Cat. No. 54100-18

SP-510™
HARDNESS MONITOR
INSTRUMENT MANUAL

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SP-510™
HARDNESS MONITOR

INSTRUMENT MANUAL

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Rev. 1, 10/99

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ToxTrak™
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VIScreen™
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ZincoVer®

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CERTIFICATION

Hach Company certifies this instrument was tested thoroughly, inspected, and found to meet its published specifications when it was shipped from the factory. The SP-510™ Hardness Monitor has been tested and is certified as indicated to the following instrumentation standards:

Product Safety

The SP-510™ was tested for safety as follows:

UL 3101-1 (ETL Listing # H0492805390)
CSA C22.2 No. 1010.1 (ETLc Certification # H0492805390)
Certified by Hach to EN 61010-1 (IEC1010-1) per 73/23/EEC, supporting test records by Intertek Testing Services.

Immunity

The SP-510™ Hardness Monitor was tested for EMC as follows:

EN 61326:1998 (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) Electro-Static Discharge Immunity (Criteria B)
IEC 1000-4-3:1995 (EN 61000-4-3:1996) Radiated RF Electro-Magnetic Field Immunity (Criteria A)
IEC 1000-4-4:1995 (EN 61000-4-5:1995) 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 Electro-Magnetic Field from Digital Telephones (Criteria A)

Emissions

The SP-510™ Hardness Monitor 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 "TBD" 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 "TBD" (Test date 4-21-99) 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 SP-510™ Harness Monitor from its power source to verify that it is or is not the source of the interference.
2. If the SP-510™ Harness Monitor is connected into the same outlet as the device with which it is interfering, try another outlet.
3. Move the SP-510™ Harness Monitor away from the device receiving the interference.
4. Reposition the receiving antenna for the device receiving the interference.
5. Try combinations of the above.

SAFETY PRECAUTIONS

Please read this entire manual before unpacking, setting up, or operating this instrument. Pay particular 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 the protection provided by this equipment is not impaired, do not use or install this equipment in any manner other than that which is specified in this manual.

Use of Hazard Information

If multiple hazards exist, this manual will use the signal word (Danger, Caution, Note) corresponding to the greatest hazard.

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.

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 operational and/or safety information.

 This symbol, if noted on the product, indicates the need for protective eye wear.

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SPECIFICATIONS

GENERAL SPECIFICATIONS

Hard/Soft Display: Two LEDS with one indicating hard water and the second one indicating soft water

Time Delay: A soft-to-hard water alarm transition requires two successive readings above the trip point. A hard-to-soft water alarm clearing transition requires one reading below the trip point.

Trip Points:
1.0, 2.0, 5.0, 10.0, 20.0, 50.0, and 100.0 mg/L hardness measured as $CaCO_3$

Reagents Required: Buffer and indicator for the desired trip point

Trip Point	Buffer Cat. No.	Indicator Cat. No.
1 mg/L	27685-49	27690-49
2 mg/L	27685-49	27691-49
5 mg/L	27685-49	27692-49
10 mg/L	27686-49	27692-49
20 mg/L	27687-49	27692-49
50 mg/L	27688-49	27692-49
100 mg/L	27689-49	27692-49

Reagent Bottle Volume: 500 mL

Reagent Shelf Life: 1 year

Reagent Consumption Rate: 500 mL of each reagent every two months

Sampling Rate:
New sample every 1.9 minutes ± 5% at 60 Hz; new sample every 2.3 minutes ± 5% at 50 Hz

Controls: On/Off Switch, ALARM OFF, ZERO CAL, HARD CAL

Service Requirements:
Restandardization every 2 months. Replace pump tubes every 6 months.

PERFORMANCE SPECIFICATIONS

Nominal Alarm Point	Minimum Trip Value	Maximum Trip Value
1 mg/L	0.75 mg/L	1.25 mg/L
2 mg/L	1.5 mg/L	2.5 mg/L
5 mg/L	3.75 mg/L	6.25 mg/L
10 mg/L	7.5 mg/L	12.5 mg/L
20 mg/L	15.0 mg/L	25.0 mg/L
50 mg/L	37.5 mg/L	62.5 mg/L
100 mg/L	75.0 mg/L	125.0 mg/L

Repeatability:
±10% of trip value on 1 and 2 mg/L ranges; ±4% of trip value on remaining ranges.

ENVIRONMENTAL SPECIFICATIONS

Operating Humidity Range: 5 to 95%, noncondensing

Storage Temperature Range: -40 °C to +60 °C (-40 °F to +140 °F)

Operating Temperature Range: 5 °C to 40 °C (32 °F to 104 °F)

Influence of Temperature On Trip Point:

1 mg/L	–0.03 mg/L/°C
2 mg/L	–0.03 mg/L/°C
5 mg/L	–0.06 mg/L/°C
10 mg/L	–0.08 mg/L/°C
20 mg/L	–0.09 mg/L/°C
50 mg/L	–0.29 mg/L/°C
100 mg/L	–0.60 mg/L/°C

ELECTRICAL SPECIFICATIONS

Power Requirements: 115/230 Vac, (switch selectable inside instrument)
70 VA, 50/60 Hz, 1.25 Amp Fuse (see *Section 2.8.3* on page *28*).

Installation Category: II

Electrical Connection:
Two 3-wire barrier terminal blocks. Wire range 12–18 AWG. Holes for two 1/2" conduit fittings are provided.

Hard Water Alarm Relay: SPDT relay, actuated when hard water indicator is on. (Alarm may be disabled from front keypad.)

Contact ratings: 5 A resistive at 100-240 Vac

OPTICAL SPECIFICATIONS

Light Source: Class 1 LED (Light Emitting Diode) with peak wavelength of 610 nm. Estimated 50,000 hours minimum life.

Detector: Silicon photo detector

Optical Path Length: 0.35"

MECHANICAL SPECIFICATIONS

Enclosure: Environmental Rating IP62

Dimensions: Approximately 42 x 31.5 x 18 cm (16.5 x 12.5 x 7") (refer to the transmittal drawing for exact space requirements).

Case Construction: IP62 instrument enclosure with gasketed door

Mounting: Wall-mounted

Shipping Weight: 11.3 kg (25 lbs)

HYDRAULIC (SAMPLING) SPECIFICATIONS

Sample Flow Rate to Sample Conditioning: 50 to 500 mL/minute flow rate required.

Inlet Pressure to Instrument: 1 to 5 psig, 1.5 psig is optimum. Exceeding 5 psig can cause sample tubing failure.

Inlet Pressure to Sample Conditioning: 1.5 psig to 75 psig (with the sample tube level with the bottom of the instrument)

Inlet Fitting:
At instrument, ¼" OD polyethylene tubing with quick-disconnect fitting

Drain Fitting: Hose barb for ½" ID flexible tubing

Sample Temperature Range: 5 °C to 40 °C (41 °F to 104 °F)

Sample Conditioning: use provided sample conditioning

SECTION 1 GENERAL INFORMATION

1.1 Instrument Description

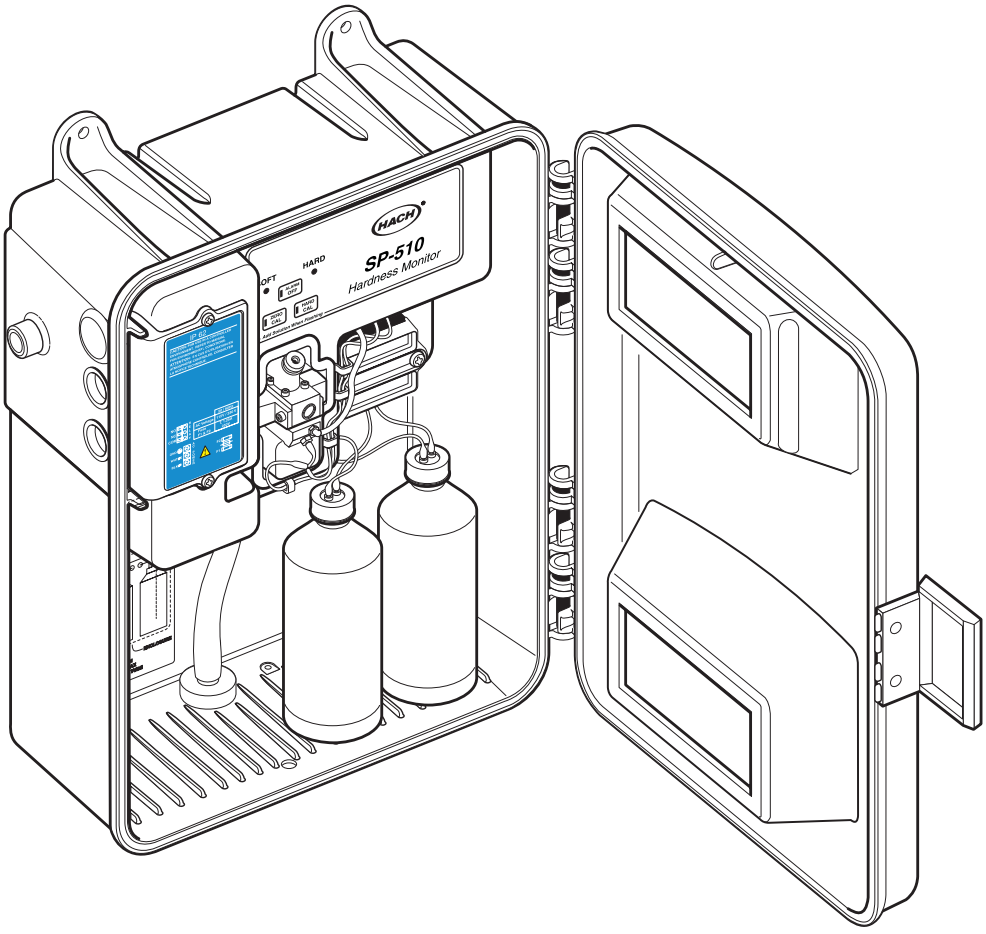
The Model SP-510™ Hardness Monitor is designed to monitor water softener effluents continuously to detect hardness breakthrough due to softener exhaustion. It enables commercial and industrial water softener operators to establish automatic control of their systems by initiating regeneration sequences with the instrument's alarm circuit. The Hardness Monitor is also suited for other applications requiring the monitoring of hardness.

By selecting the appropriate hardness indicator and buffer reagents, the monitor will alarm at 1, 2, 5, 10, 20, 50, or 100 mg/L hardness measured as $CaCO_3$. When the preselected alarm point is exceeded, the alarm relay responds, closing the normally open contacts and opening the normally closed contacts. These dry contacts can be used to actuate annunciators and/or initiate softener regeneration. Control panel indicators provide “hard” or “soft” sample status.

The SP-510™ Hardness Monitor enclosure is environmentally rated for IP62 per IEC 529. The enclosure is dust-tight, and drip-resistant but is not designed for outdoor use.

The instrument is designed so electronic components are isolated from the hydraulic components. Windows allow the operator to observe the display indicators and reagent supply without opening the instrument enclosure.

Figure 1 Model SP-510™ Hardness Monitor



1.2 Principle of Operation

The Hardness Monitor uses a buffered colorimetric hardness indicator solution that is mixed with the water sample as it flows through the instrument. While in the colorimeter sample cell, light is transmitted through the solution to a detector, which provides the colorimetric measurement.

Note: *The Class 1 Light Emitting diode (LED) used as the light source for the photometric measurement does not present any potential for eye damage.*

Indicator solutions are formulated to provide 50% transmittance (%T) to the detector at their nominal alarm point values. Below 50%, the color of sample/reagent mixture is blue. As hardness increases, the color becomes red. Because the light source for the colorimetric measurement is an orange light-emitting diode, a blue solution blocks light to the detector while a red solution allows light to be transmitted unattenuated through the measurement cell to the detector. Maximum light transmittance through the cell occurs when all of the indicating reagent available has reacted with sample hardness and any further increasing levels of hardness have no effect on solution color.

A linear, peristaltic pump/valve controls the flow of incoming sample and injects metered volumes of the buffer and indicator reagents on a sequenced cycle. The pump/valve uses a motor-driven cam to operate pinch blocks that squeeze special thick-walled tubing against a fixed plate, the sequence operates as follows:

1. The sample inlet line opens and remains open to allow sufficient sample flow to purge the inlet line and measure cell. While the inlet sample is flowing, the reagent inlet valve and pinch blocks are opened, filling the tubing with reagent.

2. The sample inlet line is then pinched shut, leaving a fresh sample in the measuring cell. The cell volume is controlled by an overflow weir.

3. Reagent inlet valve block is then closed.

4. Reagent outlet valves open and the pinch block squeezes the tubing, forcing reagent into the measuring cell. A magnetic stirrer mounted beneath the measuring cell mixes sample and reagent in the cell. Sufficient time is allowed for sample and reagents to react.

5. An optical interrupter circuit on the drive motor shaft signals the monitor electronics to take a measurement.

This cycle is repeated approximately every 2 minutes.

INSTALLATION

DANGER

Some of the tasks in this section of the manual have safety issues associated with them. Because the potential for injury to individuals and equipment exists when these safety issues are not addressed, Hach Company strongly recommends that qualified personnel conduct the installation, and that all installation personnel review the associated instructions carefully.

PELIGRO

Algunas de las tareas comprendidas en esta sección del manual pueden ocasionar daños a las personas y al material si no observan la medidas de suguridad. Hach Company recomienda encarecidamente que el material sea instalado por un personal cualificado y que el personal encargado de la instalación lea atentamente estas instrucciones.

