensor or module configuration process. Event logs are stored in a CSV format.

1. From the Settings Menu, select SD Card Setup and push the **ENTER** key.
2. Select Save Logs and push the **ENTER** key.
3. If more than one device appears on the screen, all devices are selected by default. To deselect an item, highlight the selection and push the left arrow key. Select the devices from which logs will be saved and push the **ENTER** key.
4. Select the time period from which logs are to be saved.

Option	Description
<b>Last Day</b>	All logs from the last full 24 hours, starting from 12:00 a.m., and any additional time remaining on the current day
<b>Last Week</b>	All logs from the last full week (7 days) starting from 12:00 a.m., and any additional time remaining on the current day
<b>Last Month</b>	All logs from the last full month (30 days) starting from 12:00 a.m., and any additional time remaining on the current day
<b>All</b>	Save all logs in memory
<b>New</b>	All logs that are new since the last time logs were saved to the SD card

5. Push the **ENTER** key to confirm the choice, and push the **ENTER** key again to begin the file transfers.
6. Allow time for the files to transfer. The display will show Transferring files. Please wait... and the percentage of files transferred.  
If the transfer is successful, the display will show "Transfer complete." If the transfer is not successful, the display will show "Transfer failed."
7. Do one of the following:
  - a. Push the **ENTER** key to exit back to the SD Card Setup menu.
  - b. Push the **HOME** key to return to the measurement screen.
  - c. Push the **BACK** keys to return to the Settings Menu.

### 6.12.3 Access data and event log files on the SD card

A PC with an SD Card reader device or USB adapter is necessary to view the event and data logs kept on the SD Card. Excel 2003 or higher (for XML files) or the Data Com application (for binary flg files) is necessary to open the event and data logs.

Data logs have the following structure: Device Name, Device Serial Number, Device Identification, Data Log, Time Stamp.

Event logs have the following structure: Device Name, Device Serial Number, Device Identification, Event Log, Time Stamp.

To view data or event log files stored on the SD card:

1. Attach the card reader device to the PC (if necessary) and install the SD card that contains the files in the reader device.
2. In the SD card directory, open the HACH folder.
3. Select the Logs folder.
4. Select a device folder.

The event and data log files in the folder are shown.

5. To view XML data log files:
  - a. Make sure the HachDataLog.xsl style sheet exists in the device folder.
  - b. Open the Excel application.
  - c. Go to File, Open.
  - d. Select the data log file.
  - e. In the Import XML dialog box, select **Open the file with the following style sheet applied** and select **HachDataLog.xml**.
  - f. Click OK to view the data.
6. To view binary data log (.flg) files:
  - a. Make sure the device driver (.flg.drv) file exists in the device folder.
  - b. Open Data Com.
  - c. In the File Viewer section, click Open.
  - d. Select the data log file.  
The data log file is shown in the box and a comma separated values (csv) file with the same file name is created. This csv file can be opened in Excel.

#### 6.12.4 Firmware updates with SD cards

The latest firmware updates can be placed on an SD card. The SD card can then be used to update the controller or device firmware.

A PC and a USB card reader or other device capable of reading an SD card are necessary.

1. Find the zip file at <http://www.hach.com> and copy it to the PC.
2. Extract file(s) from the zip folder and save them to the SD card.
3. Remove the SD card and update the controller and device firmware. Refer to [Updating software](#) on page 42.

#### 6.12.5 Backup settings to an SD card

Saves the configuration of a device to the SD card.

1. Push the **MENU** key.
2. Select SD Card Setup and push **ENTER**.
3. Select Manage Configuration and push **ENTER**.
4. Select Backup Settings and push **ENTER**.
5. Select the devices to be backed up. All devices are selected by default. To deselect an item, highlight the selection and push the left arrow key. Push **ENTER** to begin the file transfers. If backup files already exist on the SD card, a confirmation window appears. Select the devices again and push **ENTER**. Wait for the "Transfer complete" message.
6. Push **ENTER** again to return to the Manage Configuration menu.

#### 6.12.6 Restore settings to the controller

This menu selection only appears if a (serial number-specific) backup file for the controller or one of the sensors connected to it exists on the SD Card. This menu selection loads the configuration of a specific device from the SD card to the same device (serial number-controlled function).

