



Catalog Number 58600-18

Hach sc100™ Controller

Installation Manual

2/04 3ed

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Specifications are subject to change without notice.

Component Description	Microprocessor-controlled measuring unit with measured value display, temperature display, and menu-driven system
Controller Operating Temperature	–20 to 60 °C (–4 to 140 °F); 95% relative humidity, non-condensing with sensor load <7 W; 20 to 40 °C (–4 to 104 °F) with sensor load <25 W
Controller Storage Temperature	–20 to 70 °C (–4 to 158 °F); 95% relative humidity, non-condensing
Enclosure	NEMA 4X/IP66 metal enclosure with a corrosion-resistant finish
Power Requirements	100–230 V ac ±10%, 50/60 Hz; Power: 11 W with 7 W sensor load, 35 W with 25 W sensor load
Pollution Degree/Installation Category	II; II
Outputs	Two (Analog (4–20 mA)) outputs, maximum impedance 500 ohm. Optional digital network connection. IrDA digital connection.
Relays	Three SPDT, user-configurable contacts rated 100–230 V ac, 5 Amp resistive maximum
Controller Dimensions	½ DIN—144 x 144 x 150 mm (5.7 x 5.7 x 5.9 inches)
Controller Weight	1.6 kg (3.5 lb)

2.1 Safety Information

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.

To ensure 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.

Use of Hazard Information






DANGER: 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.

Note: Information that requires special emphasis.

2.1.1 Precautionary Labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed

	This symbol, if noted on the instrument, references the instruction manual for operation and/or safety information.
	This symbol, when noted on a product enclosure or barrier, indicates that a risk of electrical shock and/or electrocution exists.
	This symbol, if noted on the product, indicates the need for protective eye wear.
	This symbol, when noted on the product, identifies the location of the connection for Protective Earth (ground).
	This symbol, when noted on the product, identifies the location of a fuse or current limiting device.

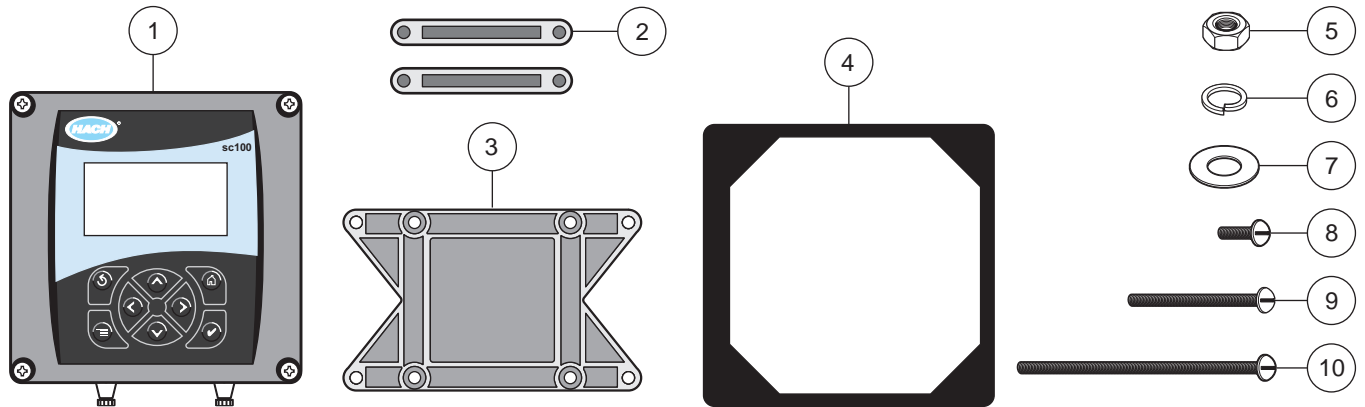
2.2 General Product Information

The controller enclosure is NEMA4X/IP66-rated and has a corrosion-resistant finish designed to withstand corrosive environmental constituents such as salt spray and hydrogen sulfide. The controller display shows the current reading plus a secondary measurement such as temperature if connected to a single sensor, or two readings with their corresponding secondary measurement readings when two sensors are connected.

Installation instructions for the controller are presented in this manual. If a system with a sensor and a controller has been purchased, complete information for installation and operation is also presented in the sensor system manual.

DANGER: Only qualified personnel should conduct the installation tasks described in this section of the manual.

Figure 3-1 Components of a Basic System



1. Controller	6. Lock washer, ¼-inch I.D. (4), Cat. No. 8H1336
2. Mounting foot for panel mounting (2), Cat. No. 1000B4F3222	7. Flat washer, ¼-inch I.D. (4), Cat. No. 8H1346
3. Bracket for panel and pipe mounting, Cat. No. 1000C4F3217-101	8. Pan head screws (4), M6 x 1.0 x 20 mm, Cat. No. 5867400
4. Gasket for panel mounting, rubber, Cat. No. 1000A4F3249-101	9. Pan head screws (4), M6 x 1.0 x 100 mm, Cat. No. 5867500
5. Hex nut, M6 (4), Cat. No. 5867300	10. Pan head screws (4), M6 x 1.0 x 150 mm, Cat. No. 5867600

Table 3-1 Customer Supplied Items

Item
14-AWG wire for electrical power connections in conduit or 115 or 230 V ac power cord plus a NEMA 4X-rated strain relief
High-quality, shielded instrumentation cable for connecting the analog outputs plus a NEMA 4X-rated strain relief.
Mounting hardware for the sensor (available from the manufacturer, order separately). See the sensor manual.
Sun shield for mounting configurations where the sun strikes the front of the display. See Figure 3-7 on page 8 .
Common hand tools

3.1 Mechanical Installation

Install in an environment that is protected from corrosive fluids.

3.1.1 Controller Dimension Illustrations

Figure 3-2 Controller Dimensions

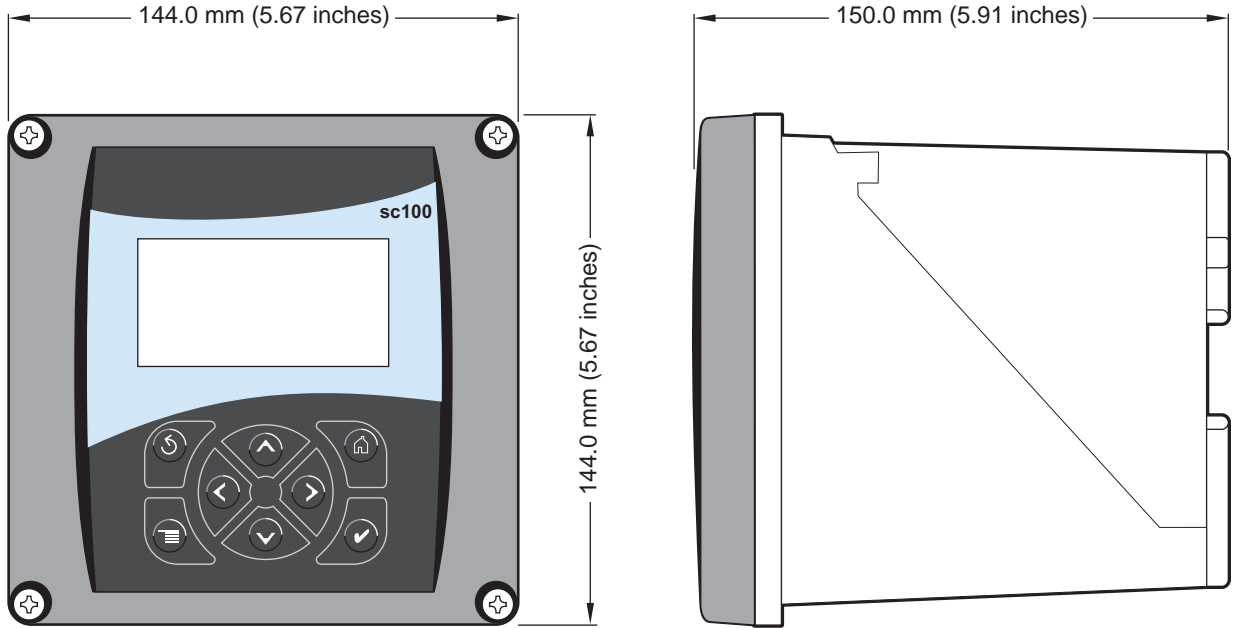
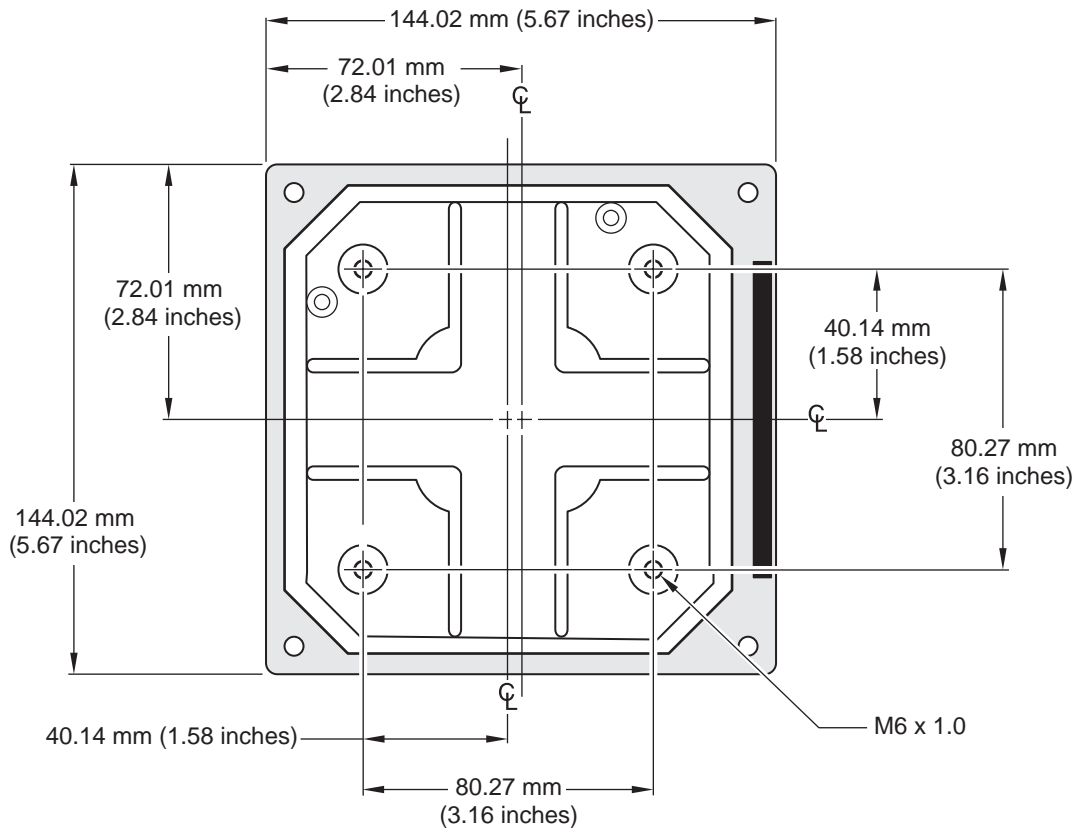


