

Catalog Number 54400-18

# **CL17 CHLORINE ANALYZER**

INSTRUMENT MANUAL

06/04 4ed

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Catalog Number 54400-18

# CL17 Chlorine Analyzer

**INSTRUMENT MANUAL**

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# Safety Precautions

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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 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 operation and/or safety information.



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

-  *Section 1.2 Instrument Environmental Considerations on page 11*
-  *Section 1.4 Plumbing Connections on page 14*
-  *Section 1.7 Optional Air Purge on page 20*
-  *Section 1.8 Electrical Connections on page 20*
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-  *Section 1.8.4 Alarm Connections on page 24*
-  *Section 2.2 Introduction on page 32*
-  *Section 2.7.5.1 Calibration on Known Standards on page 41*

# Safety Precautions

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*Section 3 Maintenance on page 45*



*Section 3.1 Scheduled Maintenance on page 45*



*Section 3.2.1 Fuse Replacement on page 48*



*Section 3.2.3 Cleaning the Colorimeter on page 49*

# Specifications

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*Specifications are subject to change without notice.*

## General

**Display:** LCD, 3½-digit measurement readout and six-character alphanumeric scrolling text line.

**Enclosure:** IP62-rated with the gasketed door latched

**Instrument Dimensions:** 34.3 cm width x 41.9 cm height x 19.1 cm depth (13.5 in. x 16.5 in. x 7.5 in.)

**Mounting:** Wall mount

**Instrument Shipping Weight:** 11.3 kg (25 lb)

## Sample Requirements

**Sample Flow Rate to Sample Conditioning:** 200 to 500 mL/min

**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 to 75 psig (with sample tube level with the bottom of the instrument—see [Figure 6 on page 19](#))

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

**Inlet Fitting:** at instrument—¼-inch OD polyethylene tubing with quick-disconnect fitting

**Drain Fitting:** ½-inch hose barb

**Sample Conditioning:** Use provided sample conditioning

## Reagent/Standard Requirements

**Maximum Reagent Usage:** one-half liter per month (each of the two reagents)

**Reagent Containers:** High-density polyethylene (2) ½-liter bottles.

**Reagent Containment:** Reagent bottles are contained inside the analyzer enclosure and are vented externally.

## Electrical

**Power Requirements:** 100–115/230 V ac (selection switch inside instrument); 95 VA, 50/60 Hz, 2.5 Amp fuse

**Power Connection:** Connection made by three wire barrier terminal block through a ½-inch conduit hole in the case. Wire range: 12–18 AWG.

**Installation Category:** II

# Specifications

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**Alarm Relay Outputs:** Two unpowered SPDT relays each rated at 5 A resistive, 240 V ac maximum. Can function as sample set point alarms (high or low) or as a system warning indicator or a system alarm indicator. Use either high voltage (greater than 30 V RMS and 42.2 V PEAK or 60 V dc) or low voltage (less than 30 V RMS and 42.2 V PEAK or 60 V dc). Do not use a combination of high and low voltage.

**Alarm Connection:** Connection made by a removable three wire plug through a ½-inch conduit hole in the case. Wire range: 12–18 AWG.

**Recorder Output:** One isolated recorder output, 4–20 mA (can be adjusted to 0–20 mA). Recommended load impedance 3.6 to 500 ohms.

**Recorder Output Connections:** Connection made by a removable three wire plug through a ½-inch conduit hole in the case. Wire range: 12–22 AWG.

## Optical

**Light Source:** Class 1 LED (light emitting diode) with a peak wavelength of 520 nm; 50,000 hours estimated minimum life

## Performance

**Operating range:** 0–5 mg/L free or residual chlorine

**Accuracy:** ±5% or ±0.035 ppm whichever is greater

**Precision:** ±5% or ±0.005 ppm whichever is greater

**Detection Limit:** 0.035 ppm

**Cycle Time:** 2.5 minutes

**Calibration:** Uses default calibration curve

**Power Switch:** User accessible power switch is required.

**Recorder:** One 4-20 mA/0–20 mA

**Alarm Relay Outputs:** Two SPDT relays, 5A resistive load at 240 V ac. Can function as sample set point alarms (high or low) or as a system warning indicator or a system alarm indicator.

**Optional External Outputs:** Hach AquaTrend® Network Interface

## Environmental

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

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

**Humidity:** 90% at 40 °C (90% at 104 °F)

**Air Purge (optional):** 0.1 CFM instrument quality air at 20 psig maximum, ¼-inch OD tubing





# INSTALLATION

## **DANGER**

*Some of the following manual sections contain information in the form of warnings, cautions and notes that require special attention. Read and follow these instructions carefully to avoid personal injury and damage to the instrument. Only personnel qualified to do so should conduct the installation/maintenance tasks described in this portion of the manual.*

## **DANGER**

*Certains des chapitres suivants de ce mode d'emploi contiennent des informations sous la forme d'avertissements, messages de prudence et notes qui demandent une attention particulière. Lire et suivre ces instructions attentivement pour éviter les risques de blessures des personnes et de détérioration de l'appareil. Les tâches d'installation et d'entretien décrites dans cette partie du mode d'emploi doivent être seulement effectuées par le personnel qualifié pour le faire.*

## **PELIGRO**

*Algunos de los capítulos del manual que presentamos contienen información muy importante en forma de alertas, notas y precauciones a tomar. Lea y siga cuidadosamente estas instrucciones a fin de evitar accidentes personales y daños al instrumento. Las tareas de instalación y mantenimiento descritas en la presente sección deberán ser efectuadas únicamente por personas debidamente cualificadas.*

## **GEFAHR**

*Einige der folgenden Abschnitte dieses Handbuchs enthalten Informationen in Form von Warnungen, Vorsichtsmaßnahmen oder Anmerkungen, die besonders beachtet werden müssen. Lesen und befolgen Sie diese Instruktionen aufmerksam, um Verletzungen von Personen oder Schäden am Gerät zu vermeiden. In diesem Abschnitt beschriebene Installations- und Wartungsaufgaben dürfen nur von qualifiziertem Personal durchgeführt werden.*

## **PERIGO**

*Algumas das seguintes secções do manual contêm informações em forma de advertências, precauções e notas que requerem especial atenção. Leia e siga atentamente as presentes instruções para evitar ferimentos pessoais e não danificar o instrumento. As tarefas de instalação/manutenção descritas nesta parte do manual só poderão ser executadas por pessoal qualificado para o fazer.*



**DANGER**

*This instrument should be installed by qualified technical personnel to ensure adherence to all applicable electrical and plumbing codes.*

**DANGER**

*Cet appareil doit être installé par du personnel technique qualifié, afin d'assurer le respect de toutes les normes applicables d'électricité et de plomberie.*

**PELIGRO**

*Este instrumento debe ser instalado por personal técnico capacitado para asegurar el cumplimiento con todos los códigos eléctricos y de plomería aplicables.*

**GEFAHR**

*Um zu gewährleisten, daß alle elektrischen und sanitärinstallationstechnischen VDE-Vorschriften und gegebenenfalls die Zusatzvorschriften der zuständigen Elektrizitäts- und Wasserwerke erfüllt werden, darf dieses Gerät nur von geschultem Fachpersonal installiert werden.*

**PERIGO**

*Este instrumento deve ser instalado por pessoal técnico qualificado para assegurar o cumprimento de todas as normas elétricas e de canalização aplicáveis.*

## 1.1 Unpacking the Instrument

Remove the analyzer from its shipping carton and inspect it for any damage. Verify that the Installation Kit, Cat. No. 55164-00, and Maintenance Kit, Cat. No. 54443-00, 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 on [Replacement Items on page 67](#).

## 1.2 Instrument Environmental Considerations

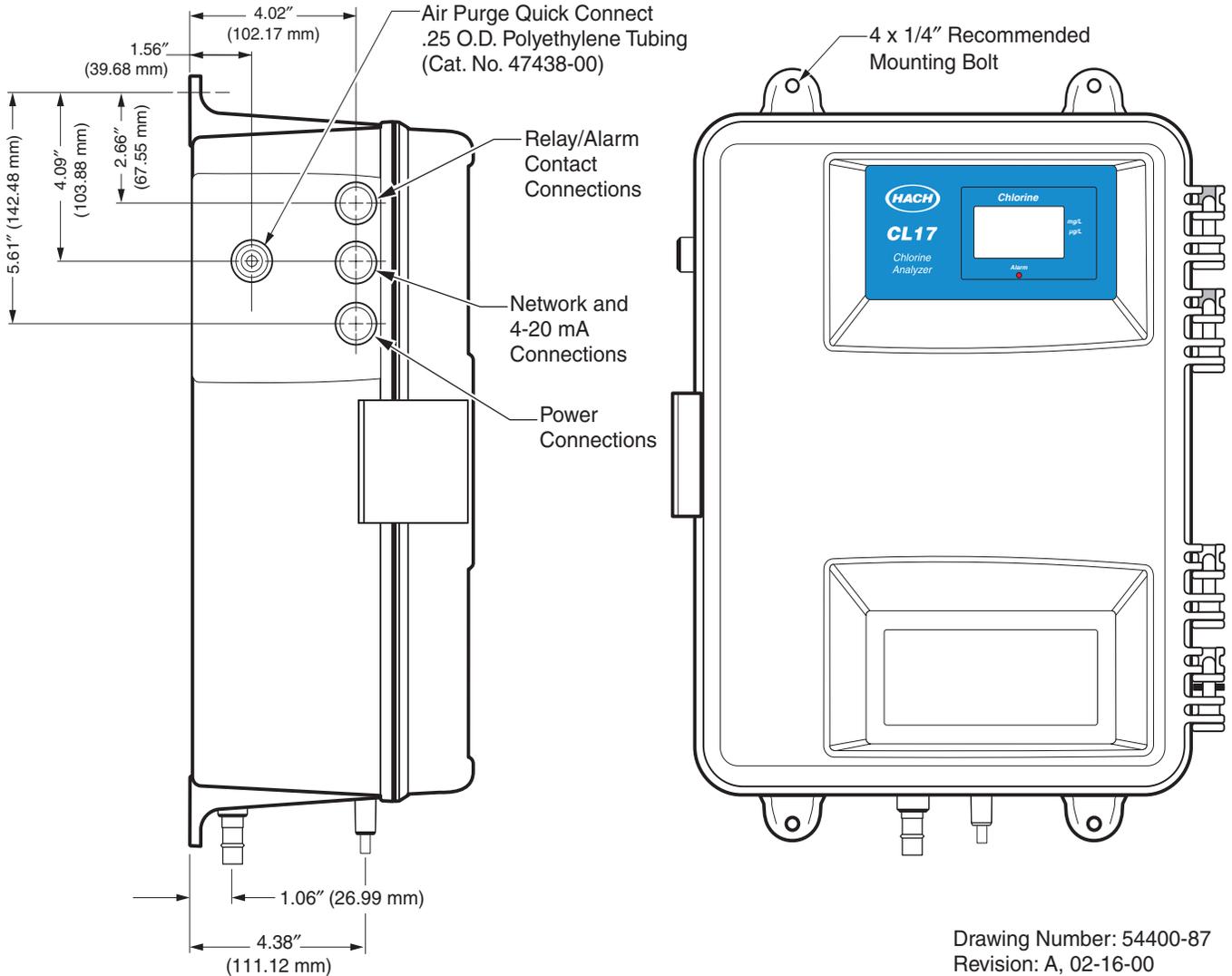
The instrument enclosure is designed for general-duty, indoor installation with a nearly constant ambient temperature between 5° and 40 °C (18° to 104 °F). The enclosure environmental rating is IP62 with the door closed and latched. Do not mount the instrument in direct sunlight; shield from dripping water.

## 1.3 Mounting the Instrument on the Wall

The instrument case is designed for wall mounting. Refer to [Figure 1](#), [Figure 2](#), and [Figure 3](#) 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 during each cycle. Leave adequate clearance at the sides and bottom of the instrument case for plumbing and wiring connections.