PERIGO

A execução de algumas tarefas previstas nesta secçao do manual pode causar ferimentos às pessoas ou estragos no equipamento se não forem observadas precauções de suranca. A Hach Company recomenda vivamente que o equipmento seja instalado por pessoal qualificado e que todas as pessoas afectadas à sua instalação leiam atentamente estas instruções.

DANGER

Certaines tâches dans ce chapitre du mode d'emploi peuvent causer des blessures aux personnes et endommager le matériel si les consignes de sécurité ne sont pas suivies. Hach Company recommande vivement que l'installation soit faite par du personnel qualifié et que toutes les personnes effectuant l'installation lisent attentivement ces instructions.

GEFAHR

Einige der in diesem Abschnitt der Betriebsanleitung beschriebenen Arbeiten können bei Nichtbeachtung der Sicherheitsvorschriften zu Verletzungen von Personen oder Schäden am Gerät führen. Es wird dringend empfohlen, die Installation ausschließlich von qualifiziertem Personal duchführen zu lassen; mit der Installation befaßte Personen sollten diese Anweisungen aufmerksam lesen.

SECTION 2 INSTALLATION

2.1 ⚠ Instrument Environmental Considerations

The instrument enclosure has been tested to IEC 529 IP 62 standards and is designed for general-duty, indoor installation. Ambient temperatures may fall within the range of 5° to 40 °C (18° to 104 °F) but they should be nearly constant. Do not mount the instrument in direct sunlight; shield from dripping water.

2.2 Unpacking the Instrument

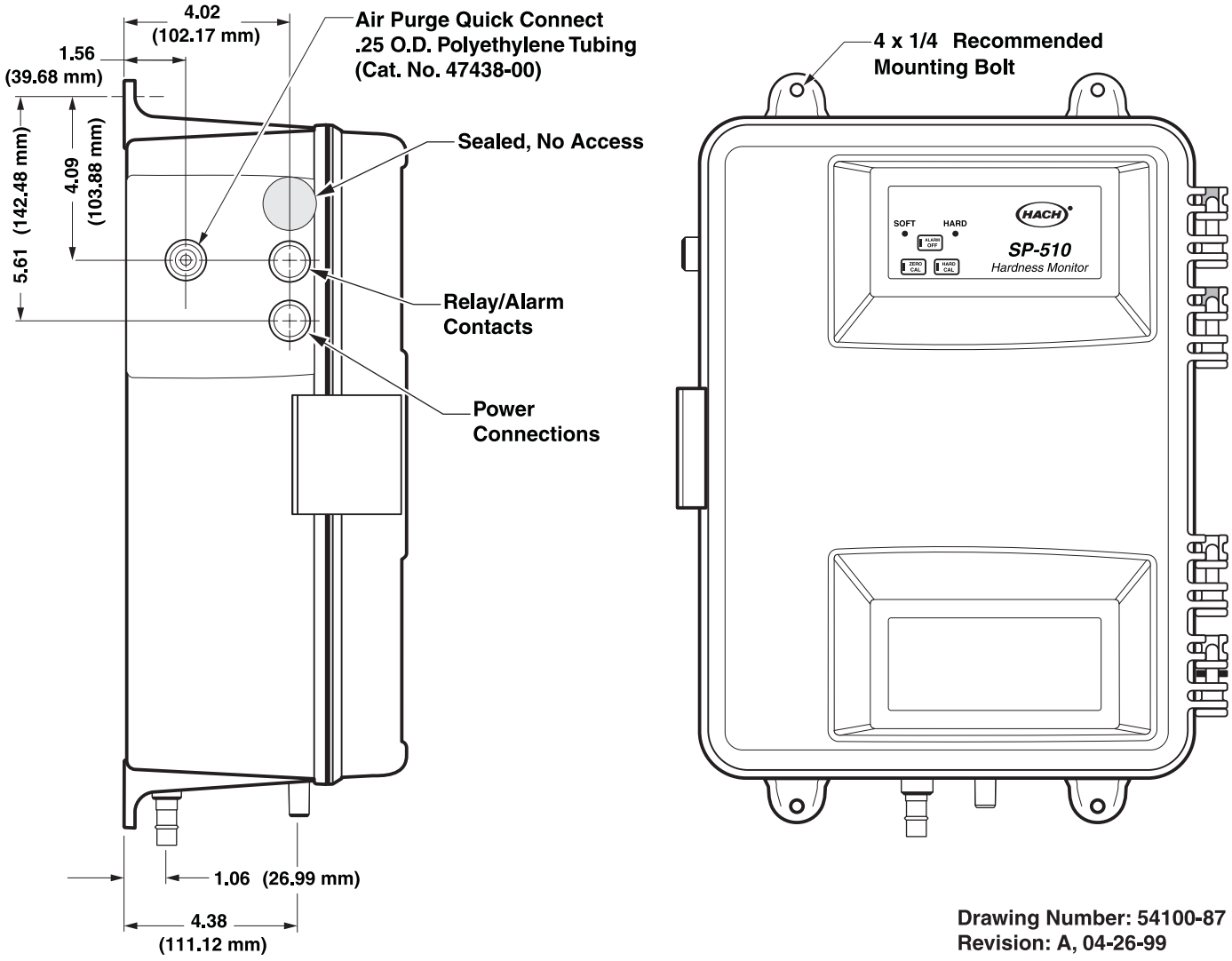
Remove the Hardness Monitor from its shipping carton and inspect it for any damage that may have occurred during shipment. Verify that the Installation Kit, Cat. No. 55164-00, and Maintenance Kit, Cat. No. 55165-00, are included in addition to reagents.

If damage is evident or the shipment is incomplete, please contact the Customer Service Department, Hach Company, Loveland, Colorado for instructions. The toll-free number is 800-227-4224. Contents of the Installation and Maintenance kits are listed in Replacement Parts.

2.3 Wall Mounting the Instrument

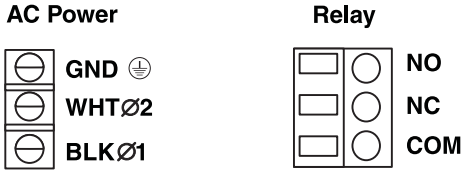
The instrument case is designed for wall mounting. Refer to *Figure 2*, *Figure 3*, and *Figure 4* for dimensions and other installation information. Use ¼-inch screws for mounting. Mount the instrument as close to the sampling point as practical to ensure complete purging of the sample line each cycle. Leave adequate clearance at the sides and bottom of the instrument case for plumbing and wiring connections.

Figure 2 SP-510 Instrument Dimensions (1 of 3)



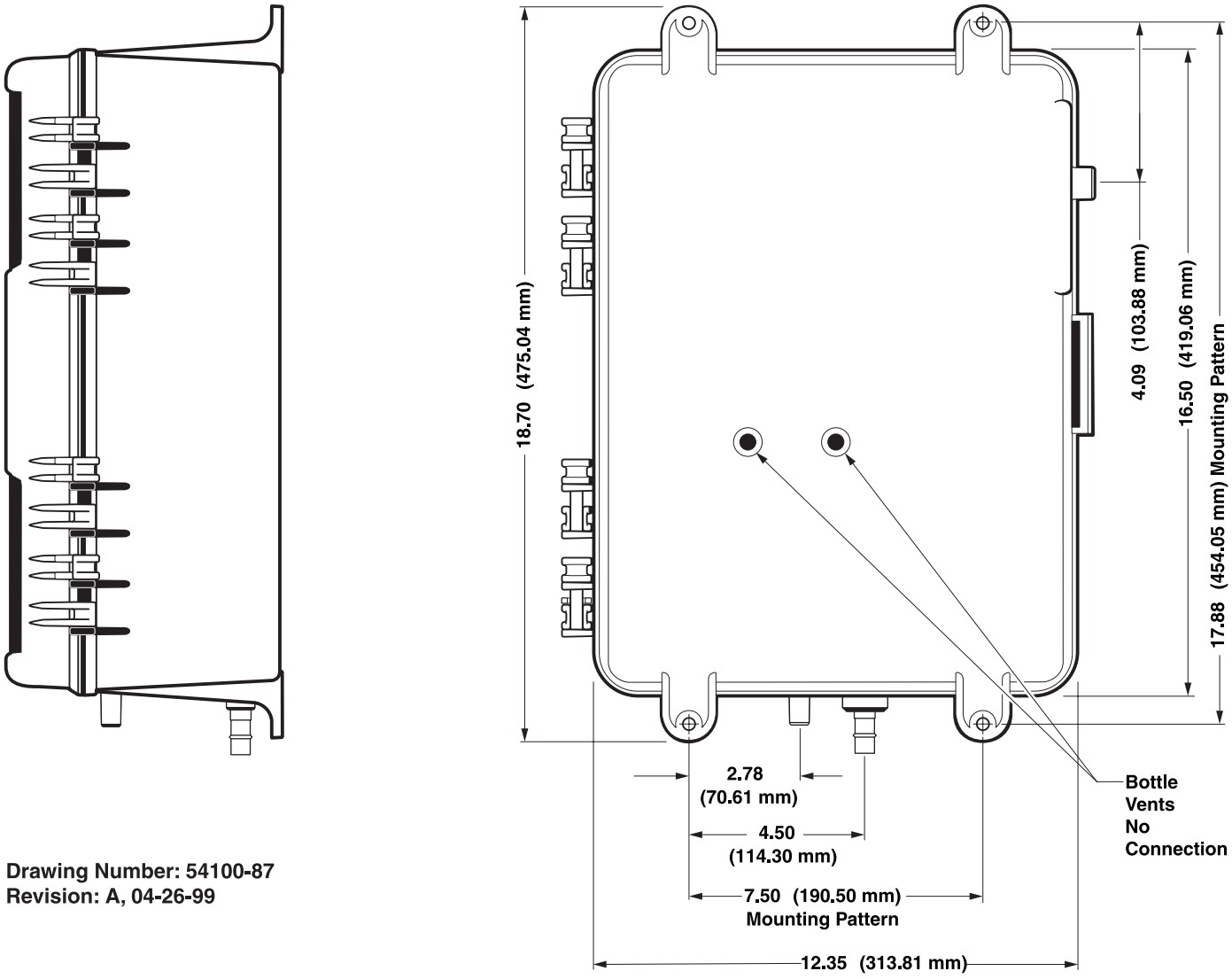
Drawing Number: 54100-87
Revision: A, 04-26-99

Customer Power Connections to Analyzer



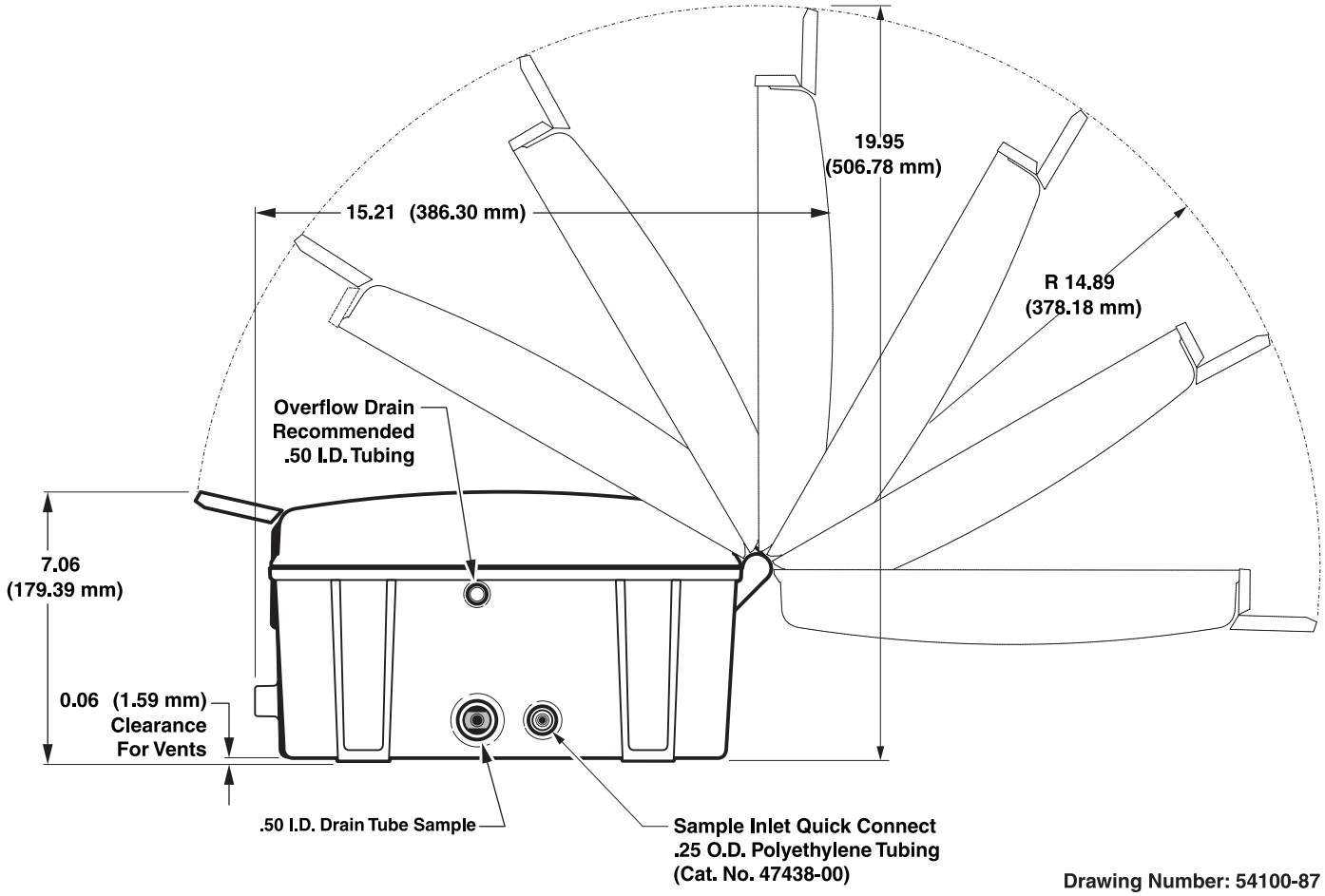
Power; 115/230/VAC 50/60 HZ 1.25A

Figure 3 SP-510 Instrument Dimensions (2 of 3)



Drawing Number: 54100-87
Revision: A, 04-26-99

Figure 4 SP-510 Instrument Dimensions (3 of 3)



Drawing Number: 54100-87
Revision: A, 04-26-99

2.4 ⚠ Plumbing Connections

Sample inlet and drain connections are made on the bottom of the instrument. The sample connection is a quick connect fitting for ¼-inch OD tubing. Connect the ¼-inch O.D. poly tubing by pushing it into the fitting. Two distinct “stops” will be felt as the tubing is correctly attached. If the tubing is not properly seated, it will pop out when water pressure is applied. The sample drain fitting is sized for ½-inch ID flexible tubing (not supplied).