Figure 3-3 Controller Mounting Dimensions

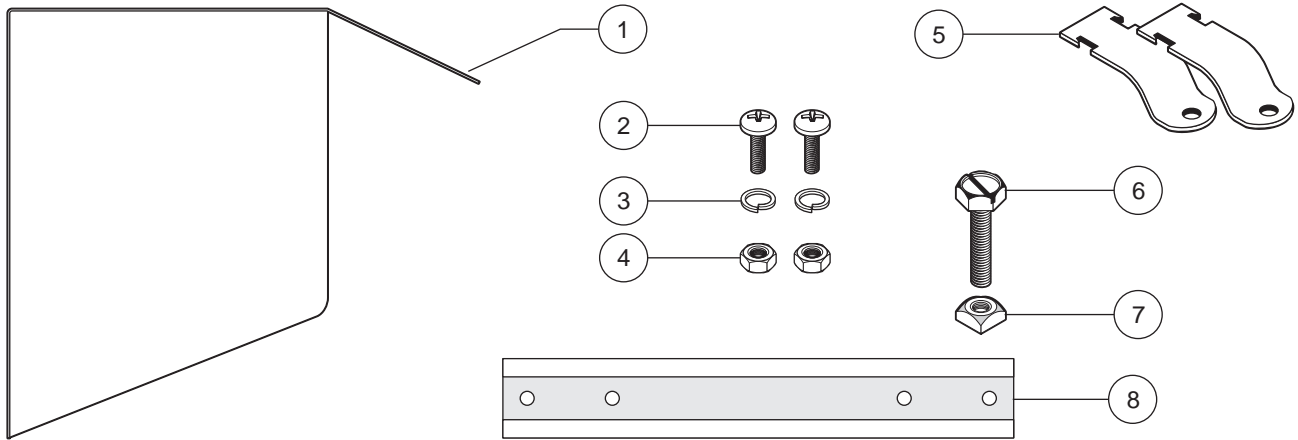


Installation

3.1.2 Using the Optional Sun Shield

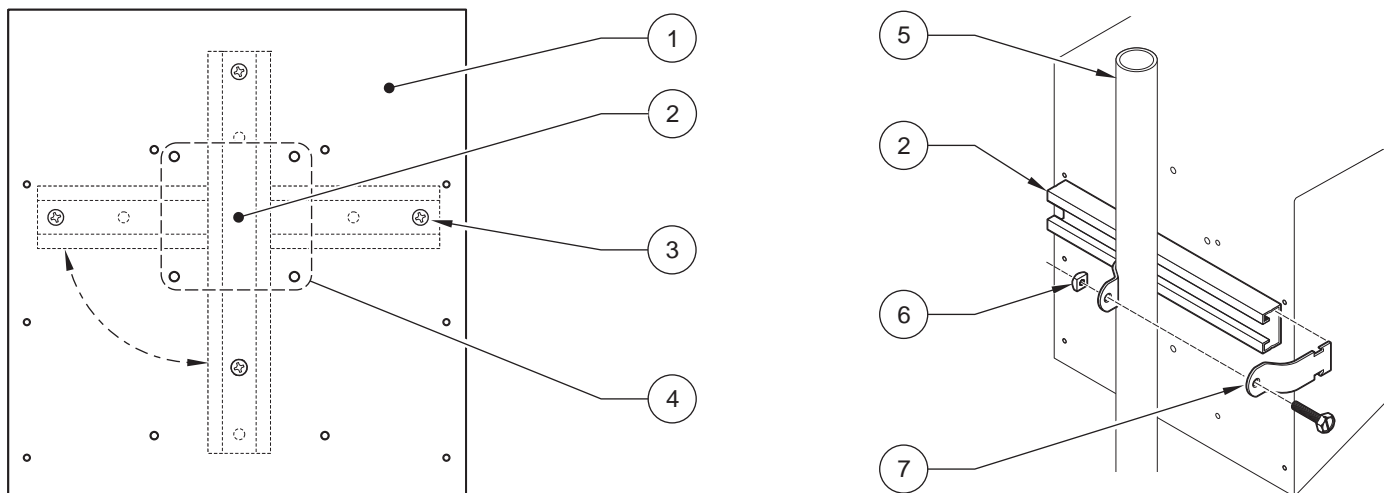
The optional sun shield was designed to increase the readability of the display by screening it from direct sunlight. See [Replacement Parts on page 21](#) for ordering information.

Figure 3-6 Sun Shield Kit Components



1. Sun shield	5. Pipe mounting brackets (2), includes items 6 and 7, Cat. No. 9H1079
2. Pan head screws, M6 x 1.0 x 12 mm (6), Cat. No. 200-1025	6. Hex/slotted head screw, $\frac{5}{16}$ -inch x 1.0-inch (supplied with item number 5)
3. Lock washers, $\frac{1}{4}$ -inch I.D. (2), Cat. No. 8H1336	7. Square nut, $\frac{5}{16}$ -inch (supplied with item number 5)
4. Hex nuts, M6 x 1.0 (2), Cat. No. 5867300	8. Uni-strut, 27 cm (10.5 inch) length, Cat. No. 276F1227

Figure 3-7 Mounting the Controller in the Sun Shield

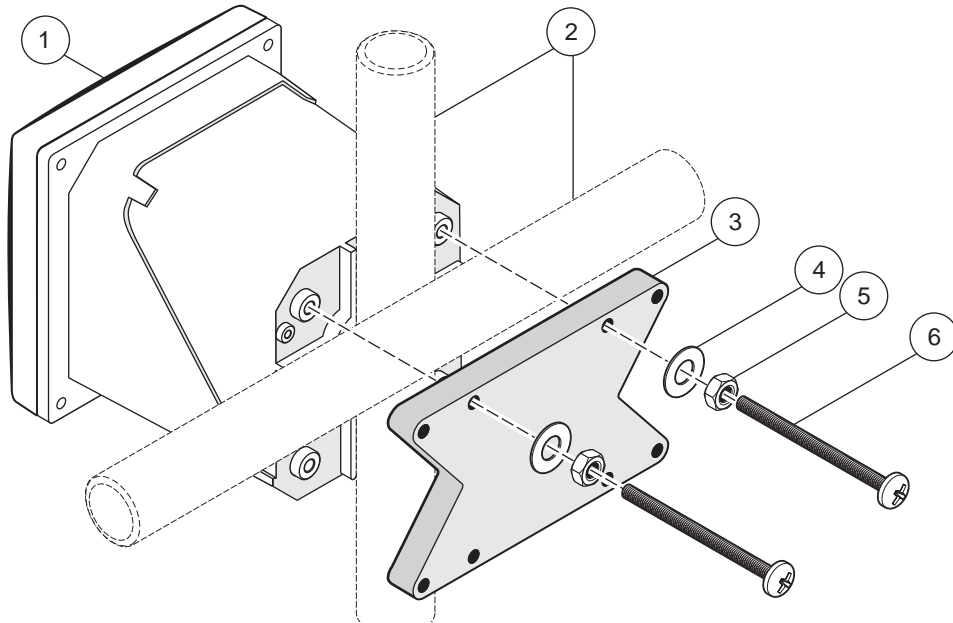


1. Sun shield	4. Hole pattern for mounting controller	7. Pipe mounting bracket—slide into uni-strut as shown. Secure the fasteners to complete installation.
2. Uni-strut (rotate 90° as required)	5. Pipe (vertical or horizontal as required)	
3. Pan head screw, lock washer (2 each)	6. Hex/slotted head screw and square nut	