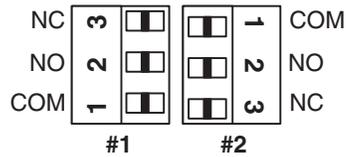
# Section 1

**Figure 1 CL17 Instrument Dimensions (1 of 3)**

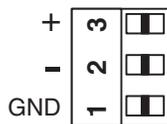


Drawing Number: 54400-87  
Revision: A, 02-16-00

**RELAYS**



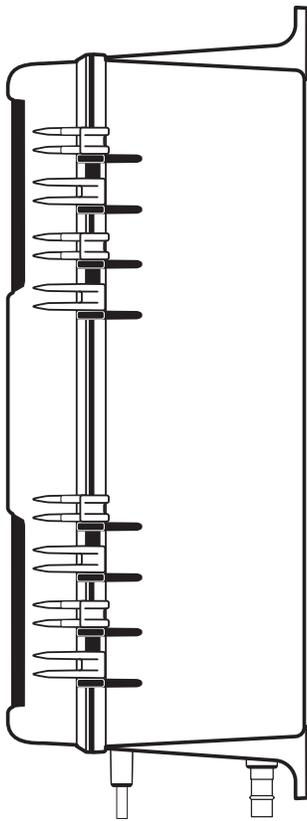
**RECORDER**



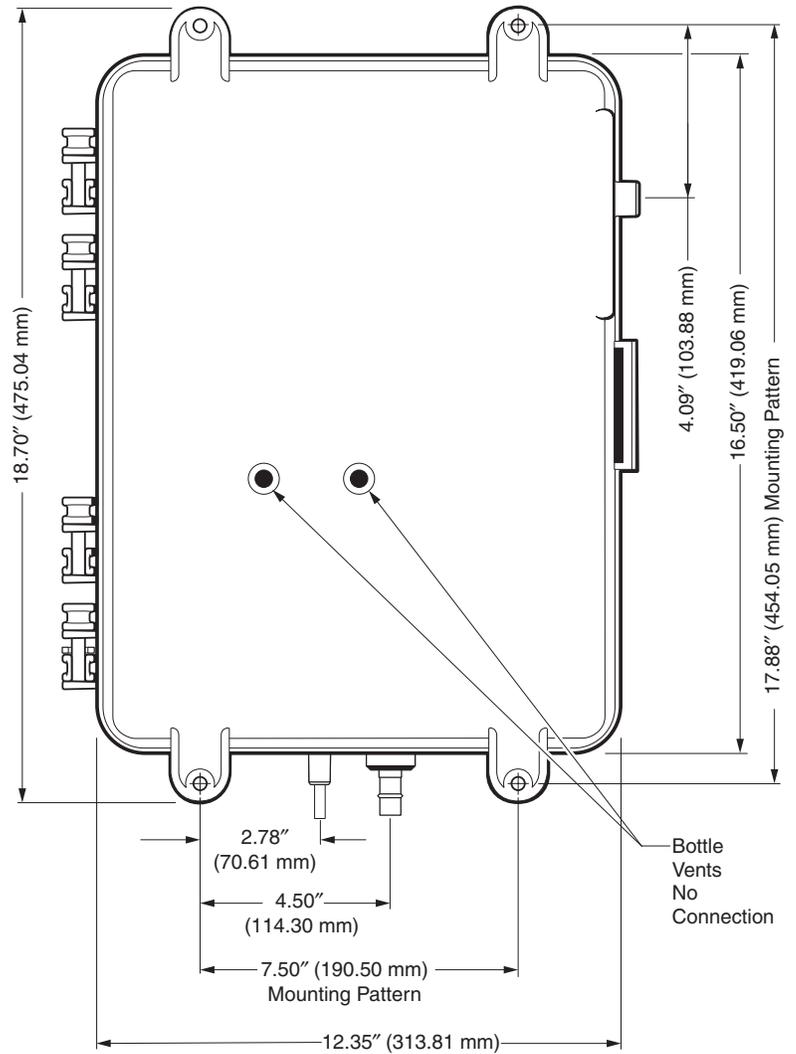
Customer Connections to Analyzer

Power: 100-115/230 Vac, 50/60 Hz, 95 VA (fused at 2.50A)

**Figure 2 CL17 Instrument Dimensions (2 of 3)**

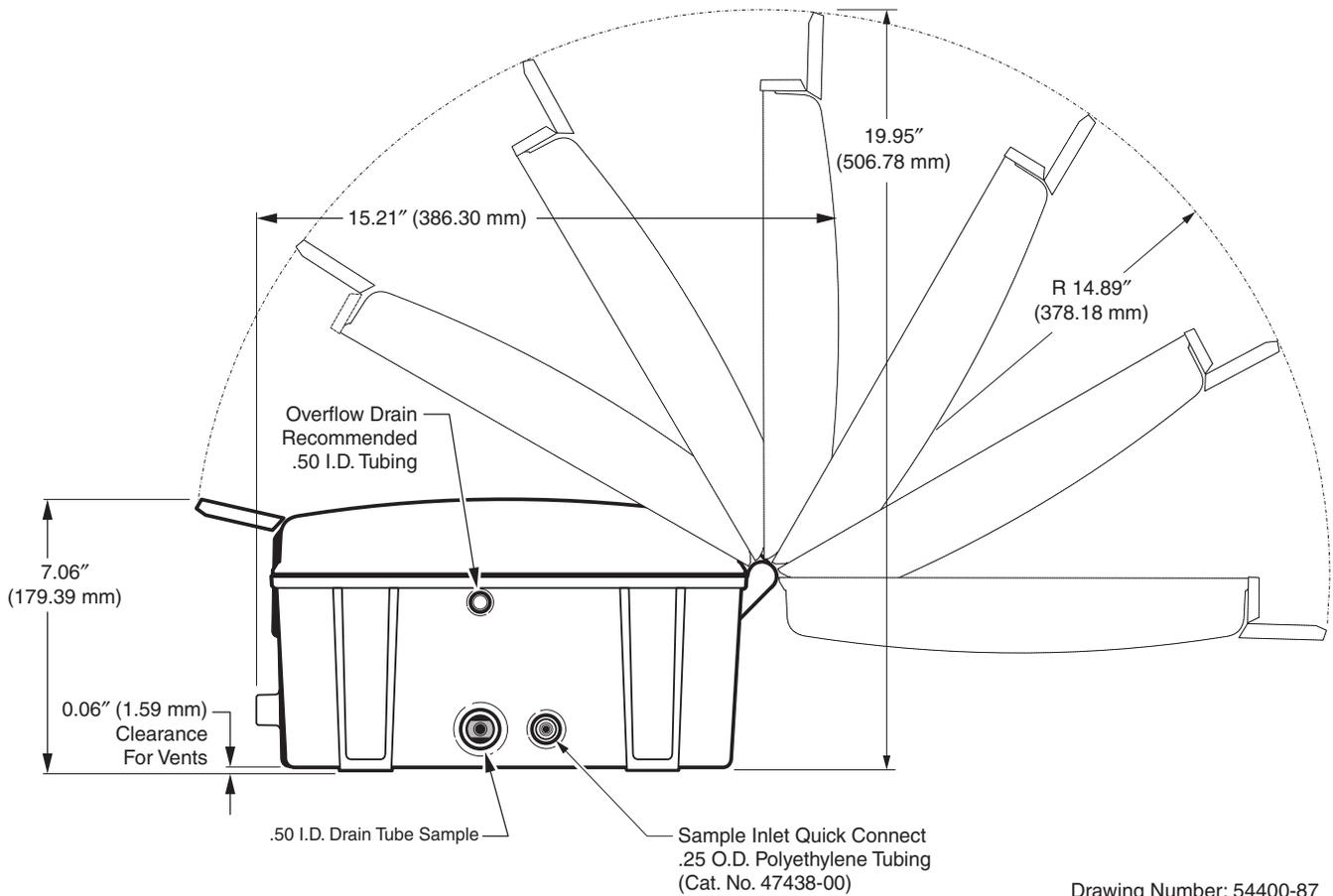


Drawing Number: 54400-87  
Revision: A, 02-16-00



# Section 1

Figure 3 CL17 Instrument Dimensions (3 of 3)



Drawing Number: 54400-87  
Revision: A, 02-16-00

## 1.4 Plumbing Connections

**Note:** The sample drain contains analysis wastes, which include both sample and chemical reagents. The enclosure drain produces no waste under normal use. However, in the event of spills or leaks, some waste may be produced. Although the chemicals used are of low concentration, it is best to check with local authorities concerning proper disposal of waste from this product.

Sample inlet and drain connections are made on the bottom of the instrument using a quick connect fitting for ¼-inch OD tubing. See Figure 4. 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 come loose when water pressure is applied. The sample drain fitting is sized for ½-inch ID flexible tubing (not supplied).

## 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.

## 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.

## 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.

## 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.

## 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.

## CAUTION

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

## PRUDENCE

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

## CUIDADO

Este analisador deve ser utilizado apenas em amostras de água.

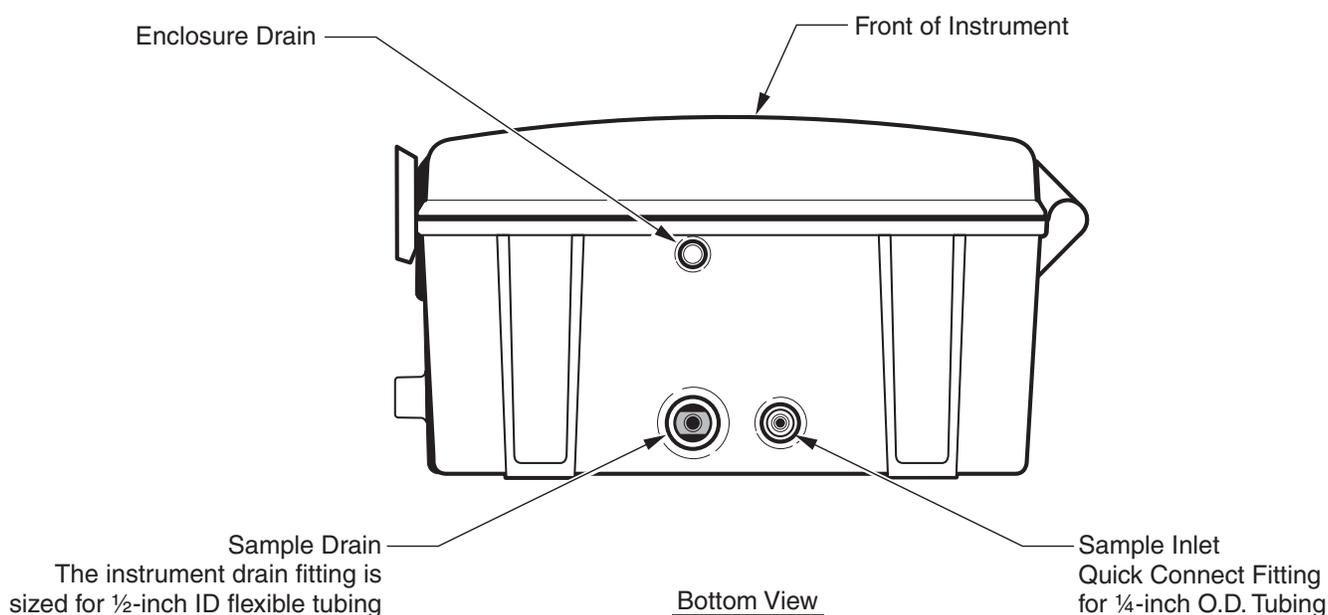
## VORSICHT

Dieser Analysator darf nur für Wasserproben benutzt werden.

## CUIDADO

Este analizador está diseñado para muestras acuosas solamente.