1. Push the **MENU** key.
2. Select SD Card Setup and push **ENTER**.
3. Select Manage Configuration and push **ENTER**.
4. Select Restore Settings and push **ENTER**.
5. Select the device that will be restored. All devices are selected by default. To deselect an item, highlight the selection and push the left arrow key. Push **ENTER** to begin the file transfers.

6. When the transfer is complete, push **ENTER**.
7. To have the settings take effect immediately, restart the controller. Push the **BACK** key to exit the Manage Configuration menu.

### 6.12.7 Transfer settings to another device

All device settings including calibration, sensor name, selected temperature and measurement units and data logging settings are transferred.

1. Push the **MENU** key.
2. Select SD Card Setup and push **ENTER**.
3. Select Manage Configuration and push **ENTER**.
4. Select Transfer Settings and push **ENTER**. Two options appear:
  - Retrieve Settings
  - Copy Settings
5. To retrieve settings from the controller (or a device connected to it) and put the settings on the SD card:
  - a. Select Retrieve Settings and push **ENTER**.
  - b. Select the devices that contain the information to be transferred. All devices are selected by default. To deselect an item, highlight the selection and push the left arrow key. Push **ENTER** to begin the file transfers. Wait for the "Transfer complete" message.
  - c. If files already exist on the SD card, a confirmation window appears. Select the devices again and push **ENTER**. Wait for the "Transfer complete" message.
  - d. Push **ENTER** to return to the Manage Configuration menu.
6. To copy settings from the SD card to a controller (or a device connected to it):
  - a. Select Transfer Settings and push **ENTER**.
  - b. Select Copy Settings and push **ENTER**.
  - c. Select the devices on the SD card. All devices are selected by default. To deselect an item, highlight the selection and push the left arrow key. Push **ENTER** to begin the file transfers.
7. When the transfer is complete, push **ENTER** to restart the connected devices.
8. Push **ENTER** to restart the controller or push **BACK** to return to the Manage Configuration menu.

## 6.13 Using the service port

The service port is used to download data files from the controller and install new versions of controller and sensor firmware. To download data and update software, use the service port in combination with DataCom and a service cable (LZX887).

## 6.14 Using DataCom

When using the service port, it is necessary to use DataCom. DataCom is a PC Application Utility that downloads data log and event log files from the controller and installed sensors. Files are downloaded from the controller through the controller service port or they can be placed on a Secure Digital Memory (SD) card installed in the controller. In addition, DataCom is used to upload software for the controller and sensors. The DataCom application must be installed on a PC to read the files.

Refer to the DataCom manual for more information on how to use the application. The DataCom manual, software updates and other downloadable resources are available at <http://www.de.hach.com> or <http://www.hach.com> on any sc200 product page.

## Section 7 Maintenance

### ⚠ DANGER



Multiple hazards. Only qualified personnel must conduct the tasks described in this section of the document.

### 7.1 Cleaning the controller

### ⚠ DANGER



Electrocution hazard. Remove power from the instrument before doing maintenance or service activities.

**Note:** Never use flammable or corrosive solvents to clean any part of the controller. Use of these solvents may degrade the environmental protection of the unit and may void the warranty.

1. Make sure the controller cover is securely closed.
2. Wipe the controller exterior with a cloth dampened with water, or with a mixture of water and mild detergent.

### 7.2 Fuse replacement

Fuses are not user-serviceable items. The need for fuse replacement in controllers indicates severe technical failure and is therefore considered to be a service activity. If a blown fuse is suspected, contact Technical Support.

### 7.3 Battery replacement

The lithium ion backup battery is not user replaceable. Contact technical support for replacement.

## Section 8 Troubleshooting

Problem	Resolution
No current output	Verify current output configuration.
	Test current output signal using the Test/Maintenance submenu. Input a current value and verify the output signal at the controller connections.
	Contact Technical Support.
Incorrect current output	Verify current output configuration.
	Test current output signal using the Test/Maintenance submenu. Input a current value and verify the output signal at the controller connections. If the output is incorrect, perform an output calibration.