3.1.3 Mounting the Controller

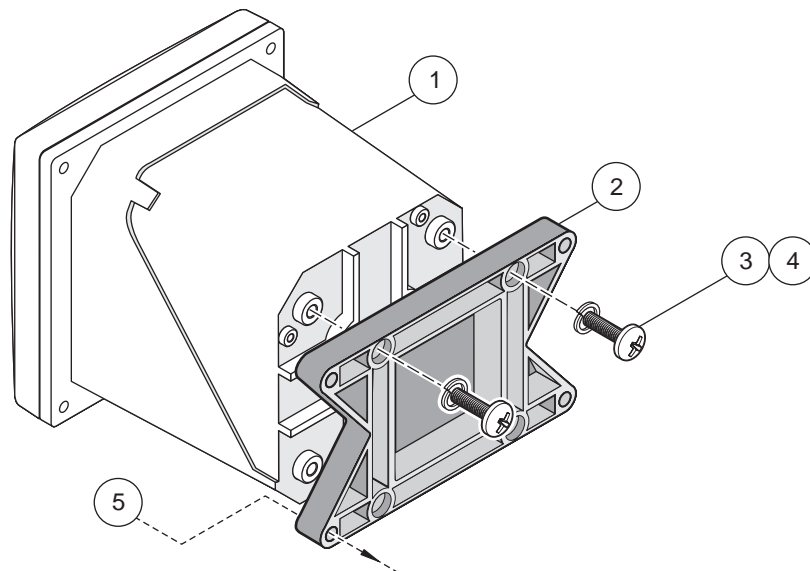
Attach the controller to a rail or wall or mount it in a panel. Supplied mounting hardware is shown in [Figure 3-8](#), [Figure 3-9](#), and [Figure 3-10](#).

Figure 3-8 Vertical or Horizontal Pipe Mounting the Controller



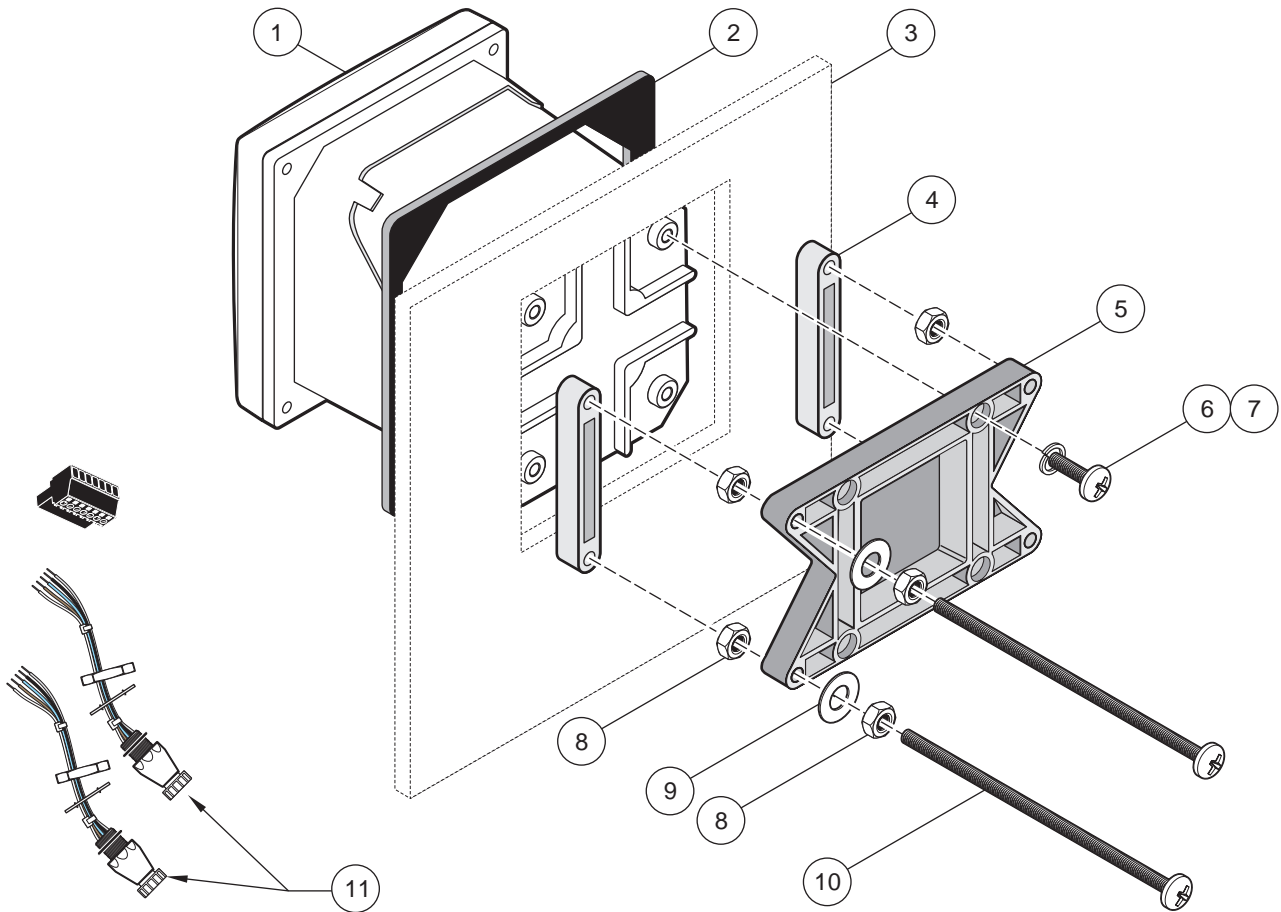
1. Controller	4. Flat washer, ¼-inch I.D. (4), Cat. No. 8H1346
2. Pipe (vertical or horizontal)	5. Hex nut, M6 (4), Cat. No. 5867300
3. Bracket, pipe mounting, Cat. No. 1000C4F3217-101	6. Pan head screw, M6 x 1.0 x 100 mm (4), Cat. No. 5867400

Figure 3-9 Wall Mounting the Controller



1. Controller	4. Pan head screw, M6 x 1.0 x 20 mm (4), Cat. No. 5867400
2. Bracket, Cat. No. 1000C4F3217-101	5. Customer-supplied hardware for wall mounting
3. Lock washer, ¼-inch I.D., Cat. No. 8H1336	

Figure 3-10 Panel Mounting the Controller



1. Controller	7. Lock washer, ¼-inch I.D., (4) Cat. No. 8H1336
2. Gasket, rubber, panel mount, Cat. No. 1000A4F3249-101	8. Hex nut (4), Cat. No. 5867300
3. Panel (maximum thickness is 9.5 mm (3/8 inch))	9. Flat washer (4), Cat. No. 8H1346
4. Mounting Foot (2), Cat. No. 1000B4F3222	10. Pan head screw, M6 x 1.0 x 150 mm (4), Cat. No. 5867600
5. Mounting bracket, controller, Cat. No. 1000C4F3217-101	11. It may be necessary to remove the sensor connectors. see procedure below.
6. Pan head screw (4), Cat. No. 5867400	

To remove the sensor connectors before inserting the controller enclosure into the panel cut-out:

1. Disconnect the wires at terminal block J5, see [Figure 3-20 on page 18](#).
2. Loosen and remove the nut securing the sensor connector inside the enclosure. Remove the sensor connector and wires. Repeat step 1 and 2 for the other sensor connector.
3. After the controller is in place in the panel, reinstall the sensor connectors and reconnect the wiring to terminal J5 as shown in [Figure 3-20 on page 18](#).

3.2 Electrical Installation

DANGER

The instrument must be installed by qualified technical personnel for adherence to all applicable electrical codes.

High-voltage wiring for the controller is conducted behind the high voltage barrier in the controller enclosure. The barrier must remain in place unless a qualified installation technician is installing wiring for power, alarms, or relays. See [Figure 3-11](#) for barrier removal information.

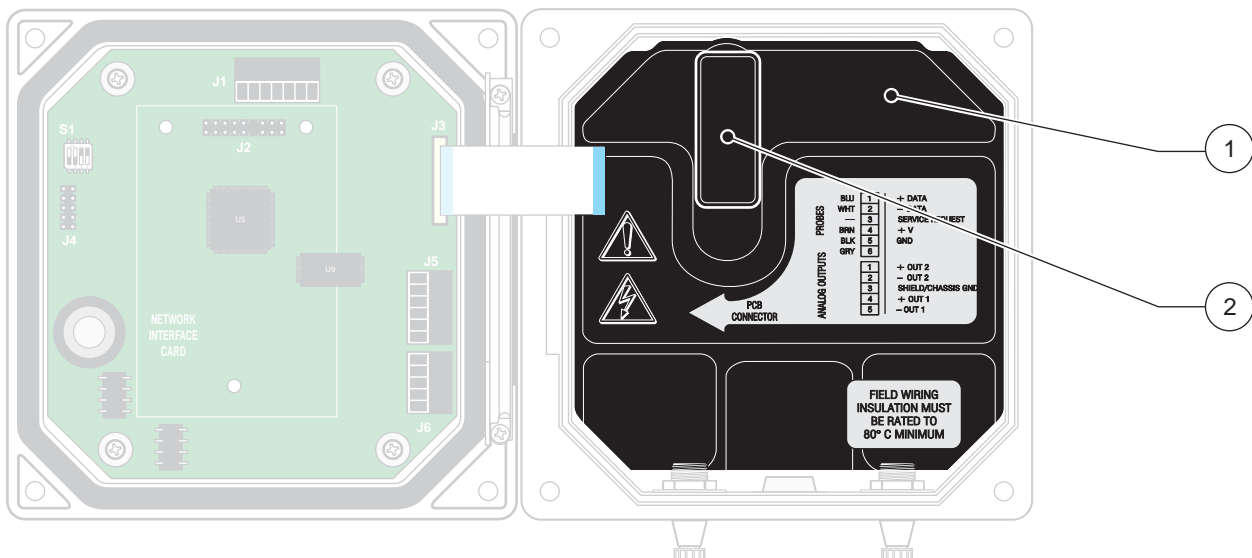
3.2.1 Installation in Conduit

In hard-wired electrical applications, the power and safety ground service drops for the instrument must be 18 to 12 AWG. See [Figure 3-12 on page 12](#) for strain relief and conduit opening sealing plug information. See [section 3.2.3 on page 12](#) for wiring information.