Figure 4 Plumbing Connections



# Section 1

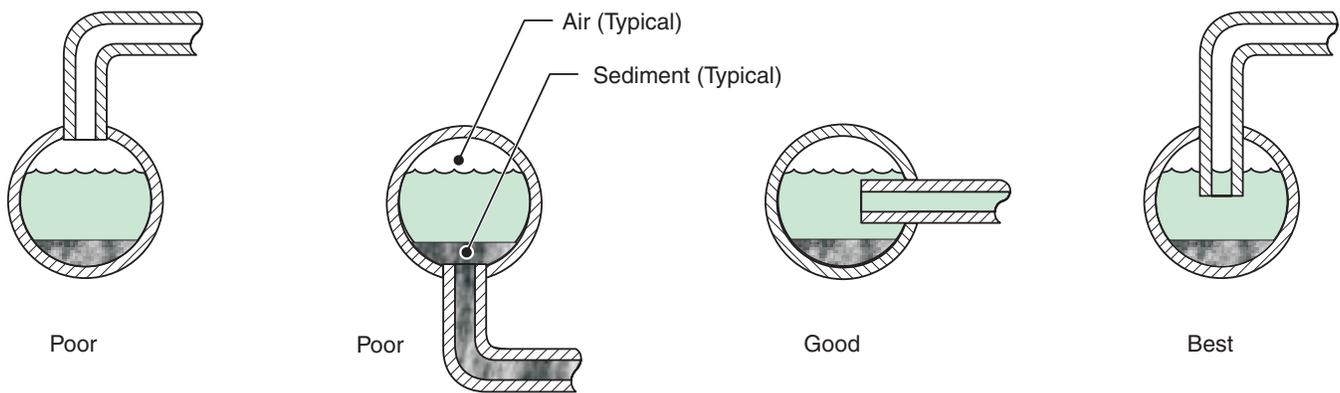
## 1.5 Installing the Sample Line

Selecting a good, representative sampling point is important for optimum performance of your instrument. The sample analyzed must be representative of the condition of the entire system. Erratic readings will be seen if sample is drawn from a location too close to points of chemical additions to the process stream, if mixing is inadequate, or if the chemical reaction is incomplete.

If the sample pressure into the instrument exceeds 5 psig at the analyzer inlet, flooding and instrument damage may result unless the sample conditioning kit is installed.

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 5](#).

**Figure 5 Sample Line Location in the Process Stream**



## 1.6 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 adjust it to help keep the strainer clean longer, or adjust it to 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 6](#). 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.

## 1.6.1 Assembling the Sample Conditioning Kit

Refer to the tips below and to the complete system diagram in [Figure 6](#) 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.

## 1.6.2 Using the Sample Conditioning Kit

Assemble the head height regulator (stand-pipe) and filter as shown in [Figure 6](#). Make sure the sample pressure to the sample conditioning is between 1.5 and 75-psig for proper operation.

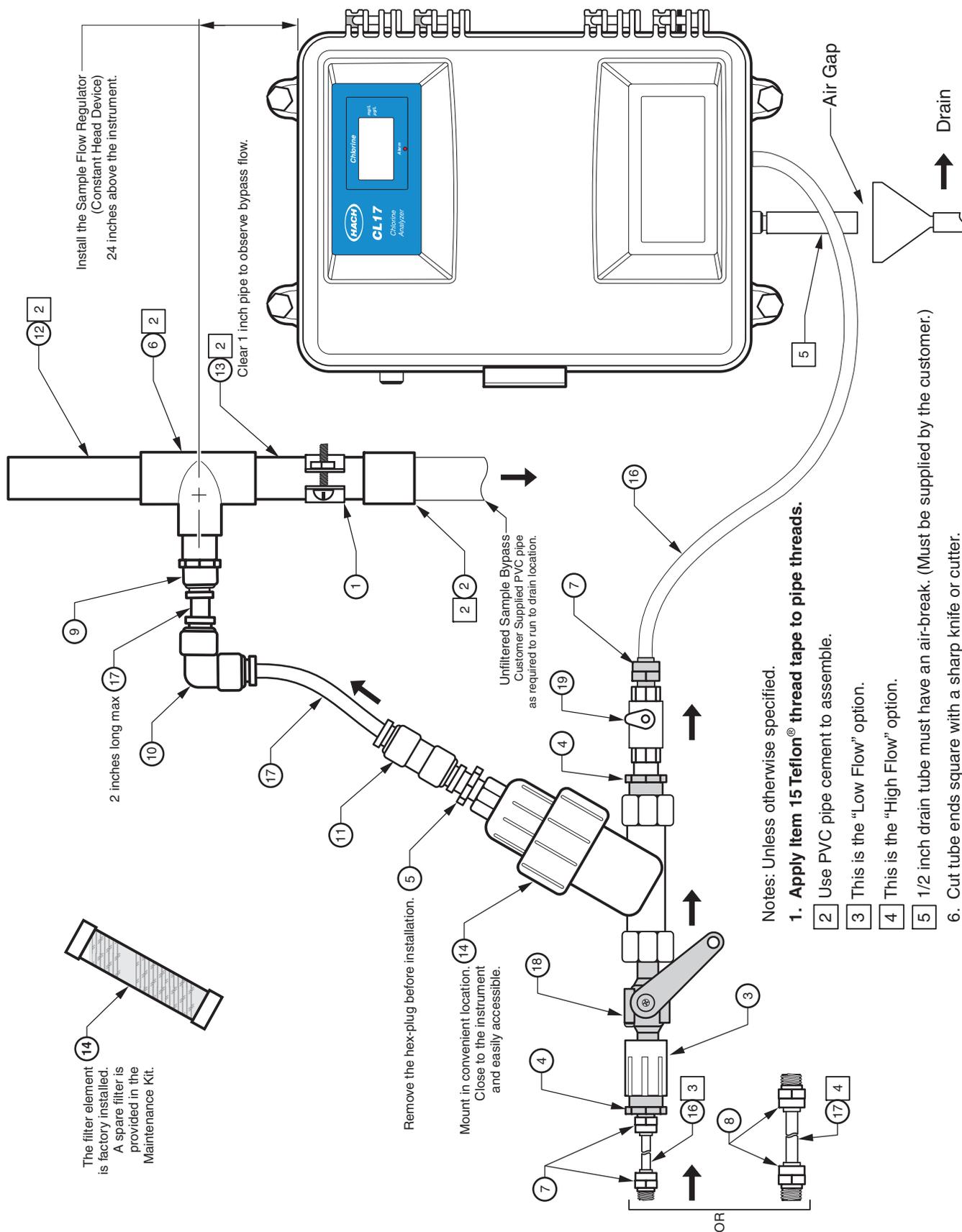
1. Set flow by adjusting the ball valve (item 18, in [Figure 6](#)). The valve is fully closed when the lever is perpendicular to the valve body and fully open when the lever is parallel with the valve body.
2. Observe the flow in the unfiltered sample bypass (clear tube, item 13 in [Figure 6](#)). Make 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.

# Section 1

**Table 1 Sample Conditioning Parts List**

<b>Item</b>	<b>Description</b>	<b>Qty</b>	<b>Catalog Number</b>
1	Clamp, Conduit Hanger, 1-inch	4	47349-00
2	Coupling, 1-inch, SCH 40, PVC pipe	1	54175-00
3	Coupling, ½-inch FPT x ½ FPT PVC	1	54176-00
4	Fitting, Reduce Bushing, PVC, Hex	2	23002-00
5	Fitting, Stem Adapter, ½-inch O.D., ¼ NPT	1	54180-00
6	Fitting, Tee, 1-inch x 1-inch	1	46622-00
7	Fitting, Tube, Connector, Male (¼-inch tubing)	3	51246-00
8	Fitting, Tube, Connector, Male (½-inch tubing)	2	51262-00
9	Fitting, Tube, ½-inch O.D. x ½-inch Male NPT	1	54178-00
10	Fitting, Tube, ½-inch O.D. Union Elbow	1	54179-00
11	Fitting, Tube, ½-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, ¼-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, ½ NPT, PVC	1	54177-00
19	Valve, Ball, PVC, ¼ NPT, PVC	1	51395-00

Figure 6 Sample Conditioning Kit



# Section 1

## 1.7 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.

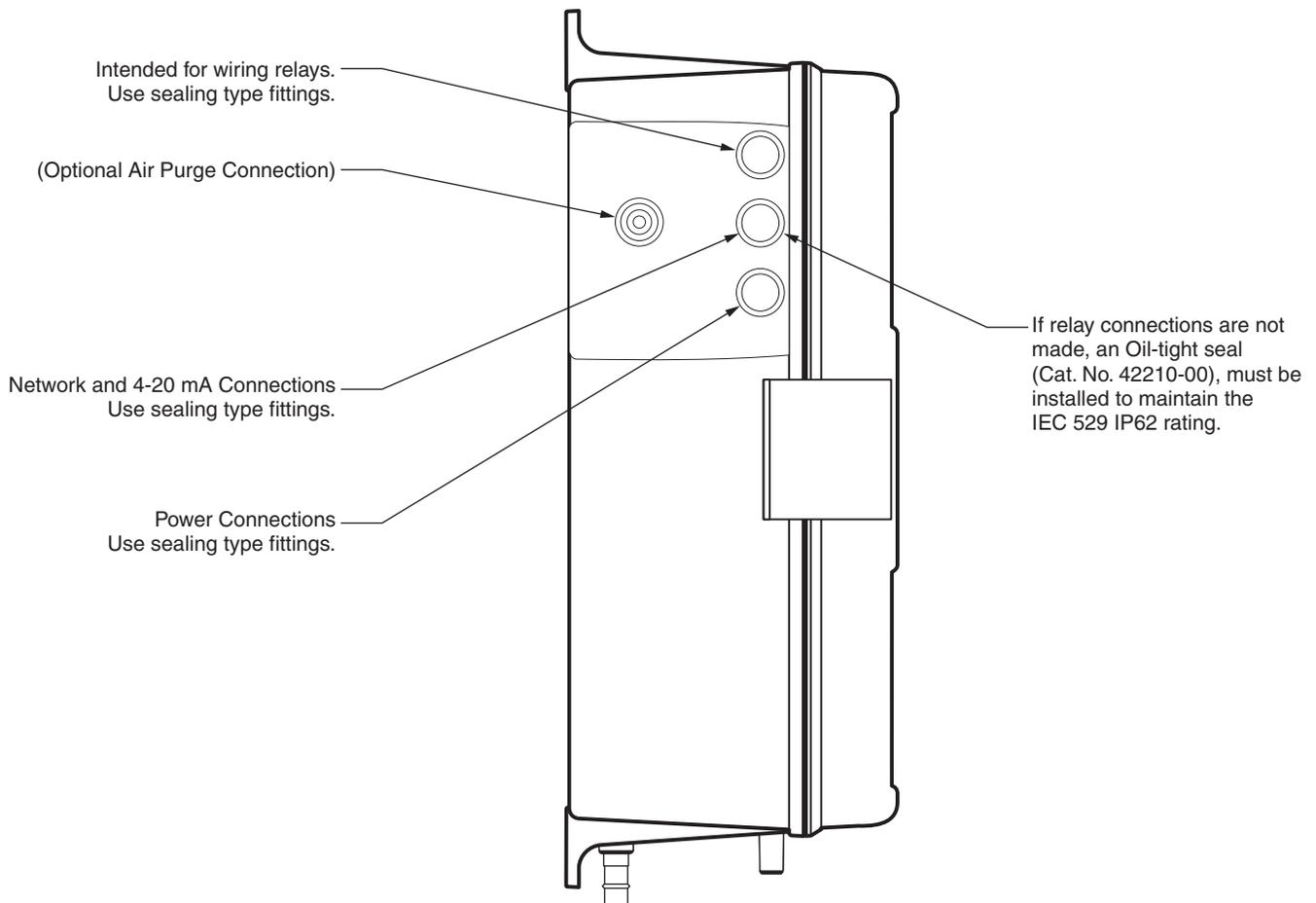
The air purge connection is located on the left side of the instrument enclosure. To connect an air supply, remove the plug in the quick connect fitting then connect ¼-inch poly tubing by pushing the tubing into the fitting. Two distinct “stops” will be felt as the tubing is correctly attached. If the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

## 1.8 Electrical Connections

All power connections are made through the conduit openings in the upper left side of the instrument. The instrument is shipped with plugs in all of the conduit openings. Wire the instrument for power, alarms, and relay connections using sealing-type conduit fittings, to maintain the IP62 environmental rating.