Sample and enclosure drains must be routed according to State and Federal regulations. Contact your regulatory agency for assistance.

DANGER
The ½-inch enclosure drain must have at least 3 feet of tubing installed to ensure the analyzer remains dust-tight. Never plug the drain. The drain must remain open to remove sample water in the event of a leak.

PELIGRO
El desagüe de la caja de ½ pulgadas debe tener por lo menos 1 metro (3') de tubería para asegurar que el analizador continúe hermético al polvo. No taponar o permitir que el desagüe se atasque, pues debe ser capaz de eliminar el líquido de las muestras en caso de derrame.

PERIGO
O dreno do envoltório de ½ polegada deve ter pelo menos 3 pés de tubulação instalados para garantir que o analisador permaneça impermeável a pó. Jamais tampe o dreno. O dreno deve permanecer aberto para remoção de água de amostra caso ocorra um vazamento.

ATTENTION
Afin que l'analyseur soit hermétique à la poussière, le drain d'½ pouce du boîtier doit être connecté à un tuyaux d'au moins un mètre. Ne jamais obstruer le drain. Le drain doit rester libre pour permettre l'évacuation de l'eau en cas de fuite.

GEFAHR
An dem ½ Zoll Ablauf des Gehäuses muss eine mindestens 90 cm lange Schlauchleitung installiert sein, damit gewährleistet ist, dass der Analysator vor Staub geschützt ist. Der Ablauf darf nienals verschlossen werden sondern muss stets offen sein, damit Probenwasser im Fall einer Undichtigkeit ablaufen kann.

Caution:
This analyzer is intended to be used for water samples only.

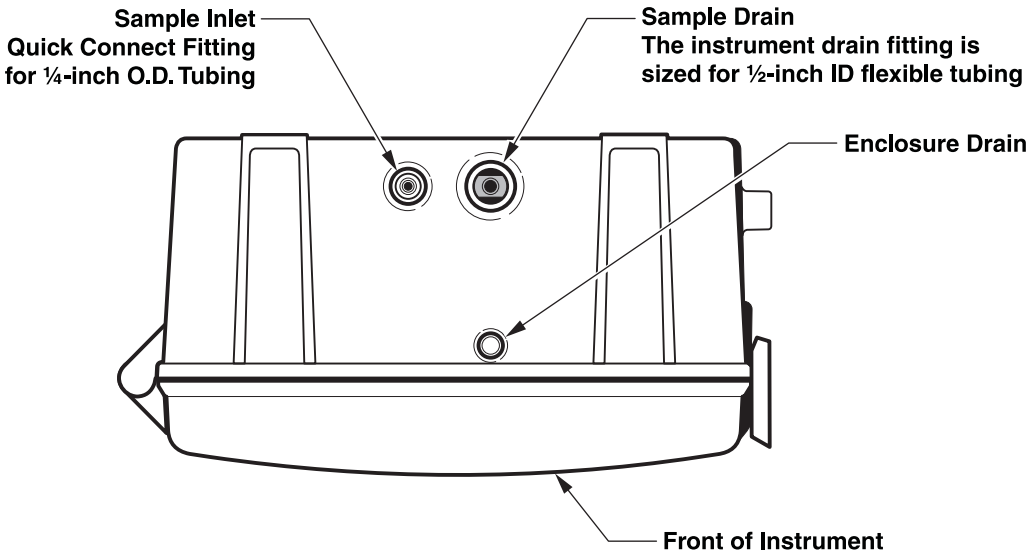
CUIDADO
Este analisador deve ser utilizado apenas em amostras de água.

CUIDADO
Este analizador está diseñado para muestras acuosas solamente.

PRUDENCE
Cet analyseur est prévu pour utilisation avec des échantillons d'eau uniquement.

VORSICHT
Dieser Analysator darf nur für Wasserproben benutzt werden.

Figure 5 Plumbing Connections

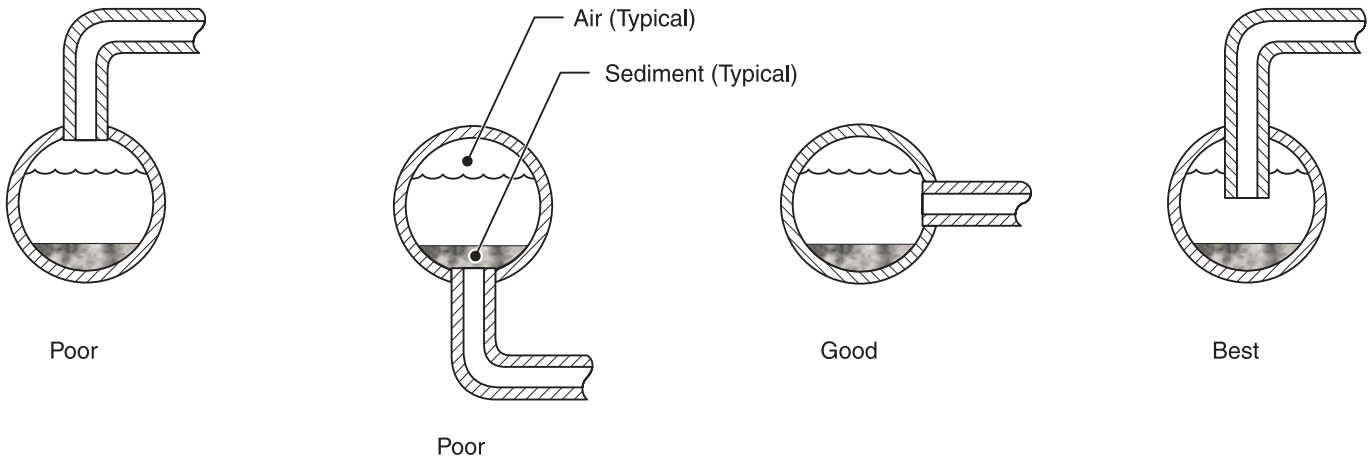


2.5 Installing the Sample Line

Selecting a good, representative sampling point is important for optimum performance from your hardness monitor. The sample analyzed must be representative of the condition of the entire system. If sample is drawn from a location too close to points of chemical additions to the process stream, inadequate mixing or an incomplete reaction can result in erratic readings from the instrument.

Install sample line taps into the side or center of larger process pipes to minimize the chance of ingesting sediment from the pipe line bottom or air bubbles from the top. A tap projecting into the center of the pipe is ideal. See *Figure 6*.

Figure 6 Sample Line Location in the Process Stream



2.6 ⚠ Optional Air Purge

Air purge may be necessary if the analyzer is located in an environment with high humidity and/or caustic vapors. The goal is to maintain a slight positive pressure in the instrument with dry instrument air.

The air purge connection is located on the left side of the instrument enclosure. To connect an air supply, remove the plug in the quick connect fitting using the Quick Connect Release tool. Connect ¼-inch poly tubing by pushing the tubing into the fitting. Two distinct "stops" will be felt as the tubing is correctly attached. If the tubing is not properly seated, it will pop out when air pressure is applied. Use only dry, oil-free instrument air at 15 scfh.

2.7 Sample Conditioning

All samples are "conditioned" using the single-sample, basic sample conditioning kit shipped with each analyzer. The kit eliminates large particles using a 40-mesh strainer.

The ball valve on the raw sample inlet line may be used to control the amount of bypass flow that is delivered to the filter. For dirty water, high bypass will help keep the strainer clean longer, or adjusted in any partially open position for continuous bypass. Adjust the ball valve on the instrument supply line to control the flow rate of filtered sample to the instrument.

Note: *Installing the drain tee more than 2 feet above the instrument can result in excessive pressure which may cause leaks.*

Mount the centerline of the bypass drain tee two feet above the instrument, see *Figure 7*. When properly mounted, the vacuum breaker design of the bypass drain tee prevents negative sample pressure and establishes the needed positive sample pressure for sample flow through the analyzer.

2.7.1 Assembling the Sample Conditioning Kit

Refer to the tips below and to the complete system diagram in *Figure 7* to assemble the components.

- Seal all threaded fittings with two wraps of Teflon® tape (provided).
- Two stops should be felt when installing tubing into the push-in fitting. The first is when the tubing clears the gripper ring, and the second is when the tubing bottoms out in the fitting. Improperly installed tubing will leak; take care to push the tubing all the way in.
- Be sure to cut all tubing used in the push-in fittings with a sharp knife so the ends are round, cleanly cut and not angled.
- The push-in fittings are designed for use with soft ¼-inch OD plastic tubing as included in the kit. Tubing material such as PTFE or HDPE is recommended. The push-in fitting will not grip hard plastic or metal tubing and the tubing will slip out.

Note: *To help grip the tubing, use rubber gloves or other material that grips and forcefully push the tubing into the fitting. Two stops should be felt; otherwise the tubing will not be fully inserted and will leak.*

2.7.2 Using the Sample Conditioning Kit

Assemble the head height regulator (stand-pipe) and filter as shown in *Figure 7*. Make sure sample pressure to the sample conditioning is in the 1.5 to 75-psig range for proper operation. Refer to *Section 2.7* for sample conditioning information.

1. Set flow by adjusting the ball valve (item 18, in *Figure 7*). The valve is fully closed when the lever is perpendicular to the valve body and fully open when the lever is parallel with the valve body.

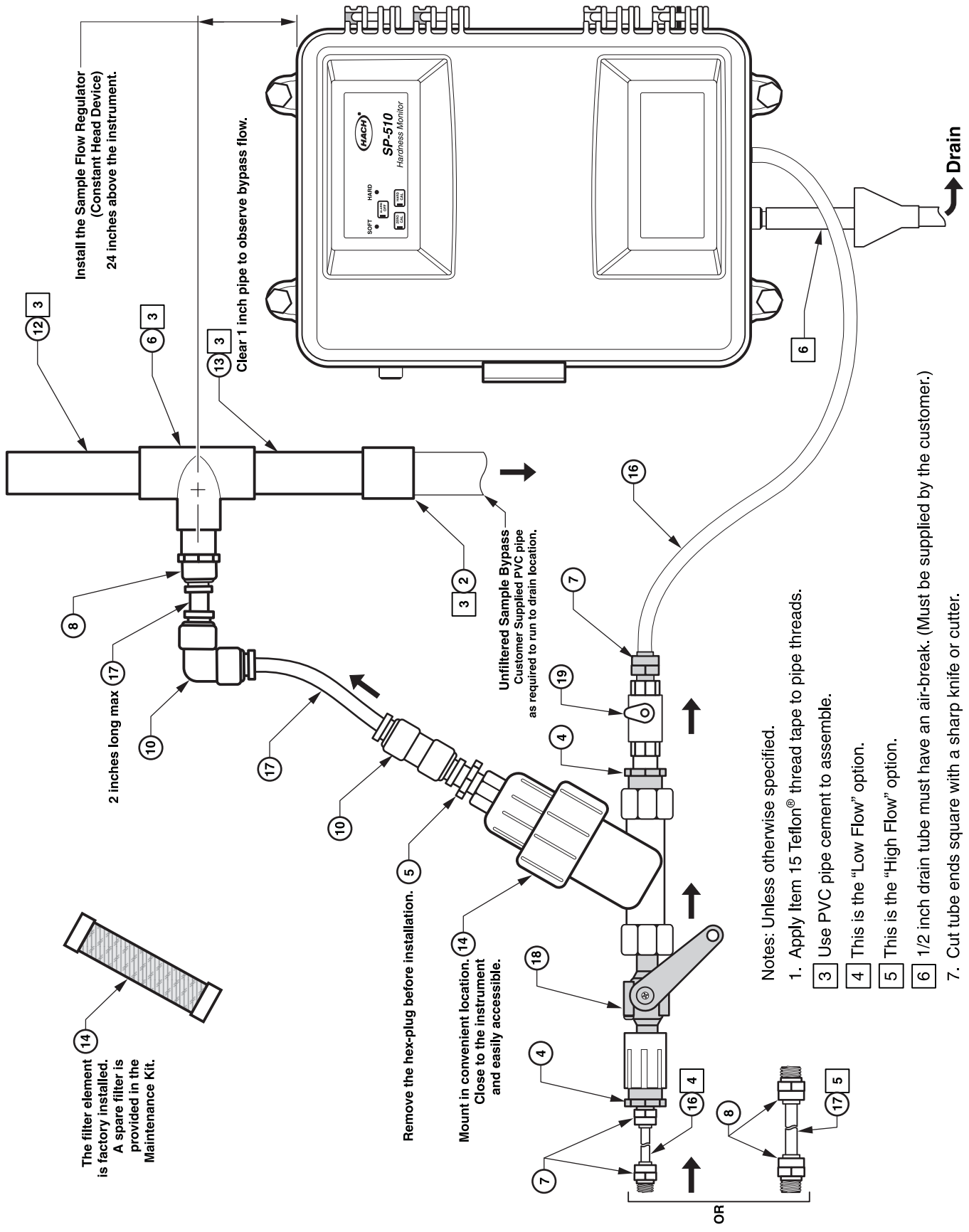
2. Observe the flow in the unfiltered sample bypass (clear tube, item 13 in *Figure 7*). Make sure the flow is adjusted so there is always bypass flow.