3.2.2 Installation Using a Power Cord

A sealing-type strain relief to maintain the NEMA 4X/IP66 environmental rating 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, see [Replacement Parts on page 21](#). See [Figure 3-12 on page 12](#) for strain relief and conduit opening sealing plug assembly. See [section 3.2.3 on page 12](#) for wiring information.

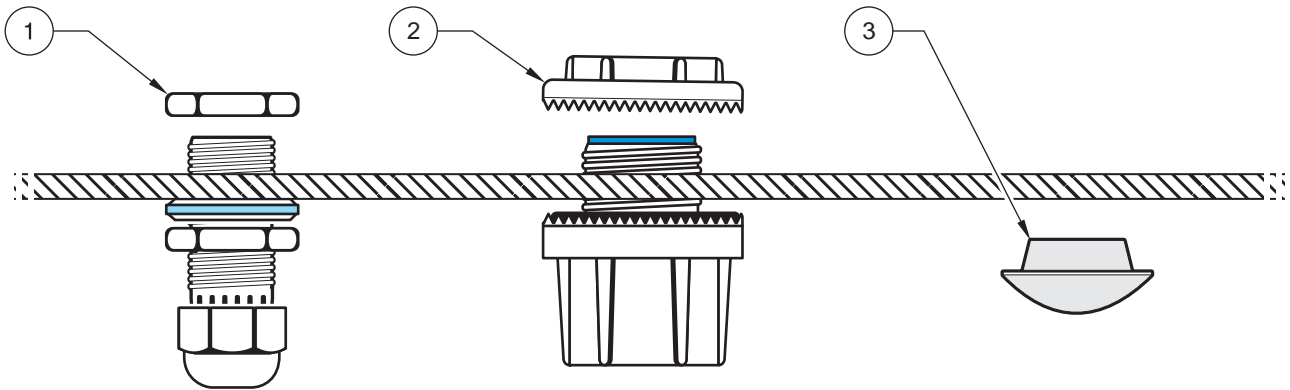
Figure 3-11 Removing Voltage Barrier



1. High voltage barrier

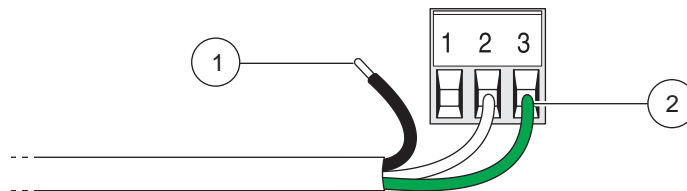
2. Unsnap the barrier latch then pull out to remove the barrier.

Figure 3-12 Using the Optional Strain Relief and Conduit Plug



1. Power cord strain relief	2. Conduit strain relief	3. Conduit opening sealing plug
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Figure 3-13 Proper Wire Preparation and Insertion



1. Strip 1/4-inch of insulation.	2. Seat insulation against connector with no bare wire exposed.
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3.2.3 Wiring for Power at the Controller

The instrument can be wired for line power by hard-wiring in conduit or by wiring to a power cord. Regardless of the type of wire used, the connections are made at the same terminal. A local disconnect designed to meet local electrical code is required and must be identified for all types of installation. See [Figure 3-15](#) and [Figure 3-16 on page 14](#) for suggested local disconnect configurations.

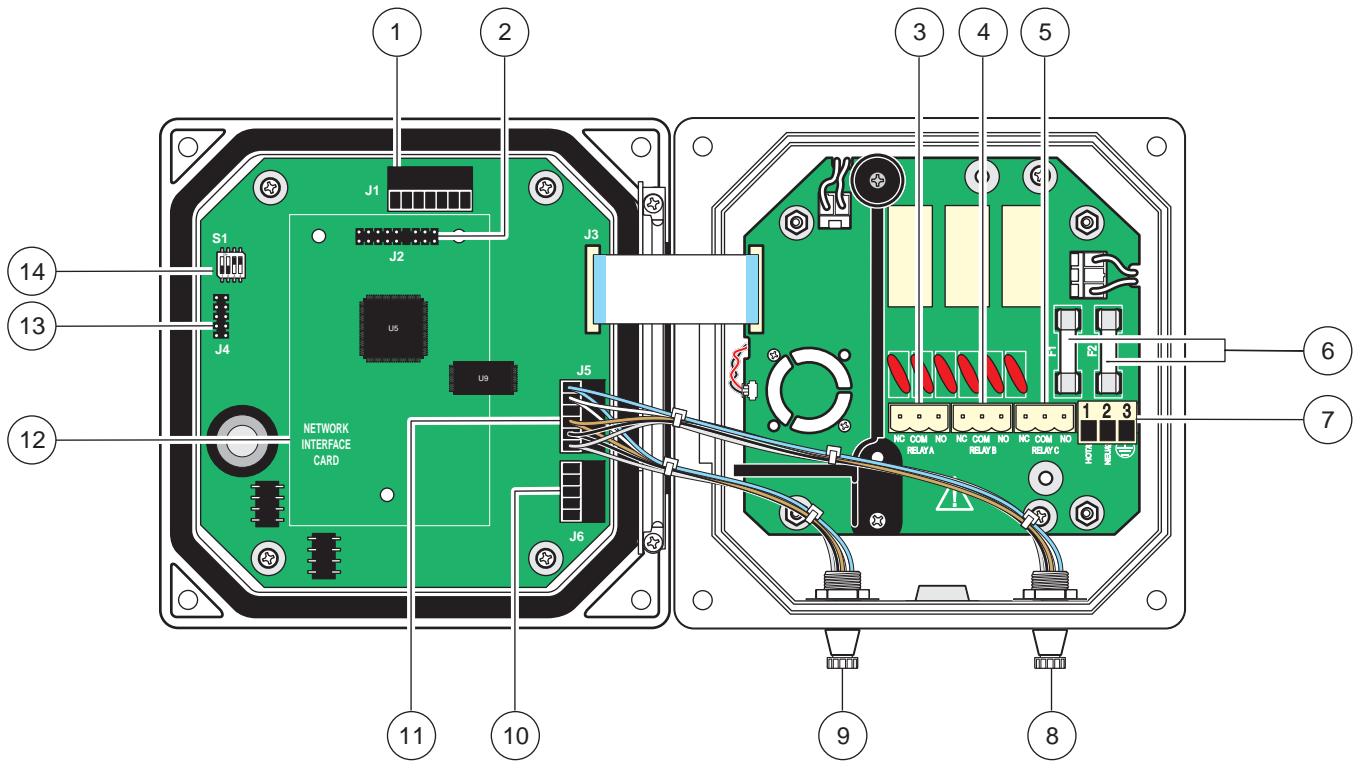
1. Obtain appropriate fittings with NEMA 4X/IP66 environmental rating.
2. Loosen the screws using a phillips-head screwdriver and open the hinged controller cover.
3. Remove the high-voltage barrier (see [Figure 3-11 on page 11](#)).
4. Insert the wires through the strain relief fitting or conduit hub located in the right-rear access hole in the bottom of the enclosure. Tighten the strain relief if used, to secure the cord.
5. Properly prepare each wire ([Figure 3-13](#)) and insert each wire into the terminal according to [Table 3-2](#). Tug gently after each insertion to ensure the connection is secure.
6. Seal any unused openings in the controller box with conduit opening sealing plugs, see [Replacement Parts on page 21](#).