If connections are not made through a conduit opening, install an oil-tight seal in place of the plugs to maintain the IEC 529 IP62 rating. See [Optional Accessories on page 67](#).

**Figure 7 Location of Air Purge and Electrical Connections**

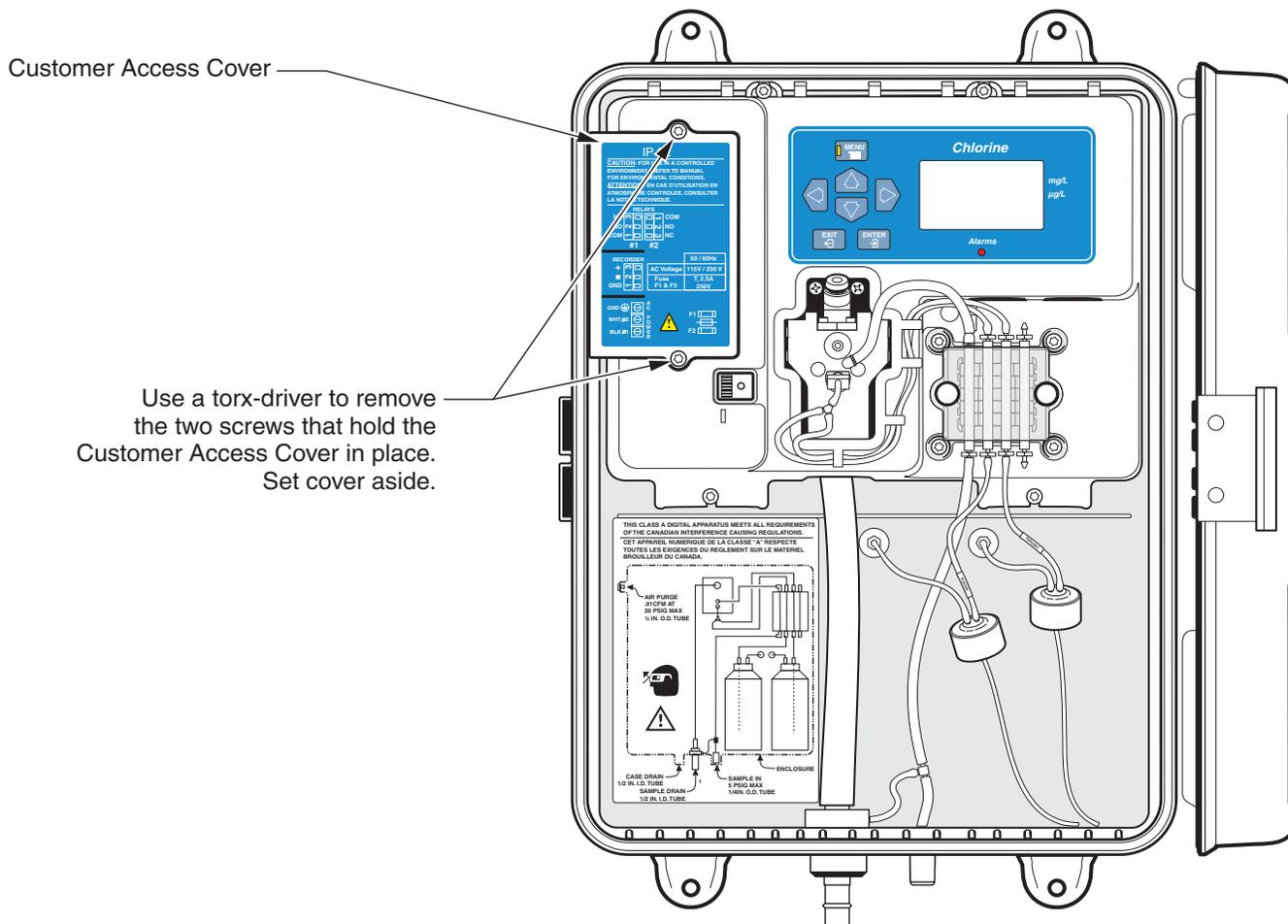


### 1.8.1 Power Connections

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 8](#) and [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 CL17 Chlorine Analyzer has been designed to conform to this requirement.

**Figure 8 Locating and Removing the Customer Access Cover**



# Section 1

Hach recommends conduit for two reasons:

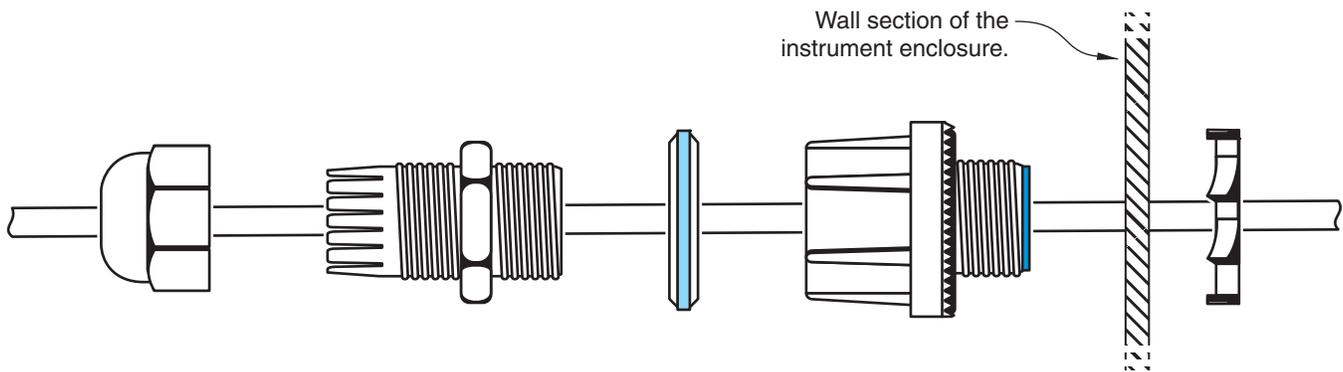
1. It is generally required by most local electrical codes.
2. Use of metal conduit can improve immunity to lightning surges and AC power transients.

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 that is located inside the instrument enclosure. To remove relay power from the instrument, an external customer-supplied 5A fused switch or a 5A breaker is required.**

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, a sealing-type strain relief and power cord with three 18 gauge conductors (including a safety ground wire) can be used. See [Figure 9](#) for strain relief assembly. The length of the power cord must not exceed 3 meters (10 feet).

**Figure 9 Assembling the Optional Power Cord Hardware**



Description	Catalog Number
115 V Power cord with strain relief	54488-00
230 V Power cord with strain relief	54489-00

## 1.8.2 Wiring the Instrument

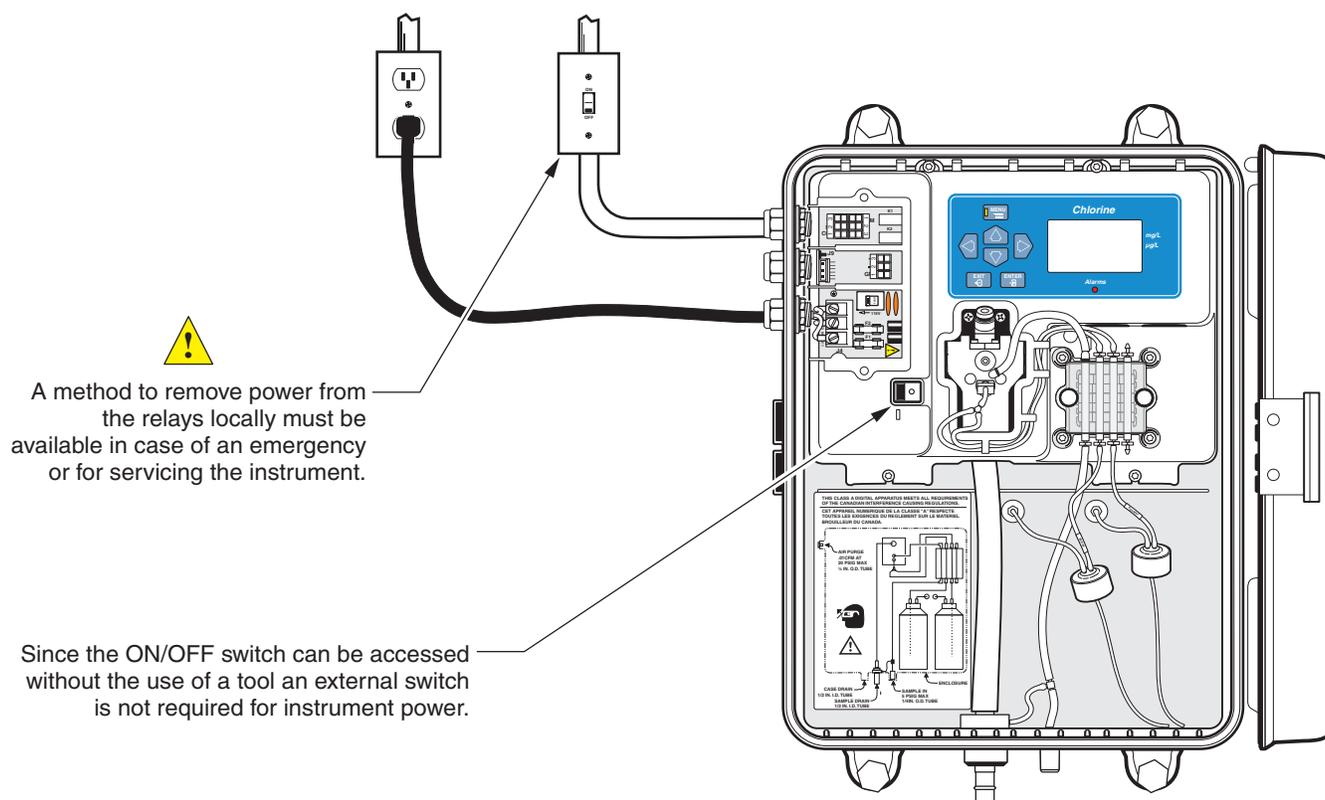
Connect the unpowered wires to the instrument power terminal as follows:

GND ⊕	
WHT Ø2	
BLK Ø1	

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

Wire Color Code for:	Protective Earth Ground	Hot or Ø1	Neutral or Ø2
North America	Green	Black	White
IEC	Green with Yellow Tracer	Brown	Blue