Problem	Resolution
No relay activation	Make sure relay connections are secure.
	If using an external power source, make sure the relay wiring is correct.
	Make sure the relay configuration is correct.
	Test the relay activation through the Test/Maintenance menu. The relay should energize and de-energize as selected.
	Make sure the controller is not in calibration mode and that the relay is not being held.
	Reset the Overfeed Timer to make sure the timer has not expired.
Secure Digital Memory (SD) card not recognized by the controller	Make sure the SD card is properly oriented. The copper traces should face toward the controller display.
	Make sure the SD card is fully seated in the slot and the spring lock is engaged.
	Make sure the SD card is properly formatted with a Fat 32 format. The MMC format is not supported. Follow the instructions of the card manufacturer to format the SD card on a PC.
	Make sure the card is not larger than 32 GB.
	Make sure an SD card is being used. Other types of cards (such as xSD, micro SD, mini SD) will not work properly.
Information not saving, or not saving properly to the SD card.	Make sure the SD card is properly formatted with the FAT 32 format. The MMC format is not supported. Follow the instructions of the card manufacturer to format the SD card on a PC.
	If the SD card has previously been in use, format the card with the Fat 32 format, install the card in the controller, and try downloading files.
	Try a different SD card.
SD card full	Read the SD card with a PC or other card reader device. Save important files and then delete some or all of the files on the SD card.
Controller cannot find software updates on the SD card.	Make sure an appropriate folder is created by installing the SD card in the controller. An update folder will automatically be created.
	Install the SD card on a PC and make sure the software files are located in the appropriate update folder.
	If the same SD card is used with multiple controllers, each controller will have a separate folder on the system. Make sure the software updates are in the folder dedicated to the controller in use.
Display is lit but shows no characters or characters are faint or blurry.	Adjust the display contrast
	Make sure protective film has been removed from display.
	Clean the outside of the controller, including the display screen.

Problem	Resolution
Controller will not power up, or powers up intermittently	Make sure the AC power connections are properly terminated in the controller.
	Make sure the power strip, line power, wall plug are all properly plugged in.
	Contact Technical Support
Network or sensor module not recognized	Make sure the module is properly installed.
	Make sure the module selector switch is set to the proper number.
	Remove sensor module and install the module into the second analog slot. Apply power to the controller and allow the controller to perform a device scan.
	Contact Technical Support.
Sensor not recognized <i>Note: Example of possible display message: ****</i>	If the sensor is an analog sensor and a corresponding module is installed in the controller, refer to the instructions supplied with the Network or Sensor Module.
	Make sure the digital connector wiring harness is seated on the inside of the door assembly and that the wiring harness is not damaged.
	If the digital sensor is connected to the controller with a digital termination box, user supplied junction box, digital extension cables, or a user-supplied extension cable, connect the sensor directly to the controller and perform a device scan. If the controller recognizes the sensor, check that all the wiring in the junction boxes or extension cables is correct.
	Make sure that only two sensors are installed in the controller. Although two analog module ports are available, if a digital sensor and two analog modules are installed, only two of the three devices will be seen by the controller.
	Contact Technical Support
Device Missing error message appears	Perform a Device Scan from the Test/Maintenance menu.
	Power cycle the controller

## 8.1 Test and Maintenance menu

- From the Settings Menu, select Test/Maint and push **ENTER**.

Option	Description
<b>Scan devices</b>	Performs a scan for active and missing devices.
<b>Output cal</b>	Lets the user calibrate the 4–20 mA outputs with a 250 ohm resistor in series to the mA output terminals. The settings for each output are adjusted until the correct value (4 mA or 20 mA) is supplied.
• <b>Output 1</b>	Calibrate 4 mA output (Min: 0 Max: 25000)
• <b>Output 2</b>	Calibrate 20 mA output (Min: 35000 Max: 65533)
<b>Hold outputs</b>	Sets the value the controller sends to an external system for a defined period of time. After the time period, the instrument goes back to reporting real time values. Set activation—Launch or release Set Outmode—Hold Outputs (default) or Transfer Outputs Set Channels—All (default) or select from hardware list