7. Reinstall the high-voltage barrier and latch to secure.

Table 3-2 Power Wiring Information

Terminal Number	Terminal Description	Wire Color Code for North America	Wire Color Code for Europe
1	Hot (L1)	Black	Brown
2	Neutral (N)	White	Blue
3	Protective Earth (PE)	Green	Green w/yellow tracer

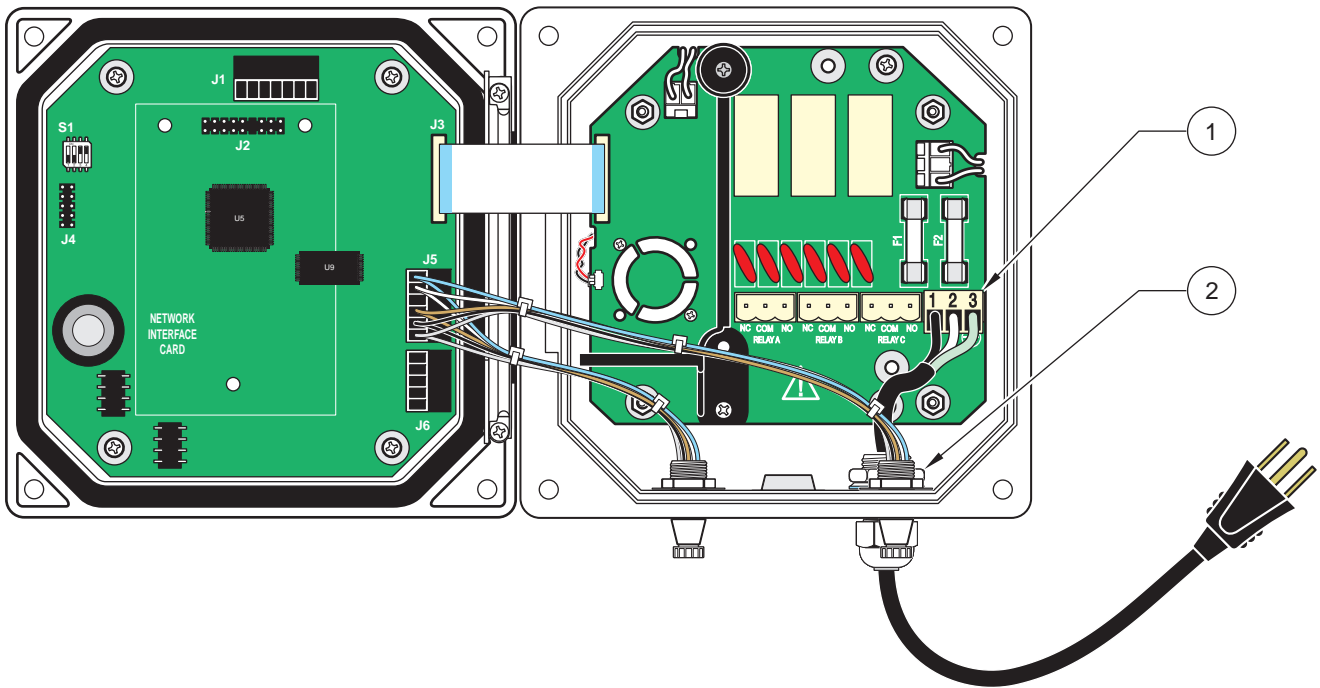
Figure 3-14 Wiring Connections



1. J1—Network connector	8. Sensor connector
2. J2—Header for optional network interface card	9. Sensor connector
3. J5—Relay A connector	10. J6—Analog output (4–20 mA) connector
4. J6—Relay B connector	11. J5—Sensor connector for hard-wiring
5. J7—Relay C connector	12. Position for network interface card
6. Fuses (F1, F2)	13. Service port
7. J8—ac Power connections	14. Sensor terminator selector/service port configuration

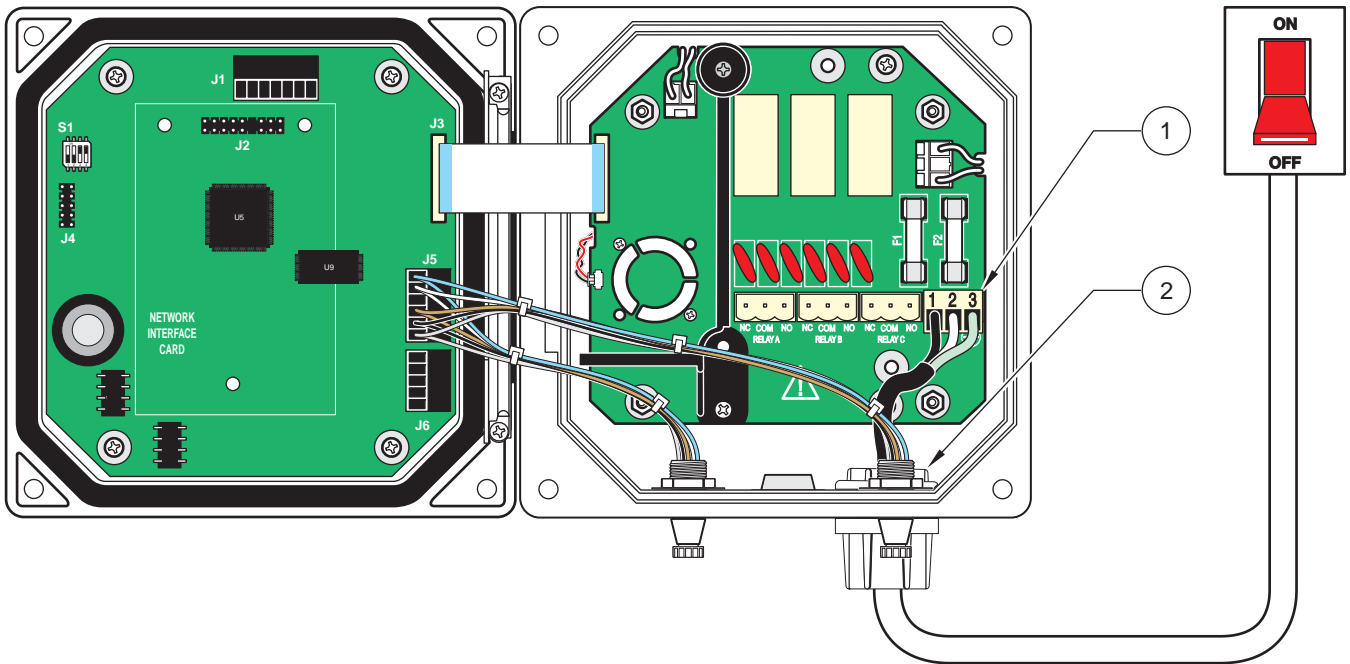
Installation

Figure 3-15 Local Disconnect for Power Cord



- | | |
|-------------------|-----------------------------|
| 1. Power terminal | 2. Power cord strain relief |
|-------------------|-----------------------------|

Figure 3-16 Local Disconnect for Hard-wired Line Power



- | | |
|-------------------|--------------------------|
| 1. Power terminal | 2. Conduit strain relief |
|-------------------|--------------------------|

3.3 Alarms and Relays

The controller is equipped with three unpowered relays rated 100–230 V ac, 50/60 Hz, 5 amp resistive maximum. See the sensor manual for relay setup details.

3.3.1 Connecting the Relays

The relay connector accepts 18–12 AWG wire (as determined by load application). Wire gauge less than 18 AWG is not recommended.

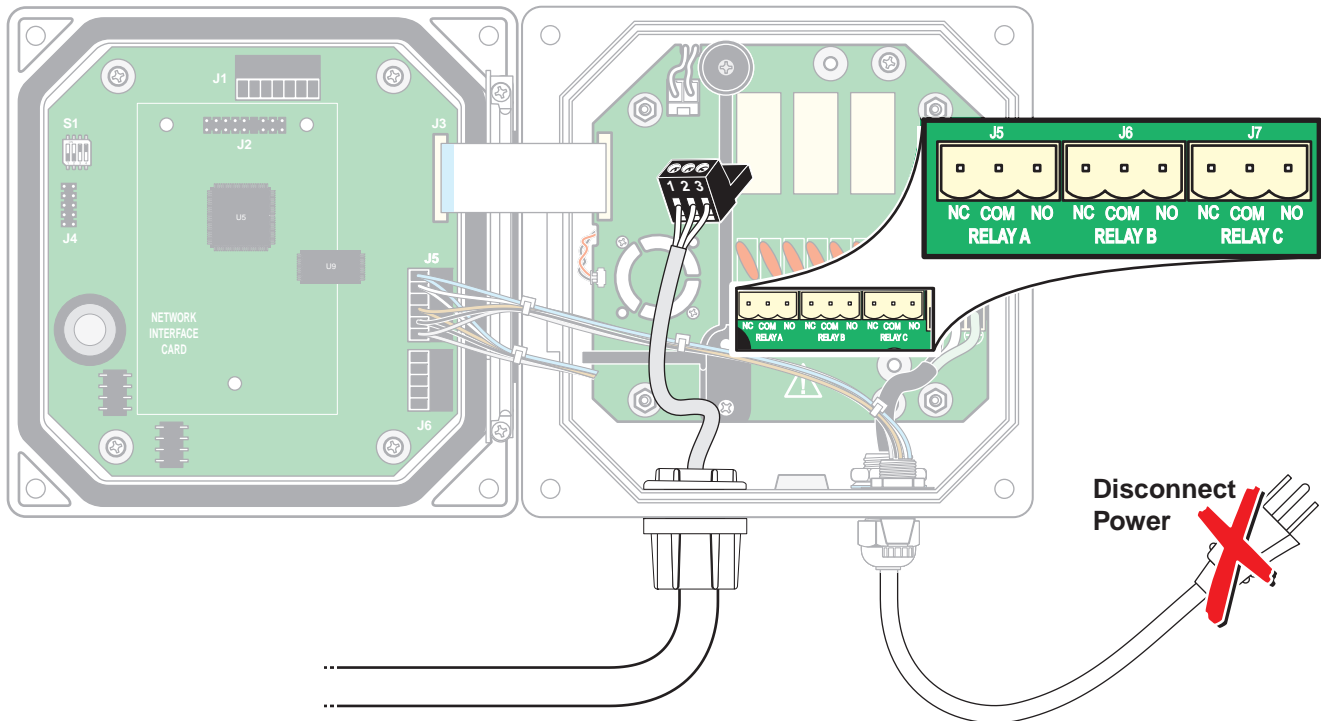
Danger: Relay loads must be resistive. User must externally limit current to the relays to 5 Amps by use of a fuse or breaker.