**Figure 10 Power Connections**



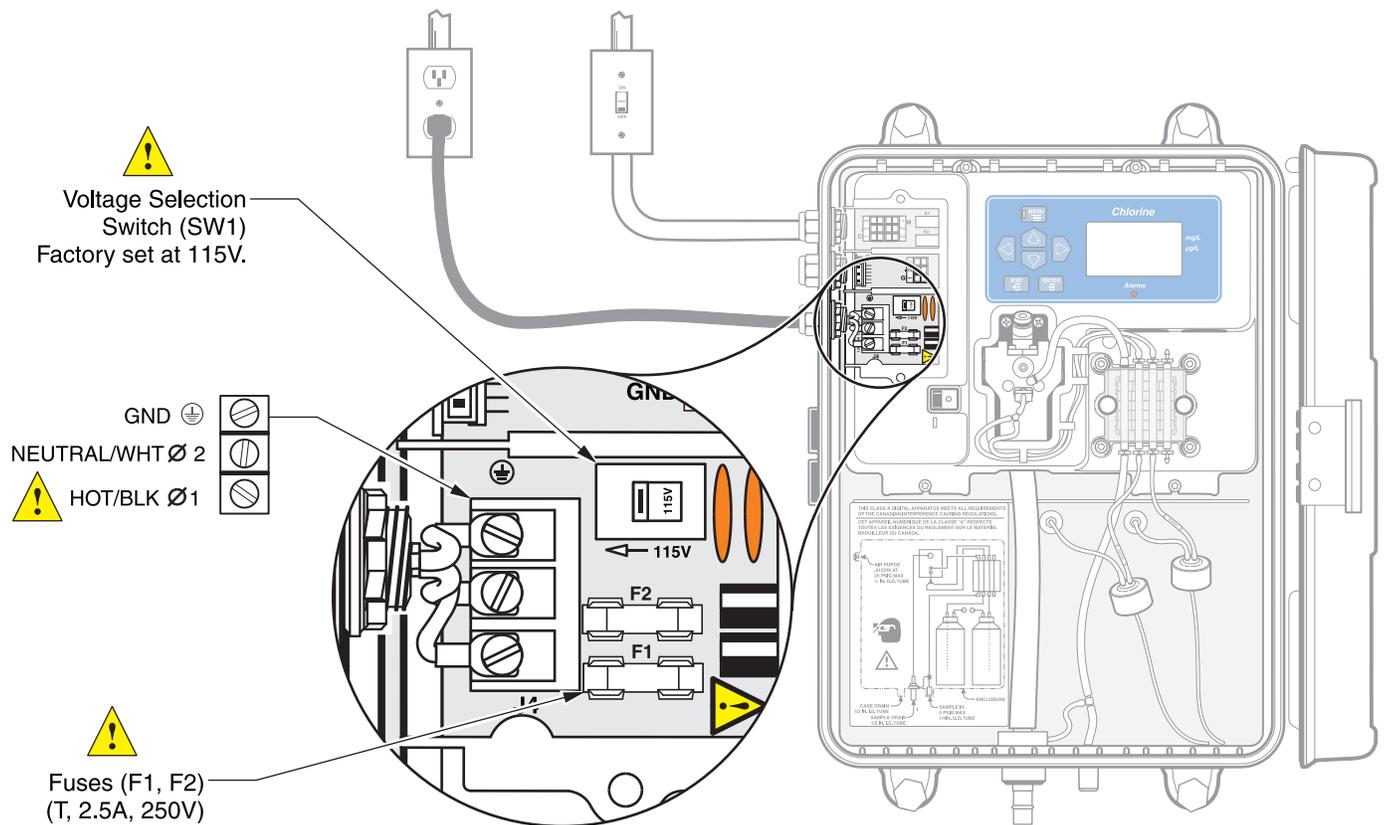
# Section 1

## 1.8.3 ⚠ Voltage Selection for Alternate Voltage Operation

**Note:** The voltage selector switch must be set properly for the line voltage to be used. An 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. To convert the instrument for 230-volt operation, slide the AC line conversion switch (shown in [Figure 11](#)) to the 230V position. The fuses used in this product are 5 mm x 20 mm. The fuses used are approved for both North American and European use; they do not need to be changed when voltage is converted.

**Figure 11 Voltage Selector Switch and Fuse Replacement**



## 1.8.4 ⚠ Alarm Connections

**Note:** Current to the relay contacts must be limited to 5 amps resistive. A method to remove power from the relays locally must be available in case of an emergency or for servicing 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 analyzer contains two alarm relays designed for use with either high voltage (greater than 30V-RMS and 42.2V-PEAK or 60 V dc) or low voltage (less than 30V-RMS and 42.2V-PEAK, or less than 60 V dc), but not a combination of both high and low voltage. Refer to [Figure 13](#) and the instructions that follow for connection information.

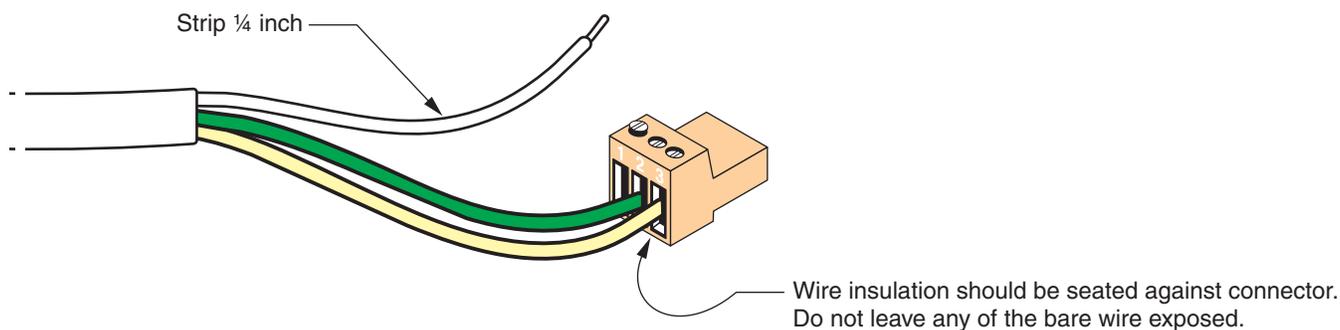
The Normally Open and Common relay contacts will be connected when an alarm condition is active.

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.

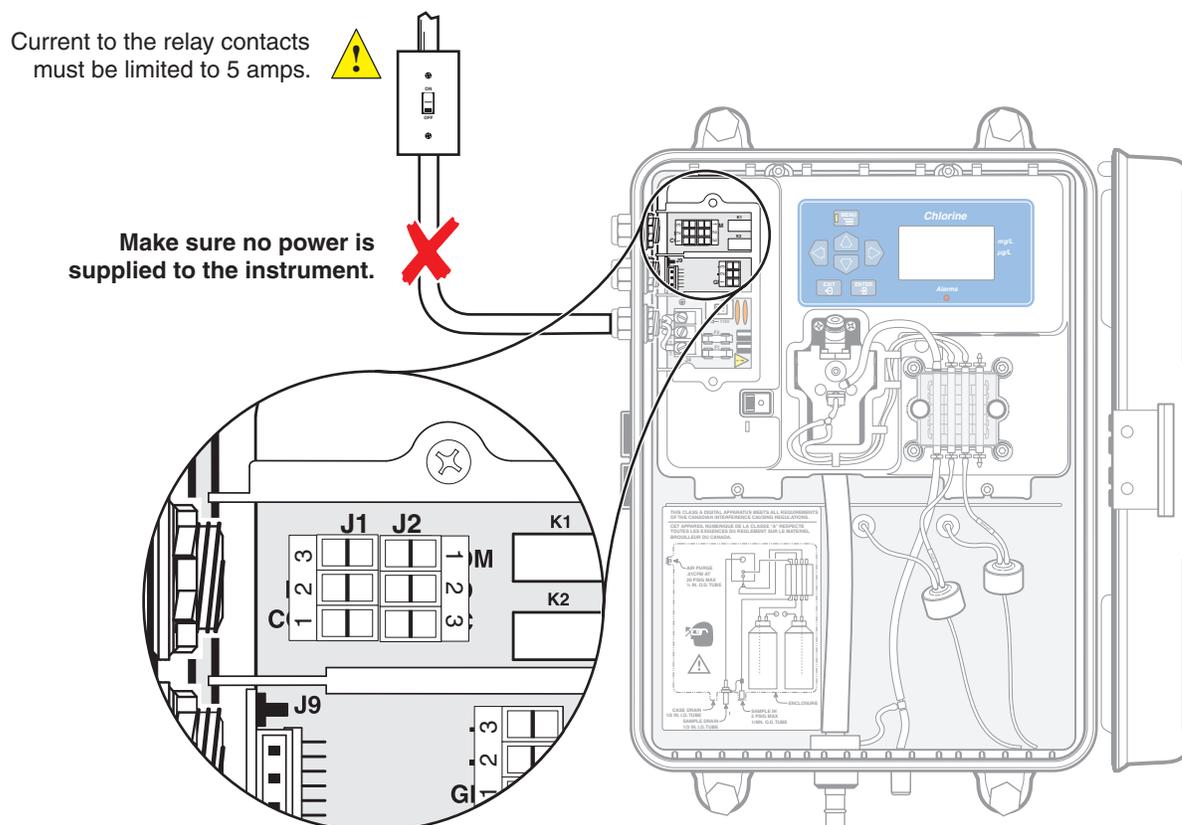
1. Make sure no power is supplied to the instrument.
2. Strip the insulation on each wire back ¼-inch. See [Figure 12](#).

3. Remove the connector from the instrument if desired.
4. Insert the wire ends into the connector until the insulation seats against the connector. See Figure 12. (Do not seat the insulation under the terminal pinch plates.)
5. Replace the connector if necessary and supply power to the instrument.

**Figure 12 Proper Wire Preparation and Insertion**



**Figure 13 Alarm Connections**



# Section 1

## 1.8.5 Recorder Output Connections

The recorder output is a 4–20 mA current-source output. Make recorder connections with twisted-pair shielded wire and connect the shield at the recorder, controlled component end or at the analyzer end. Do not connect the shield at both ends of the cable.

**Make wiring connections at the analyzer end as follows:**

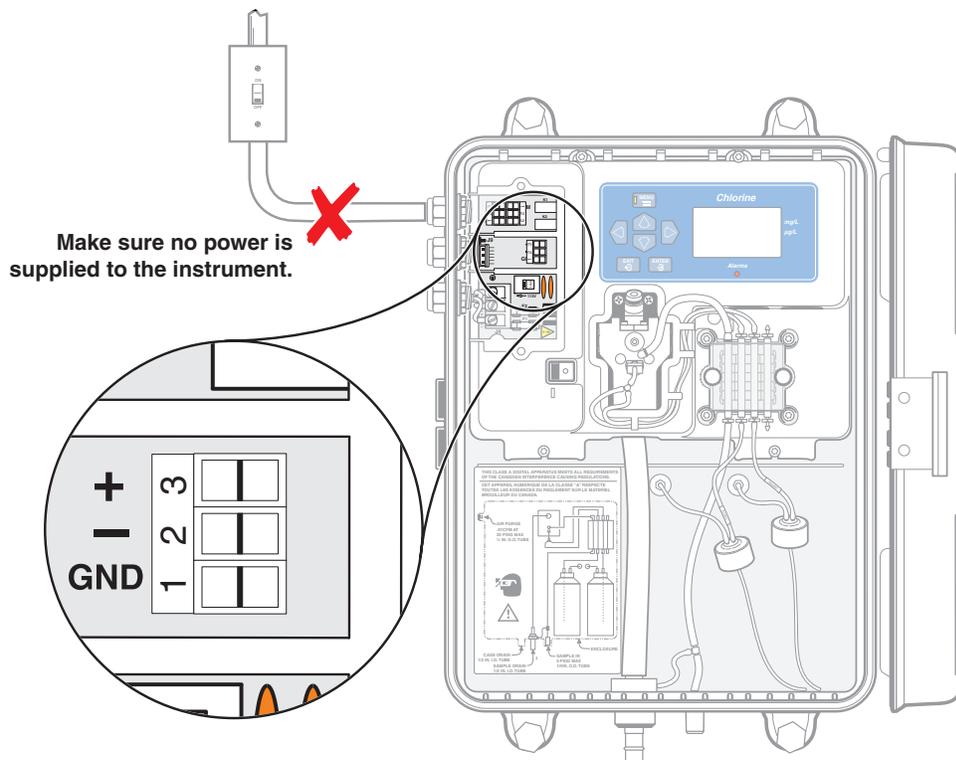
1. Make sure no power is supplied to the instrument.
2. Remove the Customer Access Cover (see [Figure 8](#) in the manual).
3. Strip the insulation on each wire back ¼-inch. See [Figure 12](#).
4. Route the wire through an available strain relief.
5. Remove the connector from the instrument. See [Figure 14](#) for connector position.
6. Insert the wire ends into the connector (see the table below) until the insulation seats against the connector as shown in [Figure 12](#). (Do not seat the insulation under the terminal pinch plates.)