3. Use the ball valve (item 19) to turn off sample flow to the instrument.

Table 1 Sample Conditioning Parts List

Item Number	Description	Quantity	Catalog Number
1	Clamp, Conduit Hanger, 1 inch	4	47349-00
2	Coupling, 1 inch, SCH 40, PVC pipe	1	54175-00
3	Coupling, 1/2 inch FPT x 1/2 FPT PVC	1	54176-00
4	Fitting, Reduce Bushing, PVC, Hex	2	23002-00
5	Fitting, Stem Adapter, 1/2 inch O.D., 1/2 NPT	1	54180-00
6	Fitting, Tee, 1 inch x 1 inch	1	46622-00
7	Fitting, Tube, Connector, Male (1/4 inch tubing)	3	51246-00
8	Fitting, Tube, Connector, Male (1/2 inch tubing)	2	51262-00
9	Fitting, Tube, 1/2 inch O.D. x 1/2 inch Male NPT	1	54178-00
10	Fitting, Tube, 1/2 inch O.D. Union Elbow	1	54179-00
11	Fitting, Tube, 1/2 inch O.D., Union Straight	1	54181-00
12	Pipe, Pre-cut Drain, 1 inch Diameter, PVC	1	51239-00
13	Pipe, Drain, Clear	1	54174-00
14	Strainer, Y-body	1	54183-00
	Filter, 40-mesh Screen (provided with strainer and in Maintenance Kit, 55165-00)	1	54184-00
15	Teflon®, Thread Tape, 0.25 inch wide	1	70608-24
16	Tubing, Polyethylene, 0.250 O.D., 0.040 W, Black	15 feet	30616-00
17	Tubing, Polyethylene, 0.500 O.D., 0.062 W, Black	10 feet	51159-00
18	Valve, Ball, PVC, 1/2 NPT, PVC	1	54177-00
19	Valve, Ball, PVC, 1/4 NPT, PVC	1	51395-00

Figure 7 Sample Conditioning Kit

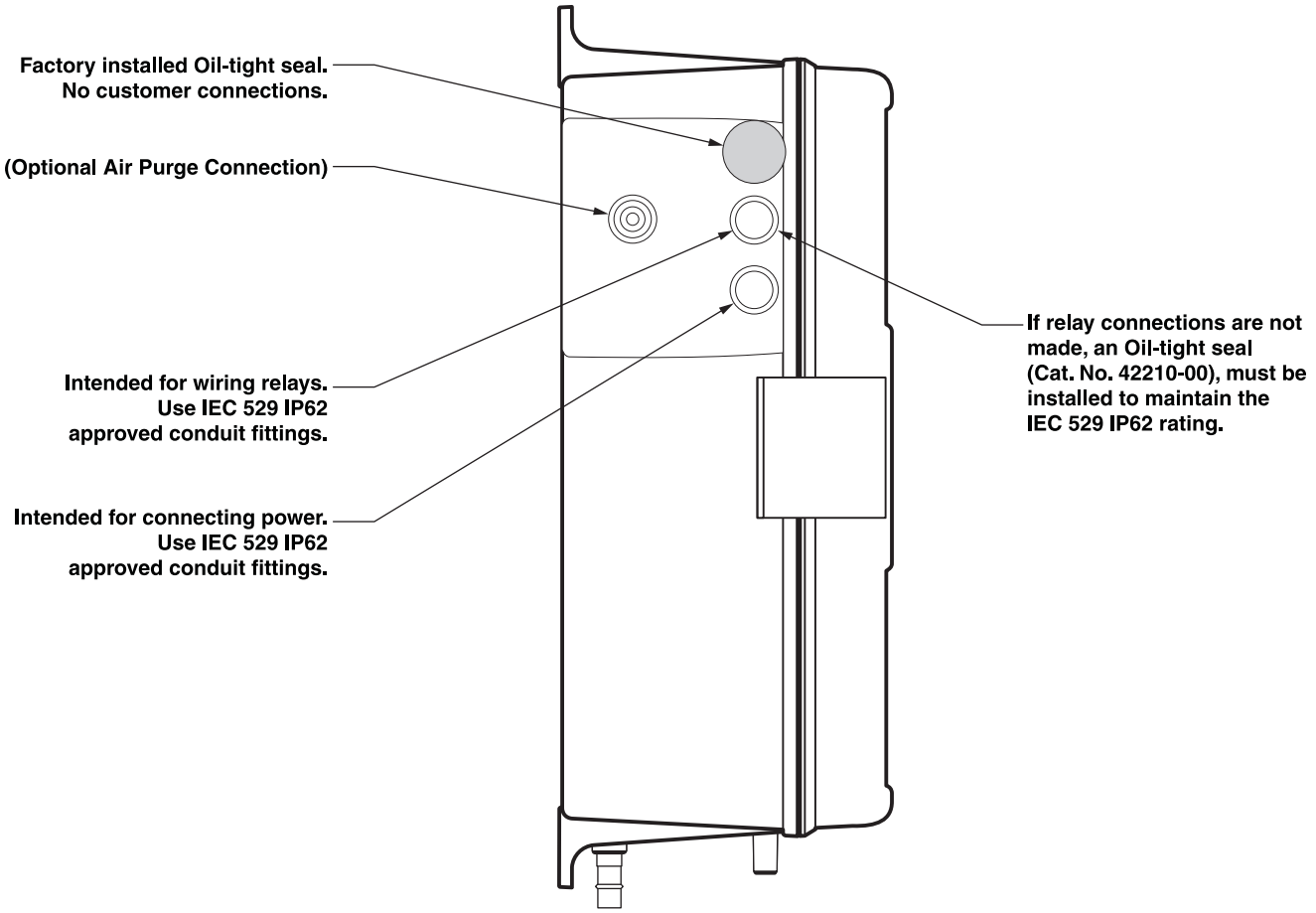


2.8 ⚠ Electrical Connections

All power connections are made through the conduit thru-holes in the upper left side of the instrument. The instrument is shipped with an oil-tight seal in the uppermost hole and plugs in the middle and lowest hole. Wire the instrument for power and relay connections using NEMA-approved conduit fittings.

The middle hole is intended for wiring of the relay and the lowest hole is intended for connecting power to the instrument. If relay connections are not made through the middle hole, an oil-tight seal must be installed in place of the plugs to maintain the IEC 529 IP62 rating. See *REPLACEMENT PARTS*.

Figure 8 Location of Air Purge and the Electrical Connections

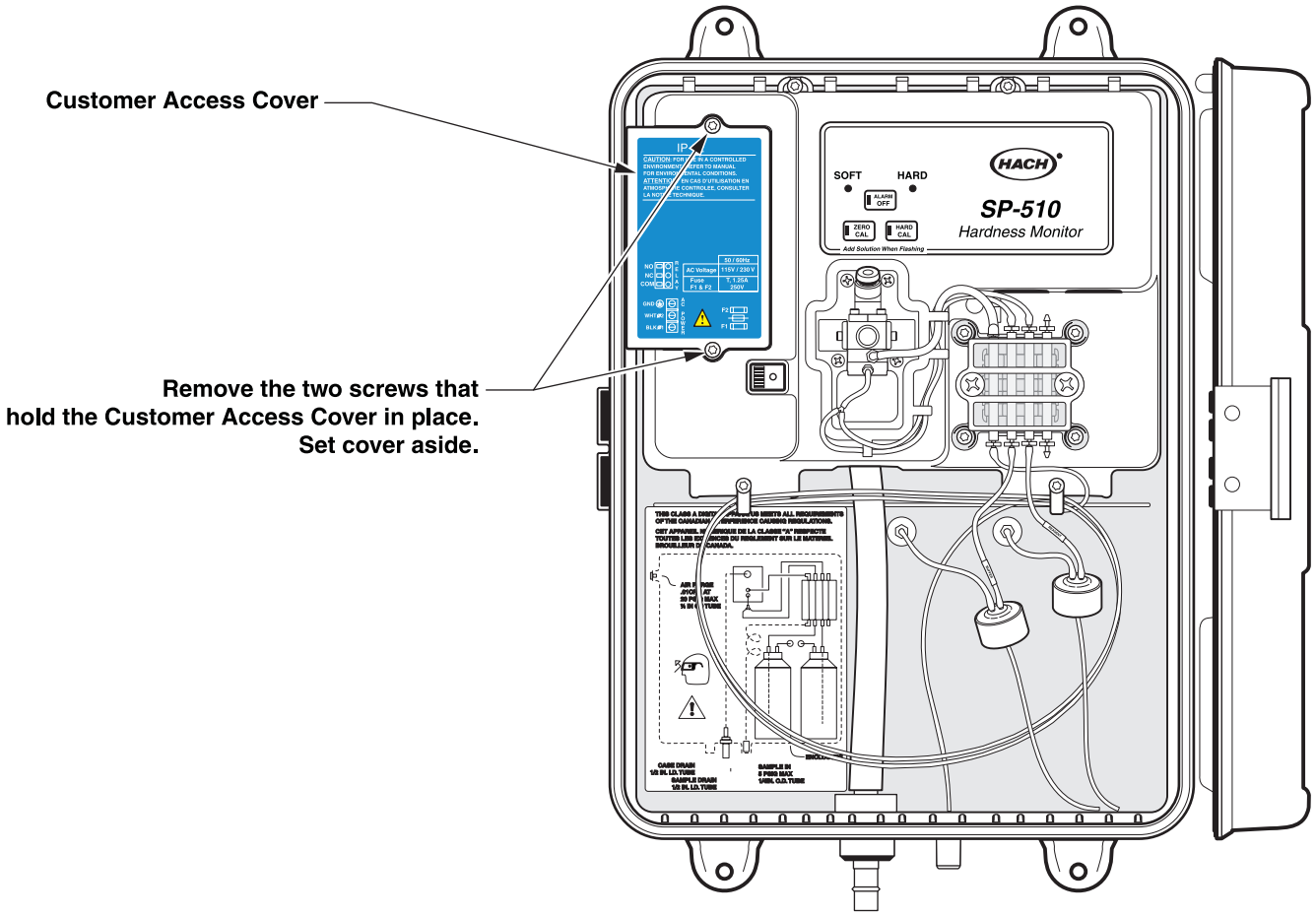


2.8.1 ⚠ Power Connections

Power connections are made at the terminal strip located in the left side of the electrical compartment and are accessible when the customer access cover is opened. See *Figure 10*.

For process or industrial applications, the national electrical codes of most countries require that AC service feeds be hard-wired and contained in conduit systems. The SP-510™ Hardness Monitor has been designed to conform to this requirement.

Figure 9 Locating and Removing the Customer Access Cover



Hach recommends conduit for two reasons:

1. It is generally required by most local electrical codes, and
2. Use of metal conduit can improve immunity to lightning surges and AC power transients.

Note: *If power cords are allowed by local electrical code, a 125V UL/CSA approved power cord with an approved NEMA-style strain relief and a standard 115V North American-style plug (Hach Cat. No. 46306-00) or a 230V VDE-approved power cord with an approved NEMA-style strain relief and a Continental European-style plug (Hach Cat. No. 46308-00) can be ordered.*

Additionally, electrical and instrumentation standards require a local means of removing power from the product. **The instrument is supplied with a power on/off switch which is located inside the instrument enclosure. To remove relay power from the instrument, an external customer-supplied switch box or power cord may be installed.** A power cord method is only acceptable if local codes permit its use and the considerations outlined in the previous paragraphs are addressed.

In hard-wired electrical applications the power and safety ground service drops for the instrument should be no longer than 6 meters (20 feet) unless metal conduit is used to shield the AC power wiring. The wire should be 18 to 12 AWG.

In applications where power cords are allowed by local electrical codes and power surges and transients are not a great concern, an 18 gauge, 3-conductor power cord (including a safety ground wire) can be used, but its length must not exceed 3 meters (10 feet). See *Figure 10B*.