Option	Description
<b>Test output</b> <ul style="list-style-type: none"> <li>• <b>Output 1</b></li> <li>• <b>Output 2</b></li> </ul>	Lets the user select a mA value that is sent by the controller for verification. Min: 0 mA (default +04.00) Max: 25.00 mA
<b>Status</b>	View status of all modules, sensors and relays.
<b>Test relay—A, B, C, D</b>	Energize or De-energize the selected relay
<b>Overfeed reset</b>	Resets the Overfeed Timer.
<b>Reset default config</b>	Resets the controller configuration settings to the default values (language, date and time, relay function and data output function).
<b>Restart sc200</b>	Performs a controller restart
<b>Simulation (only displays if sensors or modules are connected)</b>	After the sim value is entered, the controller outputs this value as if it was the value sent from the sensor. The simulation stops after the user exits the screen. Source- <ul style="list-style-type: none"> <li>• &lt;Module 1&gt;</li> <li>• &lt;Module 2&gt;</li> </ul> (Footer displays current source selection) Parameter—Source measurement type (footer displays current source selection) Sim value—Use arrow keys to change value (footer displays current source selection)
<b>Modbus stats</b>	Displays Error and Good count stats for selected port. <ul style="list-style-type: none"> <li>• Sensor port 1, 2, 3 or 4</li> <li>• Network port</li> <li>• Service port</li> <li>• Clear stats</li> </ul>
<b>System data</b>	Displays the current system current, temperature and voltage data.

## 8.2 Warning and error conditions

Follow the steps below to acknowledge controller warnings.

1. From the Settings menu, select Diagnostics and push **ENTER**.
2. Select the device (controller, sensor, network card) with the warning or error and push **ENTER**.
3. Select the warning, error or event list and push **ENTER**.
4. Select Yes and push **ENTER** to acknowledge the warning.  
**Note:** *Errors cannot be acknowledged.*
5. For more information on a specific warning, error or event, refer to the device manual.

## Section 9 Device scan information

Display message	Action
Installing device...please wait	The controller has found a new device. No action is necessary. The controller automatically performs an installation process for the new device and displays the main measurement screen of the device installed in the number one position.
Device missing <device id>	<p>A previously installed device has been removed from the controller or is not detected.</p> <ul style="list-style-type: none"> <li>• Push the <b>Enter</b> key to continue.</li> <li>• Push the left arrow key to select or de-select a missing device.</li> <li>• Push the <b>Enter</b> key to delete the missing device.</li> </ul> <p>The controller will display the main measurement screen for the device in the number one position.</p> <p><i>Note: This message also displays when a device is missing and a new device has been installed. After the missing device is deleted, the controller automatically installs the new device and displays Installing device...please wait. The controller then displays the main measurement screen for the device installed in the number one position.</i></p>

## Section 10 Replacement parts and accessories

**Note:** Product and Article numbers may vary for some selling regions. Contact the appropriate distributor or refer to the company website for contact information.

Description	Item number
4 GB Secure Digital Memory (SD) card	9218100
Connector kit for digital sensor	9201000
Controller installation kit	8806200
DataCom cable	LZX887
Mounting bracket inserts	9177900
Plug, conduit opening (set of 3)	5868700
Power cord kit, with strain relief, 125 VAC, U.S.-style plug	9202900
Power cord kit, with strain relief, 230 VAC, European-style plug	9203000
Screw driver	6134300
SD card reader	9218200
SD card cover kit for sc200 controller	9200900
Screws for controller installation kit	9177800
Cord grip kit (1)	9178000
Sealing washer for cord grip assembly	1033814
UV protection screen	8809200
Weather and sun shield w/ UV protection screen	9220600
<b>Sensor and communication modules</b>	
Conductivity module	9013000

Description	Item number
Flow module	9012700
4-20 mA input module	9012800
pH and DO module	9012900
4-20 mA output module	9334600
HART network module kit	9328100
Modbus network module	9013200
Profibus network module	9173900
Profibus M12 connector kit	9178500
Profibus M12 socket (hard wire to quick connector adapter)	9178200
Profibus M12 T-splitter	9178400





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