**Note:** Use a twisted-pair, shielded cable. Use of non-shielded cable may result in radio frequency emission or susceptibility levels higher than allowed.

Recorder Wires	Circuit Board Markings
Recorder +	+
Recorder –	–
Shield	GND

7. Replace the connector and supply power to the instrument.

**Figure 14 Recorder Connections**



## 1.9 Installing Pump/Valve Pinch Plate

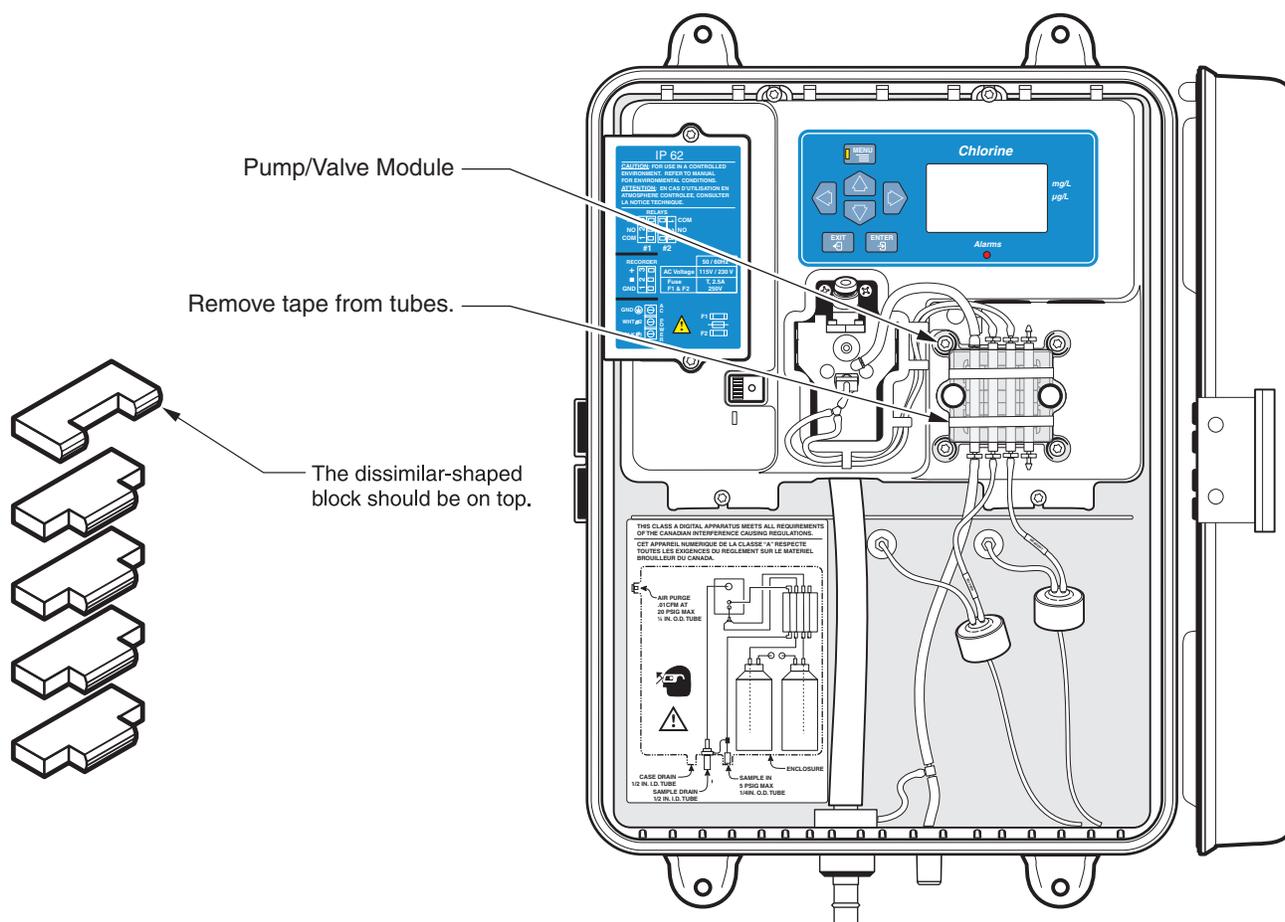
To eliminate the effects of constant pressure on the pump tubes during shipment and storage, the pinch plate and screws for the pump/valve module are shipped in the installation kit and the pump tubes are held in place with tape.

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 15](#), with the dissimilar-shaped block on top.
3. Align the pinch plate on the pump/valve module (refer to [Figure 16](#)).
4. Install the two screws through the pinch plate and into the pump/valve module. Secure the pinch plate by turning the screws in small increments moving from one screw to the other so that the plate is drawn down evenly. Tighten until the plate is seated against the pump/valve module.

**Figure 15** Installing Pump/Valve Module Pinch Blocks

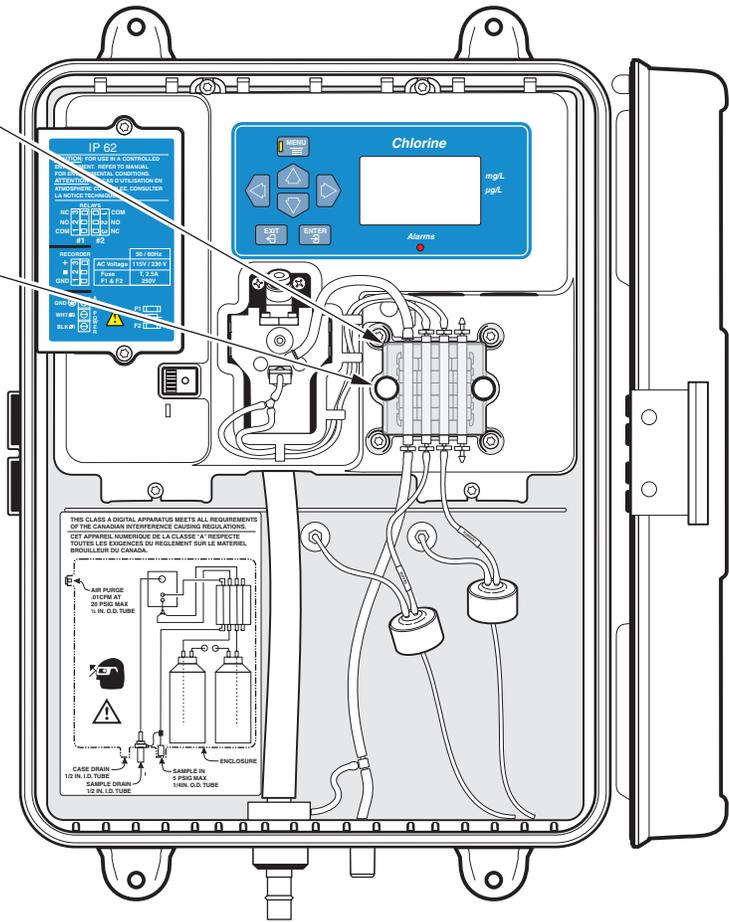


# Section 1

Figure 16 Installing Pump/Valve Module Pinch Plate

Align Pinch Plate with Pump/Valve Module.

Install screws.  
(Advance the screws in small increments moving from one screw to the other so that the plate is drawn down evenly.)





## OPERATION

### **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 Material Sicherheitsdatenblätter aufmerksam zu lesen.*

### **PERIGO**

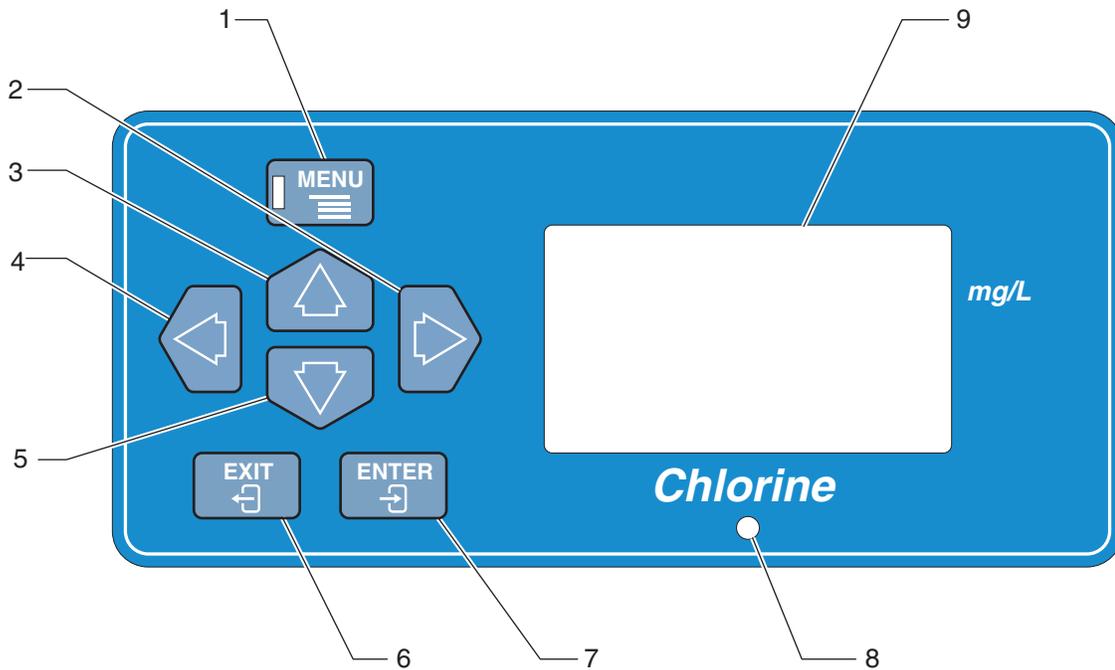
*A manipulação de amostras, padrões e reagentes químicos pode ser perigosa. Reveja a folha dos dados de segurança do material e familiarize-se com todos os procedimentos de segurança antes de manipular quaisquer produtos químicos.*



## 2.1 Keypad and Display Information

The instrument display defaults to normal Concentration Measurement Mode unless keys are pressed to change it. *Table 2* shows the functions for each key.

**Figure 17 Analyzer Keypad and Display**



**Table 2 Keypad Description**

Number	Key	Description
1	Menu	In measurement mode, pressing the <b>MENU</b> key allows access to <b>ALARM</b> , <b>RECORDER</b> , <b>MAINTENANCE</b> and <b>SETUP</b> menus.
2	Right Arrow	Allows movement so different components of the display can be edited. Active when the right arrow icon is shown on the display.
3	Up Arrow	Use to scroll through menu options or edit display components. Active when the up / down arrow icons are shown on the display.
4	Left Arrow	Allows movement so different components of the display can be edited. Active when the left arrow icon is shown on the display.
5	Down Arrow	Use to scroll through menu options or edit display components. Active when the up / down arrow icons are shown on the display.
6	Exit	Rejects an edited value or backs out of the menu structure.
7	Enter	Accepts an edited value, moves deeper into the menu structure, or accepts a menu option.
8	Alarm LED	Indicates an active alarm.
9	Display Screen	Display area for measurement and menu information.

### 2.2 Introduction



#### **CAUTION**

*To familiarize yourself with handling precautions, dangers and emergency procedures, always review the Material Safety Data Sheets prior to handling containers, reservoirs, and delivery systems that contain chemical reagents and standards. Protective eye wear is always recommended when contact with chemicals is possible.*

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.