The controller contains three relays designed for use with high voltage (greater than 30V-RMS and 42.2V-PEAK or 60 V dc). Refer to [Figure 3-17](#) for connection information. The wiring is not designed for low voltage connections. Relay must not be powered from the same wiring used to power the controller. See the sensor manual for relay setup details.

Danger: ac power terminals are designed for single wires. Do not use more than one wire in each terminal.

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 or when power is removed from the controller.

Figure 3-17 Alarm and Relay Connections



Installation

3.3.2 Connecting the Analog Outputs

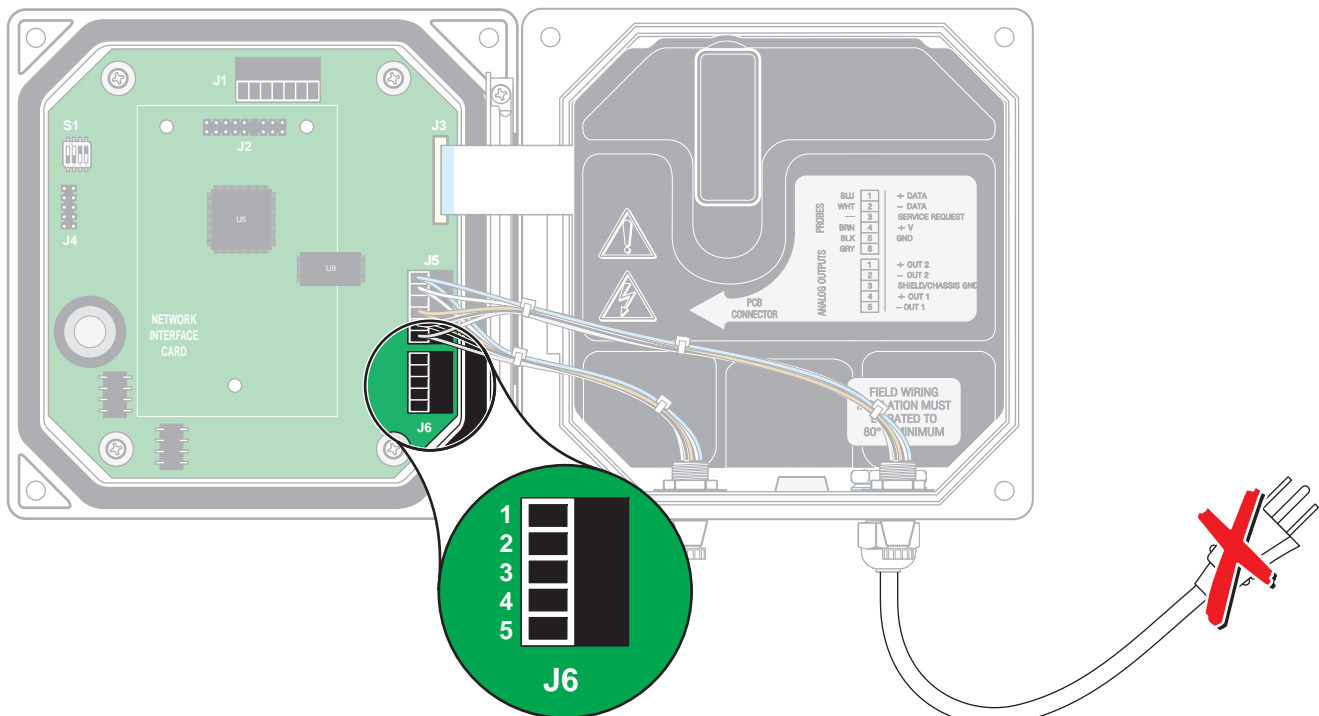
Two isolated analog outputs (1 and 2) are provided, see [Figure 3-18](#). Each output can be set to 0–20 or 4–20 mA, and can be assigned to represent the measured parameter or secondary measurement such as temperature. Make connections with twisted-pair shielded wire and connect the shield at the controlled 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. Refer to the sensor manual for output software setup.

Make wiring connections at the analyzer end as shown in [Figure 3-18](#).

Table 3-3 Output Connections at Terminal Block J6

Recorder Wires	Circuit Board Position
Output 2 +	1
Output 2 –	2
Shield	3
Output 1 +	4
Output 1 –	5

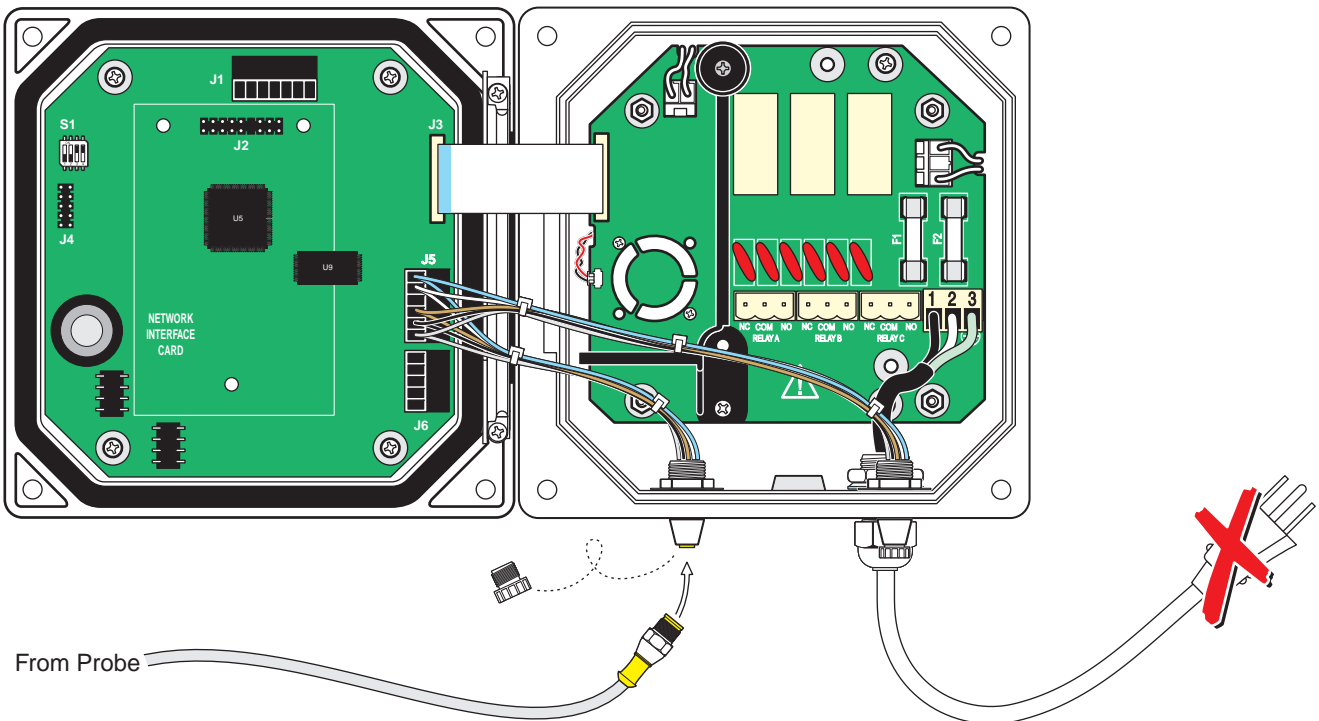
Figure 3-18 Analog Output Connections



3.4 Connecting/Wiring the Sensor Cable

The sensor cable is supplied with a keyed quick-connect fitting for easy attachment to the controller, see [Figure 3-19](#). Retain the connector cap to seal the connector opening in case the sensor must be removed. Optional extension cables may be purchased to extend the sensor cable length. If the total cable length exceeds 100 M (300 ft), a termination box must be installed. See the Replacement Parts section in the sensor manual for part number information.