2.8.2 ⚠ Wiring the Instrument

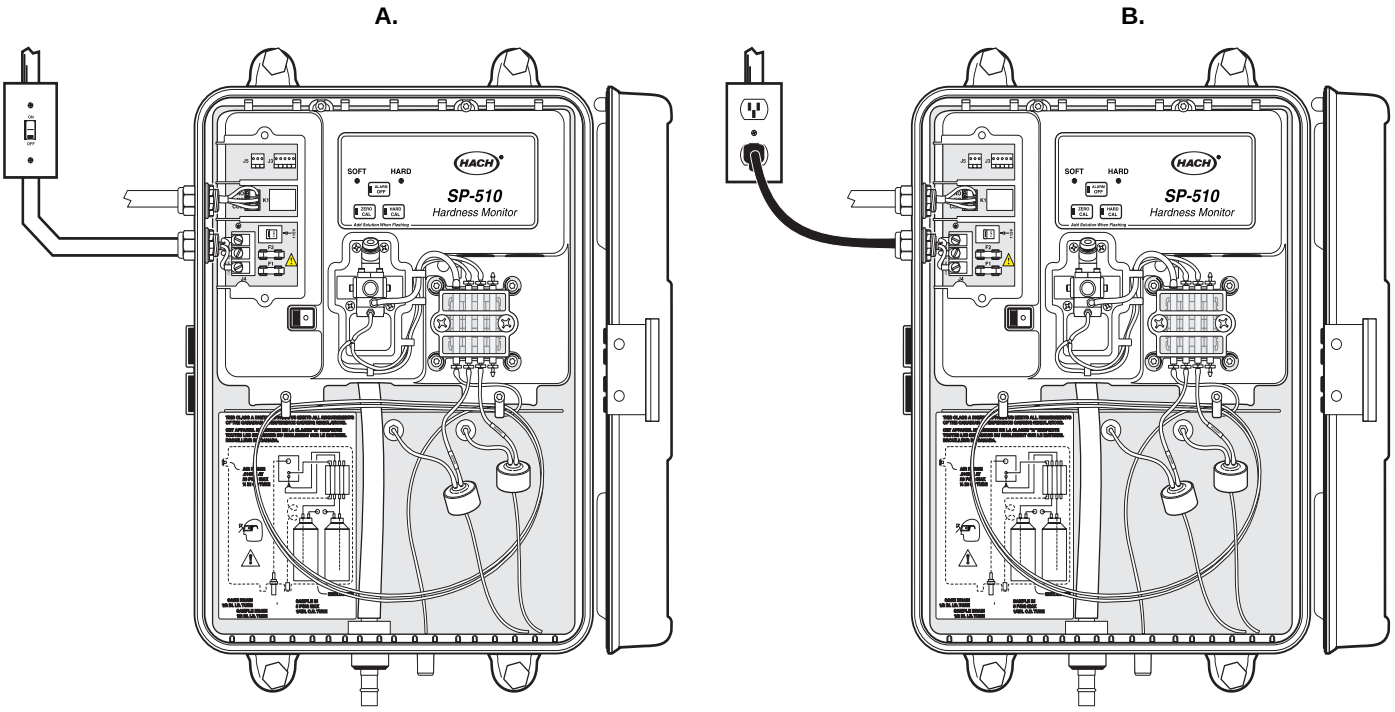
Connect the unpowered wires to the instrument power terminal as follows:

1. Strip the outside insulation of each wire back ¼-inch.
2. Connect the three wires to the terminal using the information in the following table.

Wire Color Code for:	Protective Earth Ground	Hot or ý1	Neutral or ý2
North America	Green	Black	White
IEC	Green with Yellow Tracer	Brown	Blue

3. Ensure the voltage setting is correct and supply power to the instrument.

Figure 10 Power Connections

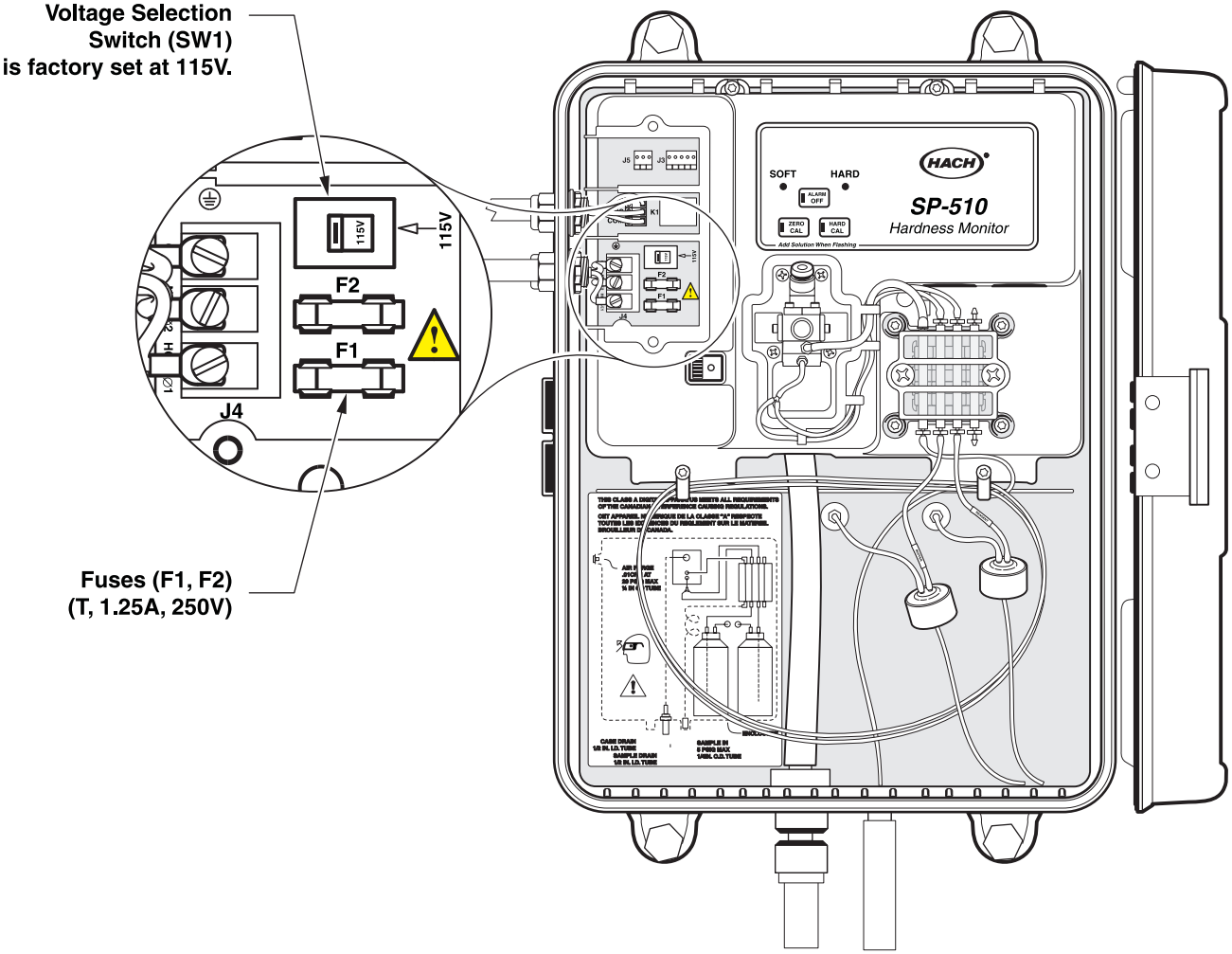


2.8.3 ⚠ Voltage Selection for Alternate Voltage Operation

Note: *The voltage selector switch must be set properly for the line voltage to be used. Improper setting can result in serious damage to the instrument when power is applied. See Figure 11.*

The instrument is switched for 115-volt operation when it leaves the factory. All that is necessary to convert the instrument for 230-volt operation is to slide the AC line conversion switch (shown in *Figure 11*) to the 230V position.

Figure 11 Voltage Selector Switch and Fuse Replacement



2.8.4 ⚠ Alarm Connections

The alarm set points are governed by the reagents used in the instrument. Refer to *Section 3.2* on page *35* to select the appropriate buffer and indicator reagents.

Note: *Current to the relay contacts must be limited to 5 amps. A method to remove power from the relays locally must be available in case of an emergency or for servicing of the product. Power removal can be accomplished with an external switch and a 5-amp fuse or with a switched 5-amp circuit breaker.*

The alarm relay contacts are connected to the terminal strip in the customer wiring compartment, providing both normally open and normally closed terminations. Terminals are unpowered and rated for 5 A, at 100–240 Vac resistive load. Refer to *Figure 13* and the instructions that follow for connection information.

The relay connector accepts 18-12 AWG wire. Wire gauge should be determined by load application. Wire gauge less than 18 AWG is not recommended.

1. Make sure no power is supplied to the instrument.
2. Strip the insulation on each wire back ¼-inch. See *Figure 12*.
3. Insert the wire end into the connector until the insulation seats against the connector. (Do not seat the insulation under the terminal pinch plates.)
4. When connections are complete, supply power to the instrument.

Figure 12 Proper Wire Preparation and Insertion

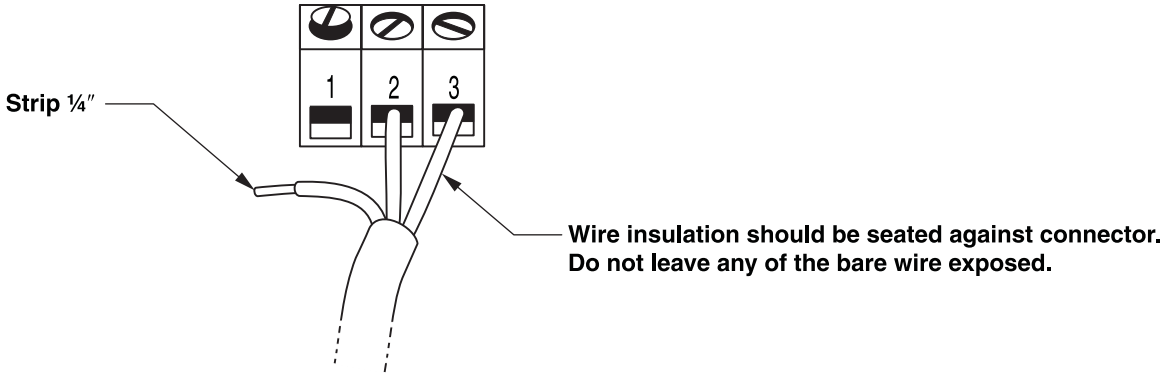
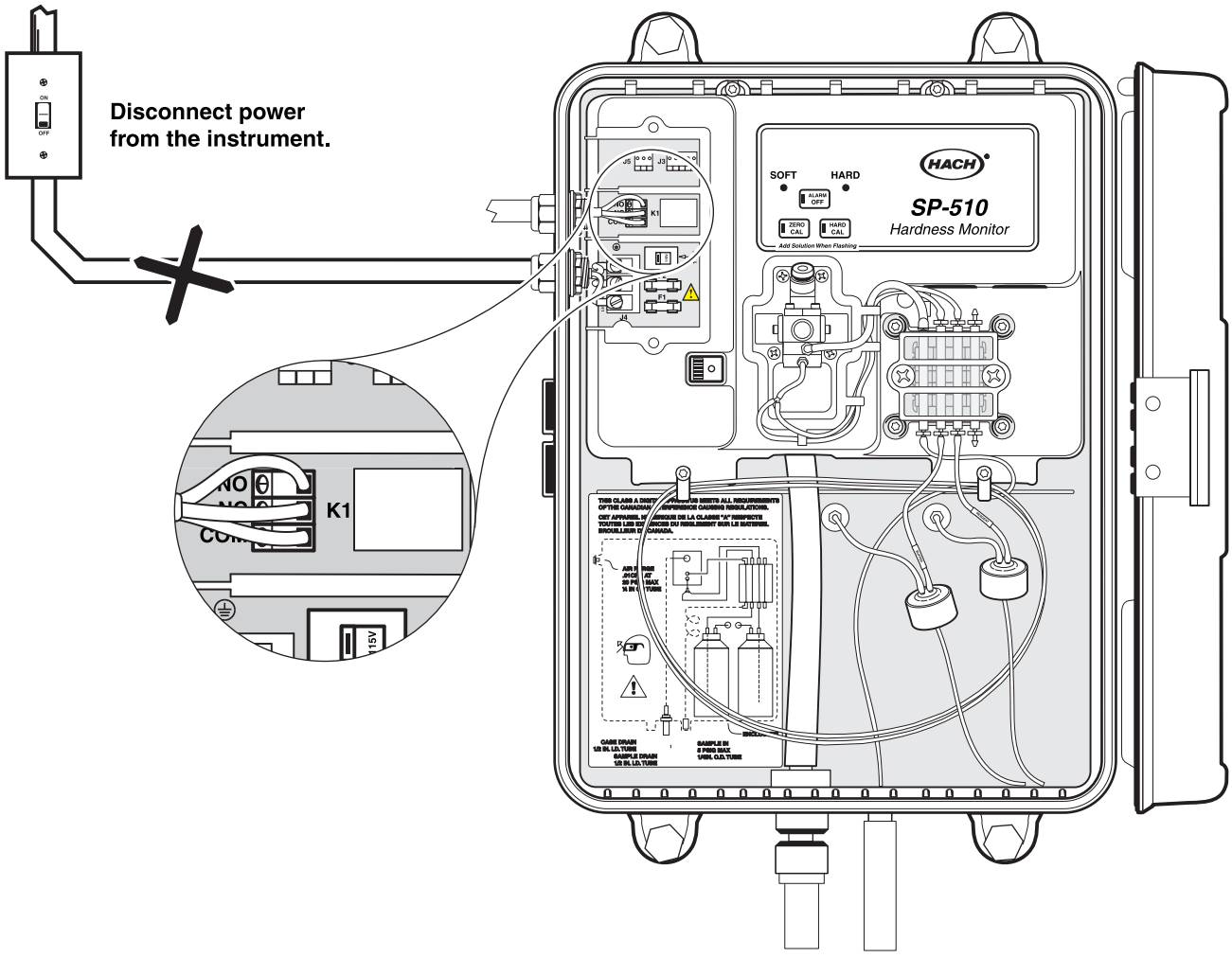


Figure 13 Alarm Connections



2.9 Installing Pump/Valve Pinch Plate

To eliminate the effects of constant pressure on the pump tubes during shipment and storage, the pinch plate and screws for the pump/valve module are shipped in the accessory kit and the pump tubes are held in place with tape.