#### **PRUDENCE**

*Pour se familiariser avec les précautions à prendre lors de la manipulation, les dangers et les procédures d'urgence, toujours lire les Fiches de Données de Sécurité des Produits avant de manipuler les récipients, les réservoirs et les systèmes de distribution contenant les réactifs chimiques et les solutions étalons. Il est toujours recommandé de porter des lunettes de protection lorsqu'un contact avec les produits chimiques est possible.*

#### **CUIDADO**

*Para familiarizarse con las precauciones de manipulación, los peligros y los procedimientos de emergencia, siempre estudie las Hojas de Datos de Seguridad de los Materiales antes de manipular recipientes, depósitos y sistemas de entrega que contengan reactivos y patrones químicos. Siempre se recomienda el uso de protectores oculares cuando sea posible el contacto con productos químicos.*

#### **VORISCHT**

*Es wird dringend empfohlen, die Sicherheitsdatenblätter vor der Handhabung von Behältern, Tanks und Zufuhrsystemen, die chemische Reagenzien und Standardsubstanzen enthalten, aufmerksam durchzulesen, damit Sie sich mit den beim Umgang mit diesen Chemikalien notwendigen Vorsichtsmaßnahmen, Risiken und Notfallschutzmaßnahmen vertraut machen, Es wird empfohlen, in allen Situationen, in denen mit einem Kontakt mit Chemikalien zu rechnen ist, eine Schutzbrille zu tragen.*

#### **CUIDADO**

*Para familiarizar-se com as precauções de manipulação, riscos e procedimentos de emergência, examine sempre o Folheto de Dados de Segurança antes de manipular os recipientes, tanques e sistemas de distribuição que contenham reagentes químicos e outros elementos padronizados. Se recomenda sempre o uso de protetores para olhos, quando possa acontecer contato com os produtos químicos.*

## 2.3 Installing the Reagents

The analyzer requires two reagents, a buffer solution and an indicator. Space is provided in the instrument enclosure for a 500-mL bottle of each of the reagents. Two reagents used in the chlorine analysis are installed in the analyzer hydraulic section and replenished at monthly intervals. One is the buffer solution, Free Chlorine Buffer, Cat. No. 23141-00, used to determine free available chlorine, or Total Chlorine Buffer, Cat. No. 22635-00, used for total chlorine analysis. The buffer solutions are completely formulated at the factory and are ready to install. Remove the cap and seal from the buffer solution bottle and install the cap and tubing labeled *BUFFER* to the buffer solution bottle.

**Note:** It is normal for the reagent tubing to become discolored over time.

### The second reagent, the indicator solution, must be prepared.

The indicator solution and indicator powder must be mixed just before use to ensure the best instrument performance. Using the powder funnel provided in the maintenance kit, add the contents of one bottle of DPD High Range Powder, Cat. No. 22972-55, to a bottle of Total Chlorine Indicator Solution, Cat. No. 22634-00, or a bottle of Free Chlorine Indicator Solution, Cat. No. 23140-00. Stir or shake until the powder is dissolved completely. Remove the cap from the reagent bottle and install the cap and tubing labeled *INDICATOR* to the reagent bottle. Tubing should be inserted to the bottoms of the bottles to prevent air from being drawn in when the level in the bottle drops.

Test Type	Required Reagent	Cat. No.	Reagent Set Cat. No.
Free Chlorine	Free Chlorine Buffer Solution	23141-11	25569-00
	Free Chlorine Indicator Solution	23140-11	
	DPD Indicator Powder	22972-55	
Total Chlorine	Total Chlorine Buffer Solution	22635-11	25570-00
	Total Chlorine Indicator Solution	22634-11	
	DPD Indicator Powder	22972-55	

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.

## Section 2

### 2.4 Installing the Stir Bar

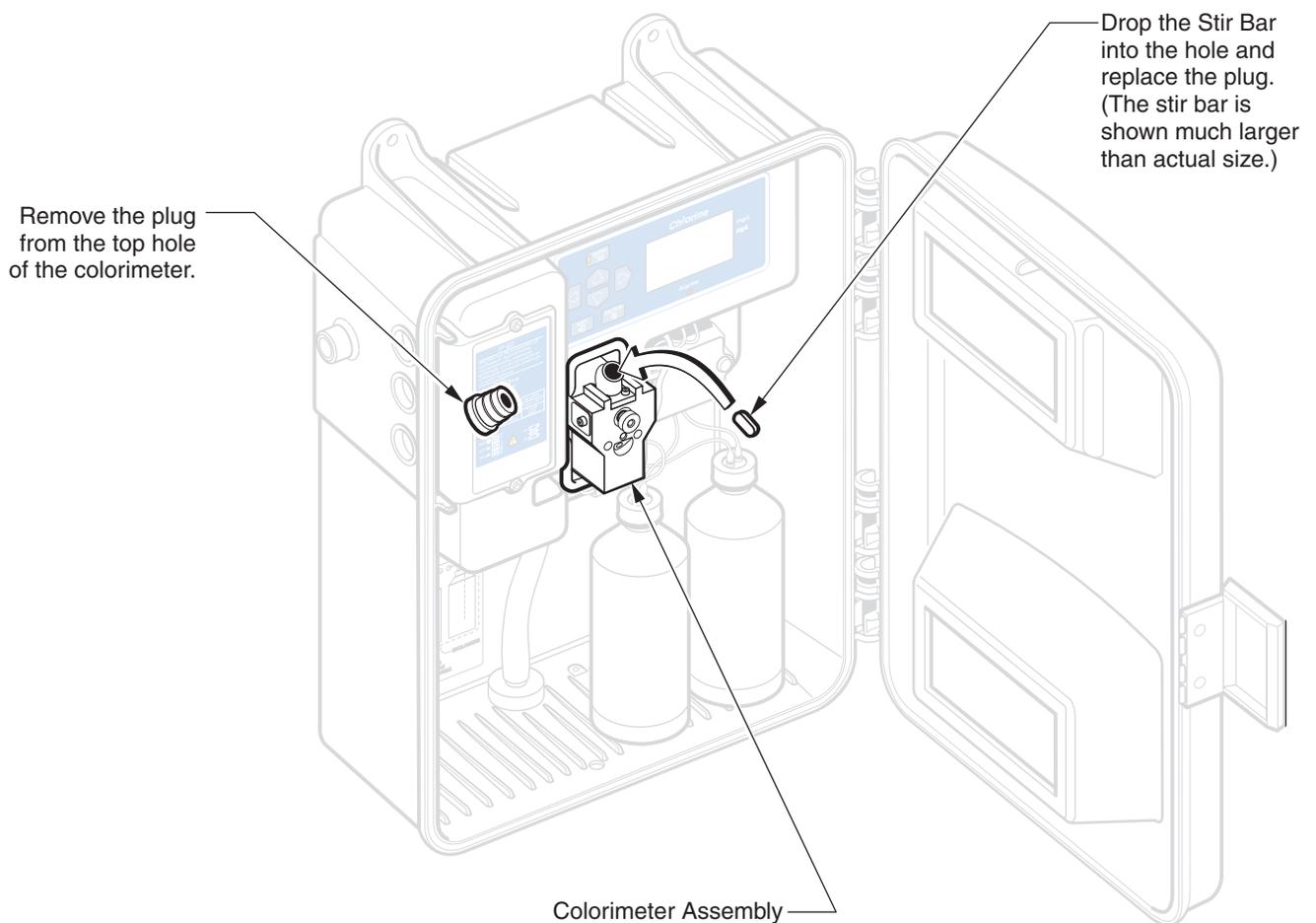
A small stir bar for the sample cell in the colorimeter assembly is included in the installation kit furnished with the instrument. The stir bar must be installed for the instrument to operate properly.

Install the stir bar as follows:

**Note:** Make sure the stir bar drops down into the colorimeter and remains in the colorimeter.

1. Remove the plug in the top of the colorimeter.
2. Drop the stir bar into the hole. See [Figure 18](#). The bar should rest on the bottom of the vertical bore.
3. Replace the plug.

**Figure 18** Installing the Stir Bar



## 2.5 Supplying Sample

**Note:** Make sure the pressure plate is securely attached to avoid backflow of the sample into the reagents.

Start sample flow through the instrument by opening the supply valve (item 19 in [Figure 6 on page 19](#)). Allow the pressure in the tubing to stabilize and check for leaks.

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 sample properties.

## 2.6 Supplying Power

The power switch is located inside the enclosure door in the recessed area to the left of the colorimeter block. Set the POWER (–/O) switch to ON (–) and allow the analyzer to operate for approximately two hours to ensure the system is completely wetted with reagents and sample.

## 2.7 Instrument Menu Structure

The major menus in the CL17 Analyzer consist of **ALARMS**, **RECRDR**, **MAINT**, and **SETUP**. Press the **UP** or **DOWN ARROW** keys to access the menus. The sections below give information on the functions of each of the menus and the submenus within them.

### 2.7.1 Setup Menu

Day-to-day analyzer functions are accessed from the **SETUP** menu. To enter the **SETUP** menu, press the **MENU** key, then use the **UP ARROW** key to scroll to the **SETUP** option. Press **ENTER**.

Scroll through the **SETUP** menu options using the **UP** and **DOWN ARROW** keys. Press **ENTER** to select the displayed menu option. Arrow icons are displayed if the display is editable. Press the **EXIT** key to back out of a menu and return to **SETUP**. The menu information below is presented in the order it appears in the **SETUP** menu.

- **SIGAVG**—The SIGAVG feature is used to average readings and prevent erratic recorder output signals. Press **ENTER**, use the **UP** and **DOWN ARROW** keys to select 1, 2, 3, or 4, then press **ENTER** to accept the displayed selection. Depending on the value selected, the last 1, 2, or 3 measurements are averages and the reported concentration is the averaged values. Option 4 is a special filter, which only reports the maximum value between the current reading and the last. This feature reduces negative spikes due to bubbles and other abnormalities in the sample. The factory default is 1. Press **EXIT** to return to the **SETUP** menu.
- **CAL ZERO**—this feature is used to offset the instrument zero using a prepared zero standard. If the offset is too large, a marginal zero (**MARG Z**) warning will occur. See [Calibration on page 40](#).
- **CAL STD**—This feature is used to adjust the analyzer slope using a prepared standard. If the adjustment is too large, the analyzer will not accept it and a marginal gain (**MARG G**) warning will occur. The new standard will not be accepted and it will have to be checked again using another method to establish a more exact reading. See [Calibration on page 40](#).

**Note:** A properly maintained instrument in good working condition will read within the accuracy specifications presented in [Specifications on page 6](#). The calibration function should never be used to force an analyzer that is not working correctly to display a correct reading. Calibrations are intended for very small adjustments only.

## Section 2

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- **CAL DEFAULTS**—(Calibration Default Settings) Press **ENTER** to return the calibration settings back to factory defaults and set the Gain to 1.0 and the Offset to 0. Use this feature to remove calibrations that are causing a MARG G or MARG Z to be displayed.
- **OFFSET**—Press **ENTER** to momentarily display the current Zero correction factor. The factory default is 0.
- **GAIN**—Press **ENTER** to momentarily display the current Gain correction factor. The factory default for gain is 1, however, readings of 0.8 to 1.25 are acceptable.
- **DISPLAY TEST**—Press **ENTER** to momentarily display all LCD segments to visually check that the complete display is functioning.
- **RECMIN**—Recorder signal test. Press **ENTER** to drive the Recorder output to its minimum (normally 4 mA) and hold it there until the next analysis is complete.
- **RECMAX**—Recorder signal test. Press **ENTER** to drive the Recorder output to its maximum (normally 20 mA) and will hold it there until the next analysis is complete.

*Note: To hold the signal longer, press the **MENU** key then the **DOWN ARROW** key to scroll to **MAINTENANCE**. Press **ENTER** then scroll down to **HOLD OUTPUTS** and press **ENTER** again.*

- **REC ADJUST**—Press **ENTER** to modify the Recorder Minimum and Recorder Maximum values. Use this feature to offset the 4 or 20 mA output signal to force a chart recorder to read zero or full scale in case of a small discrepancy. Use the **RIGHT** and **LEFT ARROW** keys to select **RECMIN** or **RECMAX** then use the **UP** and **DOWN ARROW** keys to adjust the value. Press **ENTER** to select. Press **EXIT** to accept changes and return to **SETUP**.