Figure 3-19 Attaching the Sensor using the Quick-connect Fitting



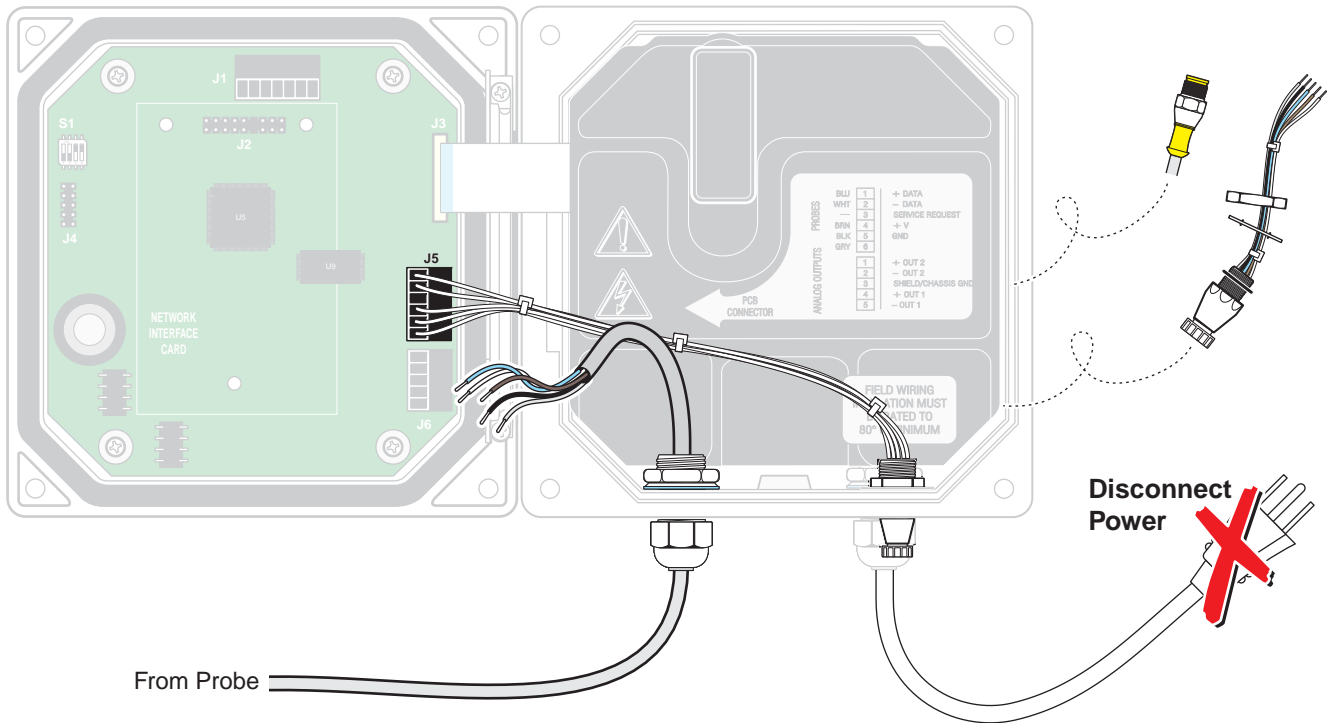
Modify the controller for sensor hard-wiring as follows:

1. Open the controller cover.
2. Disconnect and remove the existing wires between the quick connect and terminal block J5, see [Figure 3-20 on page 18](#).
3. Remove the quick connect fitting and wires and install the threaded plug on the opening to maintain the environmental rating.

Table 3-4 Wiring the Sensor at Terminal Block J5

Terminal Number	Terminal Designation	Wire Color
1	Data (+)	Blue
2	Data (-)	White
3	Service Request	No Connection
4	+12 V dc	Brown
5	Circuit Common	Black
6	Shield	Shield (grey wire in existing quick disconnect fitting)

Figure 3-20 Hard-wiring the sensor



1. Cut the connector from the sensor cable.
2. Reinstall the plug on the sensor access opening to maintain the environmental rating.
3. Strip the insulation on the cable back 1-inch. Strip ¼-inch of each individual wire end.
4. Wire as shown in [Table 3-4](#).
5. Pass the cable through conduit and a conduit hub or a strain relief fitting and an available access hole in the controller enclosure. Tighten the fitting.
6. Close and secure the cover.

3.5 Connecting the Optional Digital Output

At this time, the manufacturer supports ModBUS RS485, ModBUS RS232, and ProfiBUS DP communication protocols. The optional digital output card is installed in the location indicated in [Figure 3-21 on page 19](#). Terminal block J1 provides user connection to the optional network card. The terminal connection is based on the selected network card. Refer to the instructions supplied with the network card for more details.

Table 3-5 Network Connections at Terminal Block J1

Terminal Number	ModBUS RS485 2-wire	ModBUS RS485 4-wire	ModBUS RS232 ¹	ProfiBUS
1	D +	RD +	Rx	A -
2	D -	RD -	—	B1 +
3	—	TD +	Tx	A2 -
4	—	TD -	—	B2 +
5	Common	Common	Common	Common
6	No connection	No connection	No connection	No connection
7	Shield	Shield	Shield	Shield

1. See Detail A.

Detail A RS232 Connections to Customer-supplied Computer 9-pin D Subminiature Connector

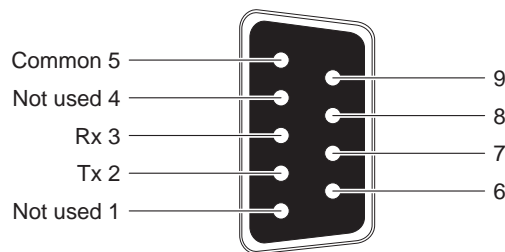
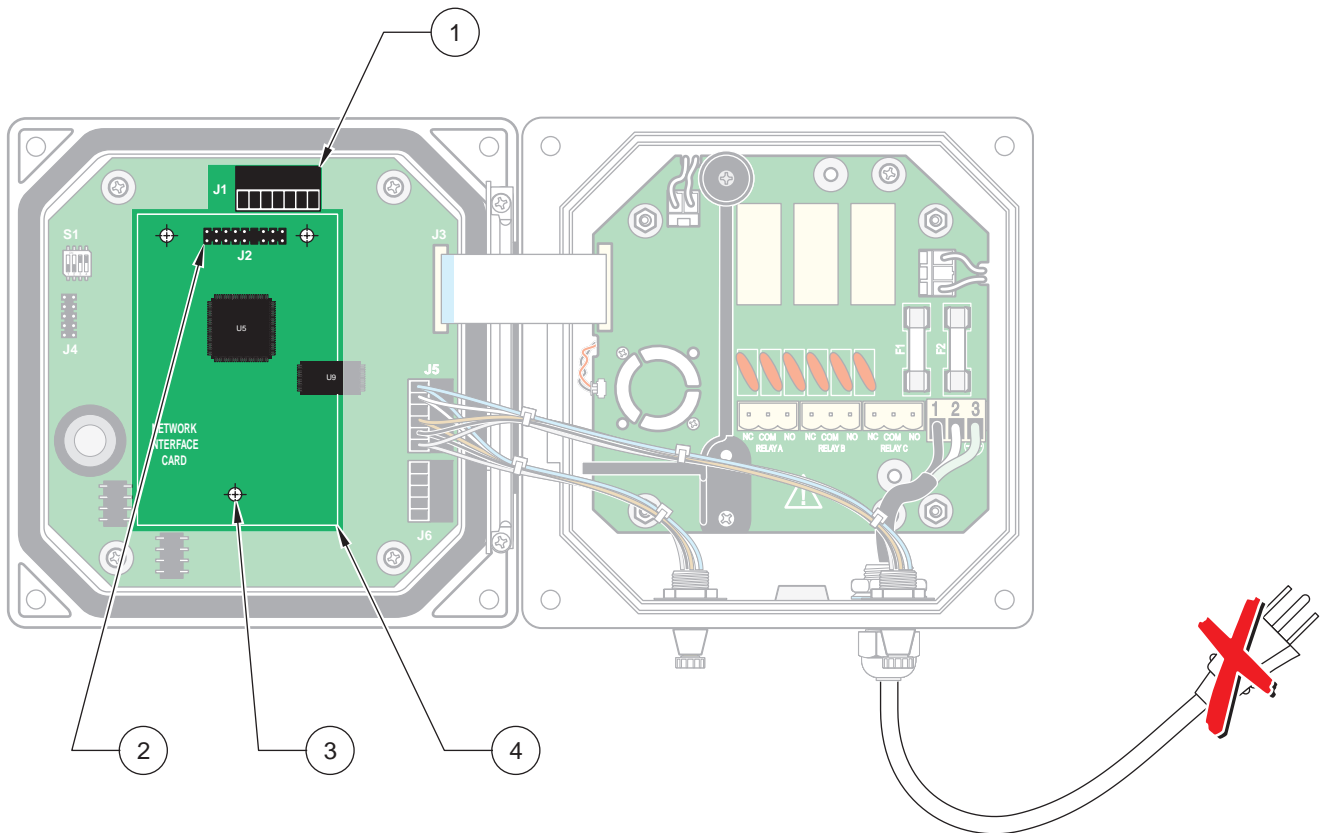


Figure 3-21 Network Card Position in the Controller



1. J2—Network card header	2. Mounting hole (3)	3. Network card placement	4. J1 Terminal
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4.1 Cleaning the Controller