Reagent flow through the pump/valve module must be from bottom to top. If reversed, fluid mixture will be pumped from the colorimeter sample cell, causing reagent bottles to overflow.

Complete the assembly of the pump/valve module as follows:

1. Remove the tape.
2. Make sure the individual pinch blocks are positioned as shown in *Figure 14* with the dissimilar-shaped block on top.
3. Align the pinch plate on the pump/valve module (refer to *Figure 15*).
4. Install the two screws through the pinch plate and into the pump/valve module. When securing the pinch plate, advance the screws in small increments moving from one screw to the other so that the plate is drawn down evenly. Tighten until snug, do not overtighten.

Figure 14 Installing Pump/Valve Module Pinch Blocks

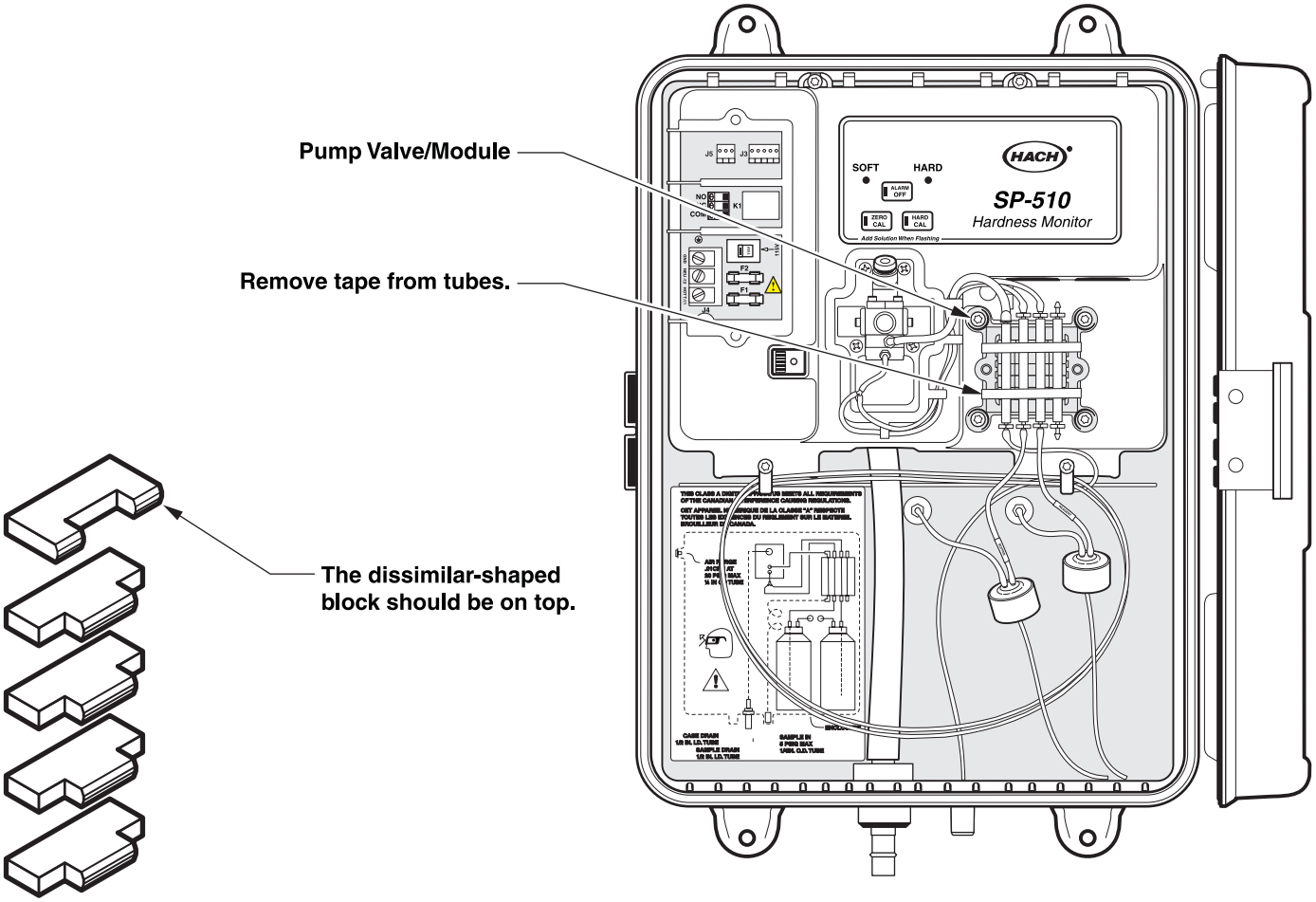
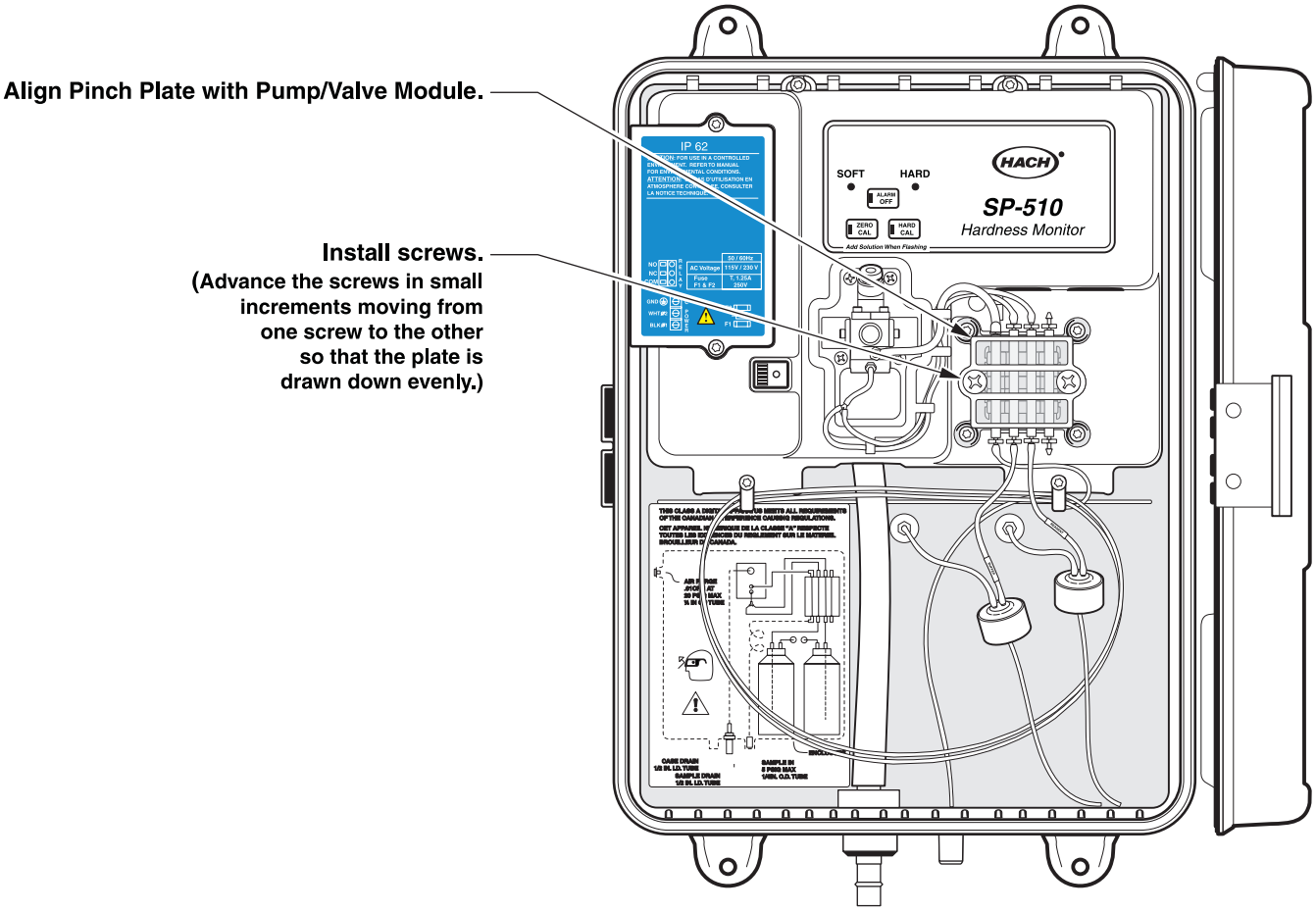


Figure 15 Installing Pump/Valve Module Pinch Plate



START UP

DANGER

Handling chemical samples, standards, and reagents can be dangerous. Review the necessary Material Safety Data Sheets and become familiar with all safety procedures before handling any chemicals.

DANGER

La manipulation des échantillons chimiques, étalons et réactifs peut être dangereuse. Lire les Fiches de Données de Sécurité des Produits (FDSP) et se familiariser avec toutes les procédures de sécurité avant de manipuler tous les produits chimiques.

PELIGRO

La manipulación de muestras químicas, estándares y reactivos puede ser peligrosa. Revise las fichas de seguridad de materiales y familiarícese con los procedimientos de seguridad antes de manipular productos químicos.

GEFAHR

Das Arbeiten mit chemischen Proben, Standards und Reagenzien ist mit Gefahren verbunden. Es wird dem Benutzer dieser Produkte empfohlen, sich vor der Arbeit mit sicheren Verfahrensweisen und dem richtigen Gebrauch der Chemikalien vertraut zu machen und alle entsprechenden Materialsicherheitsdatenblätter aufmerksam zu lesen.

PERIGO

A manipulação de amostras, padrões e reagentes químicos pode ser perigosa. Reveja a folha dos dados de segurança do material e familiarize-se com todos os procedimentos de segurança antes de manipular quaisquer produtos químicos.

SECTION 3 ⚠ STARTING THE INSTRUMENT

CAUTION:
The chemicals used in this procedure may be hazardous if inappropriately handled or accidentally misused. Please read all warnings on the reagent labels. Protective eye wear always is recommended when contact with chemicals is possible.

PRUDENCE
Los productos químicos utilizados en este procedimiento pueden ser peligrosos si se manejan inadecuadamente o se emplean mal accidentalmente. Tenga a bien leer todas las advertencias en las etiquetas de los reactivos. Siempre se recomienda el uso de protectores oculares cuando sea posible el contacto con productos químicos.

CUIDADO
OS produtos químicos usados neste processo podem ser perigosos se manuseados inapropriadamente ou usados acidentalmente de forma indevida. Leia todos os avisos de precauçao contidos nos rótulos de reagentes. Se recomenda sempre o uso de protetores para olhos, quando possa acontecer contato com os produtos químicos.

CUIDADO
Les produits chimiques utilisés dans cette procédure peuvent être dangereux s´ils sont maniés d'une manière inapproprié ou mal utilisés par mégarde. Prière de lire toutes les mises en garde apparaissant sur les étiquettes des réactifs. Il est toujours recommandé de porter des lunettes de protection lorsqu'un contact avec les produits chimiques est possible.

VORSICHT
Die in diesem Verfahren verwendeten Chemikalien können bei unsachgemäßer Handhabung und versehentlichem Mißbrauch gefährlich sein. Bitte alle Warnungen auf den Reagenz-Etiketten Iesen. Es wird empfohlen, in allen Situationen, in denen mit einem Kontakt mit Chemikalien zu rechnen ist, eine Schutzbrille zu tragen.

3.1 Introduction

Preliminary tasks necessary for placing the instrument in operation are defined below in their recommended sequence. Once these preliminary steps are performed, the instrument will be operational.

3.2 Installing the Reagents

Space is provided in the instrument enclosure to hold a 500-mL bottle of each of the two reagents. Using the table below, select the appropriate combination of indicator reagent and buffer reagent for the desired alarm trip point.

Alarm Trip Point	Buffer Cat. No.	Indicator Cat. No.
1 mg/L	27685-49	27690-49
2 mg/L	27685-49	27691-49
5 mg/L	27685-49	27692-49
10 mg/L	27686-49	27692-49
20 mg/L	27687-49	27692-49
50 mg/L	27688-49	27692-49
100 mg/L	27689-49	27692-49

Remove each reagent bottle cap and replace it with the special two-part bottle cap that is connected to the delivery tube inside the instrument. The reagent delivery tubes are labeled BUFFER and INDICATOR. Make sure the delivery tube marked BUFFER is attached to the buffer reagent and the delivery tube labeled INDICATOR is attached to the indicator reagent. Refer to the table above for reagent descriptions and catalog numbers.

3.2.1 Priming the Reagents (optional)

Priming the reagents is an optional procedure that can reduce the start up time to 15 minutes. Proceed as follows:

1. Turn off the sample flow to the instrument.
2. Disconnect the reagent feed line after the “Y” fitting at the colorimeter.
3. Connect a syringe to the tubing coming from the “Y” fitting.
4. Loosen the two screws on the pump pinch plate enough that reagents can be pulled through the reagent lines. Use the syringe to remove the air and fill the lines with reagent.
5. Retighten the screws on the pump pinch plate until just snug. Do not overtighten.
6. Remove the syringe from the tubing and reconnect the fitting on the colorimeter.

3.3 Installing the Stir Bar

A small stir bar for the sample cell in the colorimeter assembly is included in the installation kit furnished with the instrument. The stir bar must be installed for the instrument to operate properly.

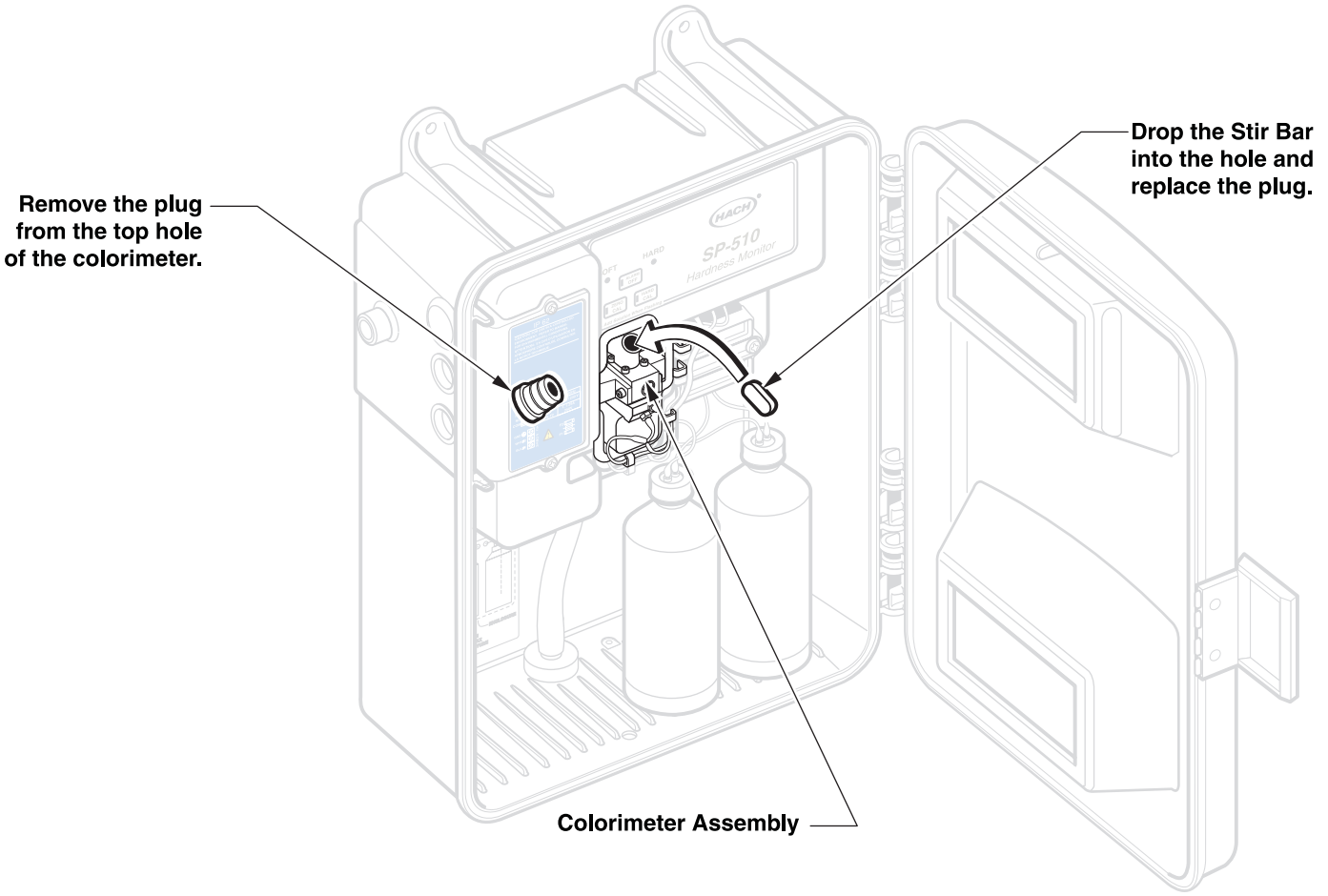
Install the stir bar as follows:

Remove the plug in the top of the colorimeter.

Drop the stir bar into the hole. See *Figure 16*. The bar should rest on the bottom of the vertical bore.

Note: *Make sure the stir bar drops down into the colorimeter and remains in the colorimeter. Do not drop it into the drain line.*

Figure 16 Installing the Stir Bar



3.4 Supplying Sample

Start sample flow through the instrument by opening the supply valve. Allow the pressure in the tubing to stabilize and check for leaks.

Note: *Priming reagents can reduce start-up time, see Section 3.2.1.*

Until the surface of the sample cell becomes completely wetted, bubbles may cling to the sample cell and cause erratic readings. This condition is temporary. Its duration depends on the dissolved oxygen content of the sample.

3.5 Supplying Power

Set the POWER switch to ON and allow the monitor to operate for approximately two hours to ensure the system is completely wetted with reagents and sample.

3.6 Two-point Standardization

Perform standardization after reagent installation or when an optical system component has been replaced. The standardization method first treats the sample to make it hard then treats it to become soft. It is performed as follows:

1. Remove the plug from the top port of the colorimeter. See *Figure 16*.
2. Push **HARD CAL**, the HARD CAL LED will light continuously.
3. Wait until the HARD CAL LED flashes, then add two drops of Magnesium Standard Solution into the top port of the colorimeter.
4. When the LED stops flashing (is continuously lit), wait for the cycle to complete. At the end of the cycle, the LED will turn off to indicate a successful calibration. If the LED starts to flash, push the **HARD CAL** key to acknowledge HARD CAL failure. Repeat *step 2* through *step 4*.
5. Push **ZERO CAL**, the ZERO CAL LED will light continuously.
6. Wait until the ZERO CAL LED flashes, then add two drops of EDTA Solution, 10 g/L, into the top port of the colorimeter.
7. When the LED stops flashing (is continuously lit), wait for the cycle to complete. At the end of the cycle, the LED will turn off to indicate a successful calibration. If the LED starts to flash, push the **ZERO CAL** key to acknowledge ZERO CAL failure. Repeat *step 1* through *step 7*.
8. Replace the plug in the top port of the colorimeter.

SECTION 4 OPERATION

4.1 Instrument Operation

After the instrument is installed on line, the only operator requirements are replenishing buffer and indicator reagents (at approximately two-month intervals) and standardizing the instrument. The instrument is designed to function operator-free for a minimum of two months. Periodically run a visual check to become aware of any problems such as bubbles in the tubing that would indicate an air leak. Be sure the colorimeter plugs are in place.

On power-up, the green LED (SOFT) will flash. It will continue to flash until the first reading is obtained. Each cycle takes two minutes. As long as the hardness of the sample is below the alarm point value of the selected reagent, the SOFT indicator will be illuminated. The HARD indicator will light only when the sample-reagent mixture measurement exceeds the trip point for two successive measurements. The alarm circuit relay will actuate and the HARD indictor will light. Pressing **ALARM OFF** will deactivate the alarm relay. The ALARM OFF indicator will be illuminated when the alarm relay is deactivated.

MAINTENANCE

DANGER

Some of the tasks in this section of the manual have safety issues associated with them. Because the potential for injury to individuals and equipment exists when these safety issues are not addressed, Hach Company strongly recommends that qualified personnel conduct the maintenance, and that all maintenance personnel review the associated instructions carefully.

PELIGRO

Algunas de las tareas comprendidas en esta sección del manual pueden ocasionar daños a las personas y al material si no observan la medidas de suguridad. Hach Company recomienda encarecidamente que el material sea Mantenimiento por un personal cualificado y que el personal encargado de la Mantenimiento lea atentamente estas instrucciones.

PERIGO

A execução de algumas tarefas previstas nesta secçao do manual pode causar ferimentos às pessoas ou estragos no equipamento se não forem observadas precauções de suranca. A Hach Company recomenda vivamente que o equipmento seja Manutenção por pessoal qualificado e que todas as pessoas afectadas à sua Manutenção leiam atentamente estas instruções.

DANGER

Certaines tâches dans ce chapitre du mode d'emploi peuvent causer des blessures aux personnes et endommager le matériel si les consignes de sécurité ne sont pas suivies. Hach Company recommande vivement que l'Entretien soit faite par du personnel qualifié et que toutes les personnes effectuant l'Entretien lisent attentivement ces instructions.

GEFAHR

Einige der in diesem Abschnitt der Betriebsanleitung beschriebenen Arbeiten können bei Nichtbeachtung der Sicherheitsvorschriften zu Verletzungen von Personen oder Schäden am Gerät führen. Es wird dringend empfohlen, die Wartung ausschließlich von qualifiziertem Personal duchführen zu lassen; mit der Wartung befaßte Personen sollten diese Anweisungen aufmerksam lesen.

SECTION 5 ⚠ MAINTENANCE

CAUTION:
The chemicals used in this procedure may be hazardous if inappropriately handled or accidentally misused. Please read all warnings on the reagent labels. Protective eye wear always is recommended when contact with chemicals is possible.

PRUDENCE
Los productos químicos utilizados en este procedimiento pueden ser peligrosos si se manejan inadecuadamente o se emplean mal accidentalmente. Tenga a bien leer todas las advertencias en las etiquetas de los reactivos. Siempre se recomienda el uso de protectores oculares cuando sea posible el contacto con productos químicos.

CUIDADO
OS produtos químicos usados neste processo podem ser perigosos se manuseados inapropriadamente ou usados acidentalmente de forma indevida. Leia todos os avisos de precauçao contidos nos rótulos de reagentes. Se recomenda sempre o uso de protetores para olhos, quando possa acontecer contato com os produtos químicos.

CUIDADO
Les produits chimiques utilisés dans cette procédure peuvent être dangereux s´ils sont maniés d'une manière inapproprié ou mal utilisés par mégarde. Prière de lire toutes les mises en garde apparaissant sur les étiquettes des réactifs. Il est toujours recommandé de porter des lunettes de protection lorsqu'un contact avec les produits chimiques est possible.

VORSICHT
Die in diesem Verfahren verwendeten Chemikalien können bei unsachgemäßer Handhabung und versehentlichem Mißbrauch gefährlich sein. Bitte alle Warnungen auf den Reagenz-Etiketten lesen. Es wird empfohlen, in allen Situationen, in denen mit einem Kontakt mit Chemikalien zu rechnen ist, eine Schutzbrille zu tragen.

5.1 ⚠ Scheduled Maintenance

5.1.1 Replenishing the Reagents

One 500-mL bottle each of buffer and indicator solution lasts approximately two months. Discard the old containers with any unused contents and install the new bottles as described in *Section 3.2*.

5.1.2 Replacing the Pump Tubes

Over a period of time, the clamping action of the pump/valve module will soften the tubing and cause it to collapse and obstruct liquid flow. This breakdown is accelerated at high temperatures. Therefore, the following replacement schedules, based on ambient operating temperature, are recommended: below 27 °C (80 °F), replace at six-month intervals; above 27 °C, replace at three-month intervals.

Pump tubes must be cut to length from one of two coils of tubing supplied in the accessory kit and installed in place of the tubes being removed. Replace the pump tubes as follows:

1. Shut off sample flow to the instrument and set the POWER switch to OFF.

2. Remove the two screws securing the pinch plate to the pump/valve module. See *Figure 15* on page *32*. Loosen in small increments, moving from one screw to the other to allow tension to be relieved evenly. Remove the plate.

3. Disconnect the pump tubes from the inlet and outlet fittings and discard the tube assemblies.

4. Cut two 2-inch lengths of 1/16” ID tubing (white) and two 2-inch lengths of 0.043" ID tubing (brown). Install one 1/16 to 1/8 barb elbow fittings in one of the 1/16" ID tubes (white) and 1/16” barb union fittings in the three remaining tubes. Although one of the pump tubes is not used for fluid flow, it must be included to provide even compression on all four tubes.

Note: *Priming reagents can reduce start-up time, see Section 3.2.1.*

5. Install the two screws through the pinch plate and into the pump/valve module. When securing the pinch plate, advance the screws in small increments moving from one screw to the other so that the plate is drawn down evenly. Tighten until snug, do not overtighten.

6. Set the POWER switch to ON and restore sample flow through the instrument. Allow the instrument to run for approximately one hour to fill the reagent lines.

5.1.3 Tubing Replacement

Figure 17 illustrates the tube routing configuration for the Hardness Monitor. Numbers on the pictorial correspond to the item numbers listed in the legend where the size, catalog number and quantity also are given. The length given in the description tells how long that particular tubing segment should be; the operator must cut a piece to that length from a coil of the proper tubing.

The catalog number given for the tubing in the legend identifies the coil of tubing from which to cut the segment and not the number for the segment itself. When installing new tubing it is helpful to dip the ends in hot water before making the connections. It also is recommended that one tube at time be removed and replaced.