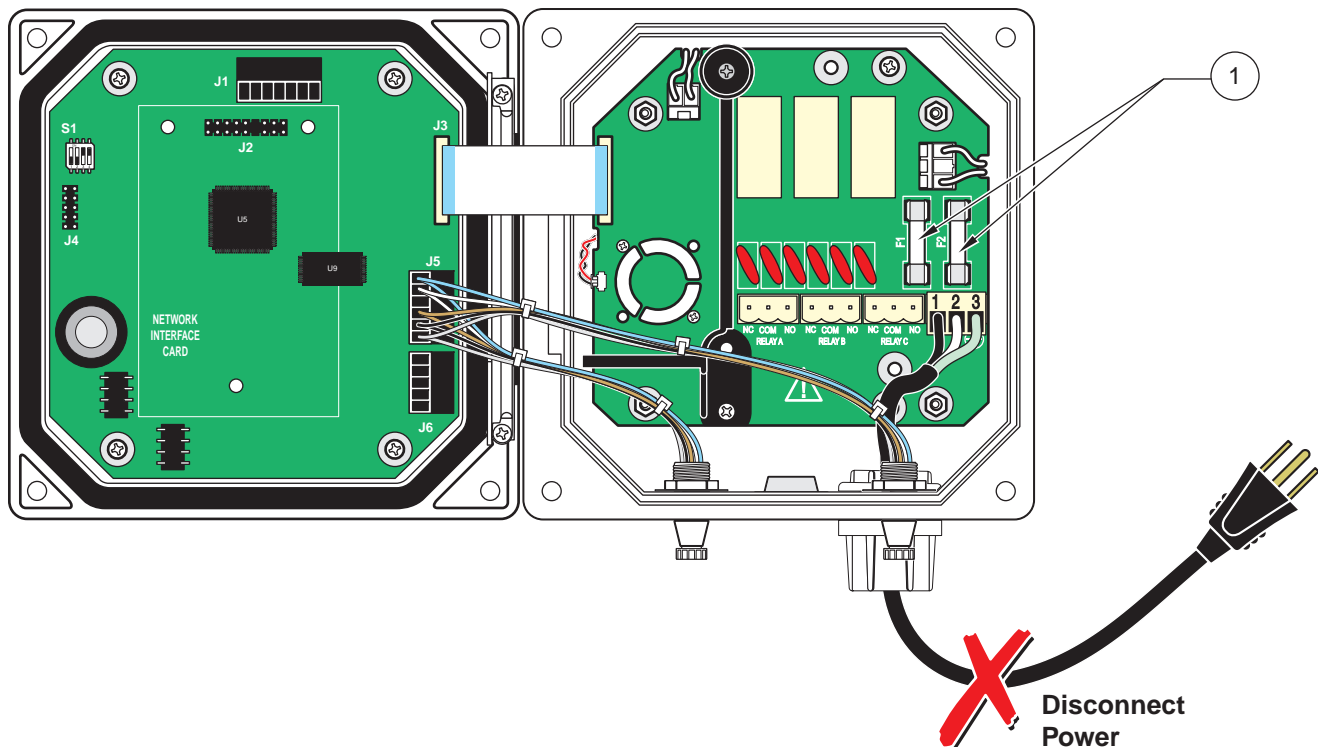
With the enclosure securely closed, wipe the exterior with a damp cloth.

4.2 Fuse Replacement

The instrument contains two mains fuses. Failed fuses are an indication that an equipment problem could exist. Problem resolution and fuse replacement should be performed only by qualified service personnel. Refer to [Figure 4-22](#) and the following steps to replace the fuses:

1. Disconnect power to the controller (including power to relays if powered).
2. Open the hinged controller cover by completely loosening all four captive screws in the cover.
3. Remove the high voltage barrier; pull out on the lever of the captive fastener then pull straight out on the barrier. Set the barrier aside for reinstallation.
4. Remove the fuses and install new fuses of the same type and rating (T, 1.6 A, 250 V, slow blow).
5. Reinstall the high voltage barrier.
6. Close the controller cover and hand-tighten the four screws.
7. Reconnect power to the instrument.

Figure 4-22 Fuse Replacement



1. Fuses F1 and F2, T, 1.6 A, 250 V, slow blow

Replacement Items

Item	Cat. No.
Controller	58600-00
Controller installation kit	58672-00
Fuse, T, 1.6 A, 250 V, slow blow	52683-00
Instruction manual, English	58600-18

Accessories

Sun shield.....	58690-00
Plug, conduit opening.....	58687-00
Power cord with strain relief, 115 V	54488-00
Power cord with strain relief, 230 V	54489-00
Strain relief, Heyco	16664
Digital output card for ModBUS RS232 communication	59200-00
Digital output card for ModBUS RS485 communication	59200-01

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Hach Company warrants its products to the original purchaser against any defects that are due to faulty material or workmanship for a period of ***one year*** from date of shipment unless otherwise noted in the product manual.

The sc100 Controller is warranted for two years from the date of shipment.

In the event that a defect is discovered during the warranty period, Hach Company agrees that, at its option, it will repair or replace the defective product or refund the purchase price, excluding original shipping and handling charges. Any product repaired or replaced under this warranty will be warranted only for the remainder of the original product warranty period.

This warranty does not apply to consumable products such as chemical reagents; or consumable components of a product, such as, but not limited to, lamps and tubing.

Contact Hach Company or your distributor to initiate warranty support. Products may not be returned without authorization from Hach Company.

Limitations

This warranty does not cover:

- Damage caused by acts of God, natural disaster, labor unrest, acts of war (declared or undeclared), terrorism, civil strife or acts of any governmental jurisdiction
- Damage caused by misuse, neglect, accident or improper application or installation
- Damage caused by any repair or attempted repair not authorized by Hach Company
- Any product not used in accordance with the instructions furnished by Hach Company
- Freight charges to return merchandise to Hach Company
- Freight charges on expedited or express shipment of warranted parts or product
- Travel fees associated with on-site warranty repair

This warranty contains the sole express warranty made by Hach Company in connection with its products. All implied warranties, including without limitation, the warranties of merchantability and fitness for a particular purpose, are expressly disclaimed.

Some states within the United States do not allow the disclaimer of implied warranties and if this is true in your state the above limitation may not apply to you. This warranty gives you specific rights, and you may also have other rights that vary from state to state.

This warranty constitutes the final, complete, and exclusive statement of warranty terms and no person is authorized to make any other warranties or representations on behalf of Hach Company.

Limitation of Remedies

The remedies of repair, replacement or refund of purchase price as stated above are the exclusive remedies for the breach of this warranty. On the basis of strict liability or under any other legal theory, in no event shall Hach Company be liable for any incidental or consequential damages of any kind for breach of warranty or negligence.

Hach Co. certifies this instrument was tested thoroughly, inspected, and found to meet its published specifications when it was shipped from the factory.

The **Model SC-100** has been tested and is certified as indicated to the following instrumentation standards:

Product Safety

UL 61010A-1 (ETL Listing # 65454)
CSA C22.2 No. 1010.1 (ETLc Certification # 65454)
Certified by Hach Co. to EN 61010-1 Amds. 1 & 2 (IEC1010-1) per 73/23/EEC, supporting test records by Intertek Testing Services.

Immunity

This equipment was tested for Industrial level EMC per:

EN 61326 (EMC Requirements for Electrical Equipment for Measurement, Control and Laboratory Use) **per 89/336/EEC EMC:** Supporting test records by Hach Company, certified compliance by Hach Company.

Standards include:

IEC 1000-4-2:1995 (EN 61000-4-2:1995) Electrostatic Discharge Immunity (Criteria B)
IEC 1000-4-3:1995 (EN 61000-4-3:1996) Radiated RF Electromagnetic Field Immunity (Criteria A)
IEC 1000-4-4:1995 (EN 61000-4-4:1995) Electrical Fast Transients/Burst (Criteria B)
IEC 1000-4-5:1995 (EN 61000-4-5:1995) Surge (Criteria B)
IEC 1000-4-6:1996 (EN 61000-4-6:1996) Conducted Disturbances Induced by RF Fields (Criteria A)
IEC 1000-4-11:1994 (EN 61000-4-11:1994) Voltage Dip/Short Interruptions (Criteria B)

Additional Immunity Standard/s include:

ENV 50204:1996 Radiated Electromagnetic Field from Digital Telephones (Criteria A)

Emissions

This equipment was tested for Radio Frequency Emissions as follows:

Per **89/336/EEC EMC: EN 61326:1998** (Electrical Equipment for measurement, control and laboratory use—EMC requirements) Class “A” emission limits. Supporting test records by Hewlett Packard, Fort Collins, Colorado Hardware Test Center (A2LA # 0905-01) and certified compliance by Hach Company.

Standards include:

EN 61000-3-2 Harmonic Disturbances Caused by Electrical Equipment
EN 61000-3-3 Voltage Fluctuation (Flicker) Disturbances Caused by Electrical Equipment

Additional Emissions Standard/s include:

EN 55011 (CISPR 11), Class "A" emission limits

Canadian Interference-causing Equipment Regulation, IECS-003, Class A

Supporting test records by Hewlett Packard, Fort Collins, Colorado Hardware Test Center (A2LA # 0905-01) and certified compliance by Hach Company.

This Class A digital apparatus meets all requirements of the Canadian Interference-causing Equipment Regulations.
Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

FCC PART 15, Class "A" Limits

Supporting test records by Hewlett Packard, Fort Collins, Colorado Hardware Test Center (A2LA # 0905-01) and certified compliance by Hach Company.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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.

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 his own expense. The following techniques of reducing the interference problems are applied easily.

1. Disconnect the Model sc100 Controller from its power source to verify that it is or is not the source of the interference.
2. If the Model sc100 Controller is connected into the same outlet as the device with which it is interfering, try another outlet.
3. Move the Model sc100 Controller away from the device receiving the interference.
4. Reposition the receiving antenna for the device receiving the interference.
5. Try combinations of the above.

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