Figure 17 Plumbing Diagram

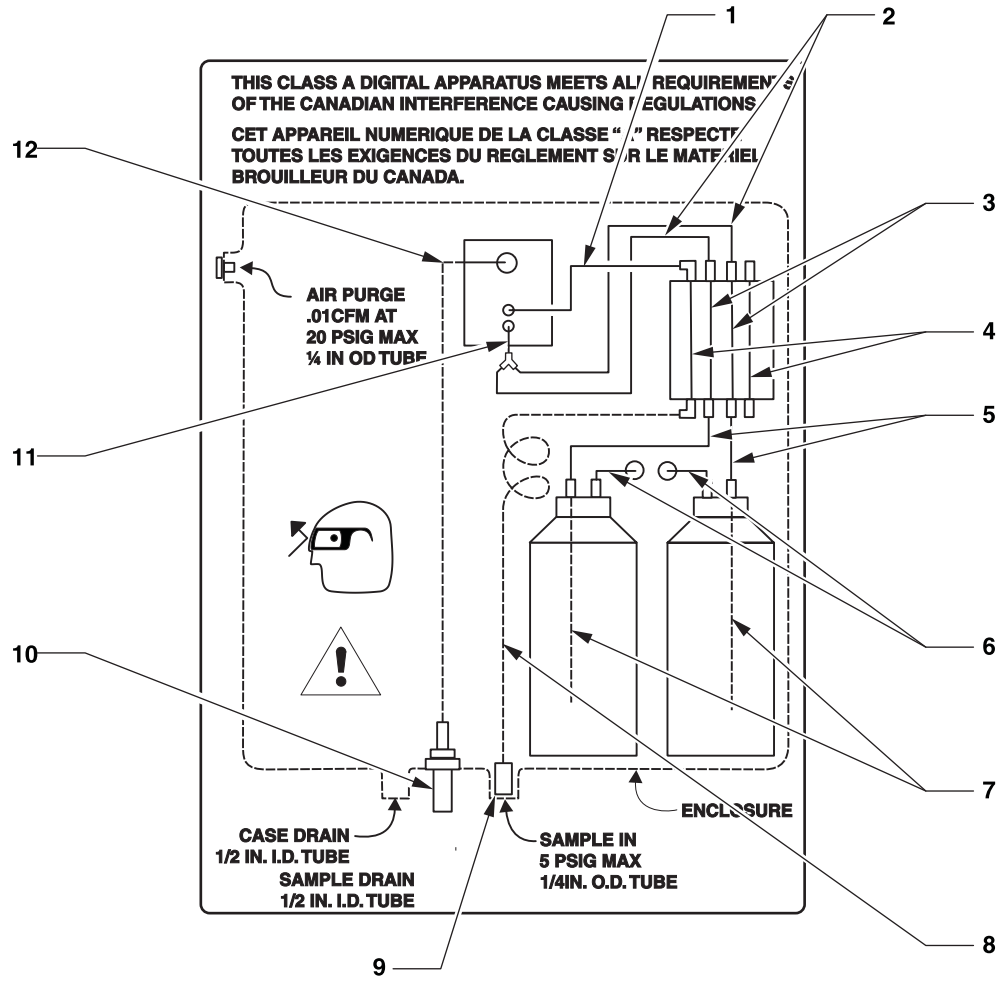


Table 20 Replacement Tubing Lengths for *Figure 17*

Item	Description	Length (Qty)	From...	To...	Catalog Number
1	1/8" ID, 1/4" OD	4.5 inches (1)	Pump Body Out	Colorimeter	43293-00
2	1/32" ID, 3/32" OD	7.5 inches (2)	Pump Body Out	Y-Fitting	44253-00
3	0.042" ID x 0.172 OD	2.0 inches (2)	Pump Body In	Pump Body Out	54121-00
4	1/16" ID, 3/32" OD	2.0 inches (2)	Pump Body In	Pump Body Out	42717-00
5	1/32" ID, 3/32" OD	7.0 inches (2)	Reagent Bottle Cap	Pump Body In	44253-00
6	1/32" ID, 3/32" OD	6.0 inches (2)	Reagent Bottle Cap	Reagent Vent Fitting	44253-00
7	1/32" ID, 3/32" OD	7.0 inches (2)	Reagent Bottle Bottom	Reagent Bottle Cap	44253-00
8	1/8" OD, 1/32" wall	48.0 inches (1)	Sample Bypass Tee	Pump Body In	5189-37
9	1/4" OD x 0.04 W, Black	varies (1)	Sample Conditioning Out	Case Fitting	30616-00
10	1/2" ID	varies (1)	Instrument Drain	Customer Drain	(not supplied)
11	1/32" ID, 3/32" OD	1.0 inch (1)	Y-Fitting	Colorimeter	44253-00
12	0.500" ID x 0.687" OD	12 inches (1)	Colorimeter	Drain Fitting	54108-00

5.2 ⚠ Unscheduled Maintenance

5.2.1 Changing Instrument Alarm Point

Changing the instrument to alarm at a different hardness level is accomplished by installing the appropriate buffer and indicator solutions, see *Section 3.2* on page *35*. Following installation of the appropriate reagents, allow the instrument to run for two hours to purge the old reagents. Recalibrate the instrument.

5.2.2 ⚠ Fuse Replacement

The T, 1.25A, 250V fuse used in this instrument is used for both 115V and 230V operation.

DANGER
Remove power from the instrument when removing or installing a fuse.

PELIGRO
Apagar la electricidad del instrumento al quitar o instalar fusibles.

PERIGO
Desconecte a energia do instrumento ao remover ou instalar um fusível.

DANGER
Couper l'alimentation électrique de l'appareil pour retirer ou installer un fusible.

GEFAHR
Beim Entfernen oder Einsetzen der Sicherung muss die Stromzufuhr zum Gerät unterbrochen werden.

1. Make sure there is no power supplied to the instrument.
2. Remove the customer access cover.
3. Locate the fuse holders (near the terminal strip in the customer wiring compartment). See *Figure 11* on page *29*.

DANGER
For continued protection against fire hazard, replace the fuse only with a fuse of the same type and rating.

PELIGRO
Para una continua protección contra incendios, reemplace los fusibles únicamente por los del tipo y capacidad recomendados.

PERIGO
Para proteçao contínua contra fogo, troque os fusíveis somente por fusíveis do tipo especificado para a força da corrente.

DANGER
Pour assurer la protection contre les risques d'incendies, remplacez les fusibles uniquement par des fusibles du même type et pour la même intensité.

GEFAHR
Zur Wahrung des kontinuierlichen Brandschutzes dürfen die Sicherungen nur mit Sicherungen des gleichen Typs und mit gleichen Stromkennwerten verwendet werden.

4. Remove the two fuses (F1 and F2) and replace them with two new fuses with the same specifications (T, 1.25A, 250V). See *REPLACEMENT ITEMS* on page *53*.
5. Reinstall the customer access cover and resupply power.

5.2.3 Cleaning the Instrument Enclosure

With the enclosure securely latched, use a soft cloth and a mild detergent to wipe the outside of the enclosure. Do not allow moisture to enter the enclosure.

5.2.4 Replacing the Sample Conditioning Filter

To insert the filter into the housing:

1. Unscrew the top of the filter housing. See *Figure 7* on page *25*.
2. Insert the filter element and push until it stays in place.
3. Replace the filter housing top.

5.2.5 Reagent Spill Clean Up Instructions

Wipe up spills with a clean, disposable wipe and discard according to applicable Federal, State and Local regulations.

SECTION 6 TROUBLESHOOTING

In the event the instrument should malfunction, the following troubleshooting guide may be used to help isolate the problem. Please contact the nearest Hach Service Center for assistance or shipping instructions if the instrument should be returned.

Table 21 supplies troubleshooting information for the instrument. After determining the symptom and probable cause, perform the corrective action steps in the order given.

Table 21 Troubleshooting Guide

Symptom	Probable Cause	Corrective Action
Display does not light and the pump motor is not operating		
	No operating power	Check power switch position, fuse, and power cord connections.
Display does not light and the pump motor operates.		
	Problem with power supply	Replace the circuit board.
Display lights and the pump motor does not operate.		
	Low operating power	Verify the line voltage is within specifications.
	Incorrect line voltage selector switch setting	Check the line voltage selector switch position.
	Motor cable not connected to the circuit board	Check the motor cable connection.
	Defective motor	Replace motor.
Reading continually High (Hard)		
	Stir bar not installed	Install stir bar.
	LED not plugged in	Check through view port for orange light.
	Sample not flowing	Turn sample on. Check sample connections. Check sample conditioning filter for blockage.
	Out of reagents	Replace reagents.
LED Hard Flashing		
	Problem saving calibration information to non-volatile memory	Contact Hach Service Department.
	Problem saving alarm disabled status to nonvolatile memory	Contact Hach Service Department.
LED Soft Flashing continuously (for more than 5 minutes) after power-up		
	Optical path blocked or optical switch not working	Allow the instrument to complete the cycle. Determine if the motor is running. Cycle Power, wait 5 minutes. Contact Hach Service Department.

GENERAL INFORMATION

At Hach Company, customer service is an important part of every product we make.

With that in mind, we have compiled the following information for your convenience.

REPLACEMENT ITEMS

REPLACEMENT PARTS AND REAGENTS

Description	Unit	Cat. No.
Maintenance Kit	each	55165-00
Installation Kit	each	55164-00
Buffer 1, 2, 5	500 mL	27685-49
Buffer 10	500 mL	27686-49
Buffer 20	500 mL	27687-49
Buffer 50	500 mL	27688-49
Buffer 100	500 mL	27689-49
Circuit Board Assembly	each	55160-00
Colorimeter Flow-cell Assembly	each	55162-00
Colorimeter Drain Plug	each	51036-00
Cam/Coupler Assembly	each	54105-00
EDTA Solution, 10 g/L, 1 oz. dropping bottle	each	1021-33
Follower Block, Reagent	each	42741-00
Follower Block, Sample	each	42742-00
Fuse, (T, 1.25A, 250V) UL/CSA/CE Accepted, 2 needed	each	55167-00
Indicator 1 Reagent	500 mL	27690-49
Indicator 2 Reagent	500 mL	27691-49
Indicator 5-100	500 mL	27692-49
LED	each	43508-00
LED Housing, Lower	each	54127-00
LED Housing, Upper	each	54128-00
Magnesium Standard Solution, 10 g/L, 1 oz. dropping bottle	each	1022-33
Motor Assembly	each	54119-00
Photo Detector	each	54113-00
Pressure Plate	each	54118-00
Screen, 40-mesh, replacement for Sample Conditioning	each	54184-00
Stir Bar, Micro, 3mm x 8mm	each	54129-00
Stir Coil	each	54111-00
Thumb Screw, to hold Pressure Plate	2	54101-00
Tubing, 1/16 ID, white		42717-00
Tubing, 0.043” ID, brown		54121-00

OPTIONAL ACCESSORIES

Seal, Oil-tight	each	42210-00
Power Cord Kit, for 115 V North American Operation	each	46306-00
Power Cord Kit, for 230 V European Operation	each	46308-00

HOW TO ORDER

By Telephone:
6:30 a.m. to 5:00 p.m. MST
Monday through Friday
(800) 227-HACH (800-227-4224)

By Fax:
(970) 669-2932

By Mail:
Hach Company
P.O. Box 389
Loveland, Colorado 80539-0389 U.S.A.

Ordering information by E-mail:
orders@hach.com

Information Required

- Hach account number (if available)
- Your name and phone number
- Purchase order number
- Brief description or model number
- Billing address
- Shipping address
- Catalog number
- Quantity

Technical and Customer Service (U.S.A. only)

Hach Technical and Customer Service Department personnel are eager to answer questions about our products and their use. Specialists in analytical methods, they are happy to put their talents to work for you. Call **1-800-227-4224** or E-mail **techhelp@hach.com**.

International Customers

Hach maintains a worldwide network of dealers and distributors. To locate the representative nearest you, send E-mail to **intl@hach.com** or contact:

Hach Company World Headquarters; Loveland, Colorado, U.S.A.
Telephone: (970) 669-3050; FAX: (970) 669-2932

In Canada:
Hach Sales & Service Canada Ltd.; Manitoba, Canada
Telephone: (204) 632-5598; FAX: (204) 694-5134

REPAIR SERVICE

Authorization must be obtained from Hach Company before sending any items for repair. Please contact the HACH Service Center serving your location.

In the United States:
Hach Company
100 Dayton Avenue
Ames, Iowa 50010
(800) 227-4224 (U.S.A. only)
Telephone: (515) 232-2533
FAX: (515) 232-1276

In Canada:
Hach Sales & Service Canada Ltd.
1313 Border Street, Unit 34
Winnipeg, Manitoba
R3H 0X4
(800) 665-7635 (Canada only)
Telephone: (204) 632-5598
FAX: (204) 694-5134
E-mail: canada@hach.com

In Latin America, the Caribbean, the Far East, the Indian Subcontinent, Africa, Europe, or the Middle East:
Hach Company World Headquarters,
P.O. Box 389
Loveland, Colorado, 80539-0389 U.S.A.
Telephone: (970) 669-3050
FAX: (970) 669-2932
E-mail: intl@hach.com

WARRANTY

Hach warrants most products against defective materials or workmanship for at least one year from the date of shipment; longer warranties may apply to some items.

HACH WARRANTS TO THE ORIGINAL BUYER THAT HACH PRODUCTS WILL CONFORM TO ANY EXPRESS WRITTEN WARRANTY GIVEN BY HACH TO THE BUYER. EXCEPT AS EXPRESSLY SET FORTH IN THE PRECEDING SENTENCE, HACH MAKES NO WARRANTY OF ANY KIND WHATSOEVER WITH RESPECT TO ANY PRODUCTS. HACH EXPRESSLY DISCLAIMS ANY WARRANTIES IMPLIED BY LAW, INCLUDING BUT NOT BINDING TO ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

LIMITATION OF REMEDIES: Hach shall, at its option, replace or repair nonconforming products or refund all amounts paid by the buyer. **THIS IS THE EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY.**

LIMITATION OF DAMAGES: IN NO EVENT SHALL HACH BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND FOR BREACH OF ANY WARRANTY, NEGLIGENCE, ON THE BASIS OF STRICT LIABILITY, OR OTHERWISE.

This warranty applies to Hach products purchased and delivered in the United States.

Catalog descriptions, pictures and specification, although accurate to the best of our knowledge, are not guarantee or warranty.

For a complete description of Hach Company's warranty policy, request a copy of our Terms and Conditions of Sale for U.S. Sales from our Customer Service Department.

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HACH COMPANY
WORLD HEADQUARTERS
P.O. Box 389
Loveland, Colorado 80539-0389
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FAX: (970) 669-2932

FOR TECHNICAL ASSISTANCE, PRICE INFORMATION AND ORDERING:
In the U.S.A. - **Call toll-free 800-227-4224**
Outside the U.S.A. - **Contact the HACH office or distributor serving you.**
On the Worldwide Web - **www.hach.com**; E-mail - **techhelp@hach.com**