*Note: The numbers on the display are A/D counts and cannot be used to determine the recorder setting.*

- **RELAY TEST**—Press **ENTER** to momentarily turn the relays off, then sequentially turn on **ALARM1** and **ALARM 2**. Automatically clears both alarms to complete the test.
- **REF\***—Momentarily displays the last Reference A/D counts.
- **SAMPLE\***—Momentarily displays the last Sample A/D counts.
- **ZERO\***—Momentarily displays the last Zero A/D counts.
- **CYCLE TIME\***—Momentarily displays the Motor On time (in seconds).
- **POWER FAIL WARNING**—Sets the power fail warning to **ON** or **OFF**. Press **ENTER** then use the **ARROW** keys to toggle between **ON** and **OFF**. Press **ENTER** to select. Press **EXIT** to accept changes and return to **SETUP**. If the power fail warning is turned on and the power is interrupted, a system warning will be generated when power is restored. The factory default is off.

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\* These functions are used by service technicians to troubleshoot the instrument.

- **DIAG OUTPUT**—Pressing **ENTER** will momentarily indicate ON at the display and any optional LonWorks® interfaces present will receive diagnostic data.
- **KEYBOARD LOCKOUT**—Press **ENTER** then use the **ARROW** keys to toggle between ON and OFF. Press **ENTER** to select the displayed option. Press **EXIT** to return to the **SETUP** menu. If the keyboard is locked out, no editing functions are allowed and all diagnostics are disabled except this one. The factory default is OFF.
- **LANGUAGE**—English language is the factory default. Spanish, French, and German can be enabled. Press **ENTER** then use the **ARROW** keys to move between the available options. Press the **ENTER** key when the language of choice is displayed. Press the **EXIT** key to accept changes and return to **SETUP**.
- **DEFAULT SETUP**—Cold Start—Press **ENTER** to reset the instrument to factory defaults. All user-specified settings will be lost. The display will show the software version number (V 1.2 for example) until the next analysis is complete.

### 2.7.2 Alarm Setup

This menu accesses two unpowered alarm relays (**AL1** and **AL2**), **RECALL WARNINGS**, and **CLEAR WARNINGS**. The alarm relays may be assigned to one of the alarm functions listed below. Only one function can be assigned to each relay.

- **LO**—Alarm is triggered if concentration is less than or equal to the trip point. (0.0 mg/L to 5.0 mg/L limits)
- **HI**— Alarm is triggered if concentration is greater than or equal to the trip point. (0.0 mg/L to 5.0 mg/L limits)
- **SYSTEM ALARM (SA)**—Activates an alarm when a system alarm occurs.
- **SYSTEM WARNING (SW)**—Activates an alarm when a system warning occurs.

In addition, alarm status can be obtained and alarms can be cleared using this menu.

The relay is activated when an alarm condition occurs. Either relay may be activated on a high chlorine alarm, a low chlorine alarm or when a System Warning or System Alarm occurs. Alarm relays can be used to control chemical feeds as an on/off control, by using them as a high or low alarm set point.

The two alarm relays can also be used to bracket a specific control range by adding a double-pole double-throw auxiliary relay and wiring it to electrically latch. This allows the pump to be turned on at a low level and off at a higher level—with the concentration dropping down in between.

Perform the procedure below to assign functions to AL1 or AL2:

1. Press the **MENU** key. **ALARMS** will be displayed.
2. Press **ENTER** to select **ALARMS**. The screen will display AL1 (or AL2), and either the alarm set point (HI or LO), SA (System Alarm), or SW (System Warning).
3. To change the AL1 (or AL2) assignment, press **ENTER** again. The item to be changed will flash. The arrow icons indicate active arrow keys. Press the **UP** or **DOWN ARROW** key to scroll through the available assignments. Press the **RIGHT ARROW** key to change the value of the high or low alarm.
4. Press **ENTER** to select the displayed assignment.
5. Repeat the procedure to customize the other alarm relay.

In addition, a selection to recall or clear warnings is available. Access as follows:

1. Press the **MENU** key. **ALARMS** will be displayed.
2. Press **ENTER** to select **ALARMS**. The resulting screen will display AL1 (or AL2) along with the alarm set point (HI or LO), SA (System Alarm), or SW (System Warning).
3. Press the **DOWN ARROW** key to scroll through the options.
4. When the appropriate option is displayed, press **ENTER**.
  - **RECALL WARNINGS**—Momentarily shows all active warnings then displays **DONE**.
  - **CLEAR WARNINGS**—Clears all resolved warnings then momentarily displays **OK**.
5. Press **EXIT** twice when done.

### 2.7.3 Setting the Recorder Output Span

This menu allows the Recorder Output High and Low limits to be set and also offers the capability to use the ON SYSTEM ALARM option to communicate an alarm condition. Use ON SYSTEM ALARM to send a signal to the control room using the recorder output, to drive any device being controlled to full off, or to maintain the present level if the analyzer goes into System Alarm status and shuts off.

The CL17 is supplied with the recorder output set at maximum range. At maximum range, a chlorine concentration of 0 mg/L provides an output of 4 mA and a concentration of 5 mg/L gives an output of 20 mA. The output span can be adjusted to bracket any portion of the 0–5 mg/L range with the 4–20mA signal. For instance, this function can be used to bracket a lower range for increased recorder resolution.

For example: if chlorine concentration of your sample is normally 0.5–0.7 mg/L, the recorder output span can be set for 0–1 mg/L (where 4 mA equals 0 mg/L and 20 mA equals 1 mg/L).

Alternatively, the output can be bracketed between 2–4 mg/L to control chemical feeds, or the signal can be inverted by assigning a higher mg/L reading for REC LO and a lower mg/L reading to REC HI.

Initially, select an output span that will cover the expected range of chlorine concentration in the sample. Determine the correct minimum and maximum values by monitoring chlorine values in your sample over time. Adjust the minimum and maximum values if necessary, to obtain the best span for your specific application.

Adjust the recorder output minimum and maximum values using the analyzer keypad as follows:

1. Press the **MENU** key.
2. Use the **DOWN ARROW** key to scroll to **RECR DR** menu and press **ENTER**. The display will show **REC LO** and a mg/L reading. Press the **DOWN ARROW** key again to move to **REC HI** or **ON SYSTEM ALARM**.
3. Press **ENTER** to change the displayed mg/L reading for **REC LO** or **REC HI**. The digit to be changed will flash.
4. Press the **ARROW** keys to change the digit or move to another digit. Appropriate values and selections are shown below. When the value is correct, press **ENTER** to accept.
  - **REC LO**—0.0 mg/L to 5.0 mg/L limits.
  - **REC HI**— 0.0 mg/L to 5.0 mg/L limits.
  - **ON SYSTEM ALARM**—Select minimum, maximum, or hold to define the recorder output when a system alarm is initiated.
5. Press **EXIT** to return to the main menu. Press **EXIT** again to return to normal operation.

### 2.7.3.1 Changing to 0 to 20 mA Output Range

Set the lower end of the output range to 0 mA instead of 4 mA as follows:

1. Press the **MENU** key then use the **UP ARROW** key to scroll to the **SETUP** menu. Press **ENTER**.
2. Use the **DOWN ARROW** key to scroll to **REC ADJUST** and press **ENTER**.

*Note: A large number may be displayed for the minimum value, this number refers to counts, not milliamps. Proceed with step 4.*

3. Use the **ARROW** keys to adjust the displayed value to 0. Press **ENTER** to accept the value.
4. Press **EXIT** twice to return to normal operation.

### 2.7.4 Maintenance Menus

The following selections allow the user to perform standard maintenance tasks. Use the **ARROW** keys to scroll through the menu selections, then press **ENTER** to select the displayed menu option.

- **PRIME**—This feature causes the analyzer to make 39 concurrent accelerated cycles to prime the reagent lines. Press **ENTER** to activate. At the end of 39 cycles, the analyzer will return to normal operation. To terminate the prime cycle before all 39 cycles are complete, press **EXIT**. The analyzer will return to normal operation.
- **CLEAN**—This feature stops the analyzer in the last portion of the measurement cycle. Sample and reagents are left in the sample cell for cleaning purposes. The analyzer remains in the clean mode for 60 minutes. To terminate the cycle earlier, press the **EXIT** key. The analyzer will return to normal operation.
- **HOLD OUTPUTS**—This feature allows the alarms to be locked out and the recorder output to be held at its present level for maintenance purposes. Activate this feature as follows:
  - a. Press **ENTER** then the **UP ARROW** key to activate for 60 minutes. The alarm LED will be flashing.
  - b. To deactivate the feature, and return to normal operation, press the **MENU** key then the **DOWN ARROW** key until **HOLD OUTPUTS** is displayed.
  - c. Press **ENTER**.
  - d. Use the **DOWN ARROW** key to select **Off** and press **ENTER** again.

### 2.7.5 Calibration

The CL17 Chlorine Analyzer is factory calibrated. A built-in electronic curve is preprogrammed into the instrument. **This instrument does not require recalibration unless specified by your regulatory agency for compliance reporting purposes.**

If you are required to do a two-point calibration or if your sample stream chlorine concentration is typically less than 0.5 mg/L, follow the instructions in [section 2.7.5.1](#). If your sample stream chlorine concentration is typically greater than 0.5 mg/L, you can perform a Calibration by Comparison as detailed in [section 2.7.5.2](#).

If the calibration you perform requires you to adjust the CAL ZERO by more than 0.2 mg/L, a SYSTEM WARNING caused by a MARGINAL ZERO error will appear. Similarly, adjusting the CAL STD by more than 10% (up or down) will produce a MARGINAL GAIN ERROR.

If either of these errors occur, reset the instrument to the default calibration (see [section 2.7](#)), check the standards, and repeat the calibration. If the error messages persist, contact the Customer Service department.

### 2.7.5.1 Calibration on Known Standards



#### CAUTION

To familiarize yourself with handling precautions, dangers and emergency procedures, always review the Material Safety Data Sheets prior to handling containers, reservoirs, and delivery systems that contain chemical reagents and standards. Protective eye wear is always recommended when contact with chemicals is possible.

#### PRUDENCE

Pour se familiariser avec les précautions à prendre lors de la manipulation, les dangers et les procédures d'urgence, toujours lire les Fiches de Données de Sécurité des Produits avant de manipuler les récipients, les réservoirs et les systèmes de distribution contenant les réactifs chimiques et les solutions étalons. Il est toujours recommandé de porter des lunettes de protection lorsqu'un contact avec les produits chimiques est possible.

#### CUIDADO

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#### VORISCHT

Es wird dringend empfohlen, die Sicherheitsdatenblätter vor der Handhabung von Behältern, Tanks und Zufuhrsystemen, die chemische Reagenzien und Standardsubstanzen enthalten, aufmerksam durchzulesen, damit Sie sich mit den beim Umgang mit diesen Chemikalien notwendigen Vorsichtsmaßnahmen, Risiken und Notfallschutzmaßnahmen vertraut machen. Es wird empfohlen, in allen Situationen, in denen mit einem Kontakt mit Chemikalien zu rechnen ist, eine Schutzbrille zu tragen.

#### CUIDADO

Para familiarizar-se com as precauções de manipulação, riscos e procedimentos de emergência, examine sempre o Folheto de Dados de Segurança antes de manipular os recipientes, tanques e sistemas de distribuição que contenham reagentes químicos e outros elementos padronizados. Se recomenda sempre o uso de protetores para olhos, quando possa acontecer contato com os produtos químicos.

This procedure provides the best over all accuracy by establishing the zero mg/L reference and the span setting. Perform the calibration as follows:

1. Prepare a zero chlorine reference solution by adding approximately 4 mL of Ferrous Ammonium Sulfate, Cat. No. 1811-33, to approximately 2 liters of the normal sample or chlorine-free demineralized water.

**Note:** Enter the zero value before the chlorine standard value.

2. Place a container of zero reference water above the analyzer with at least two feet of head. Plumb the system to enable the sample flow to be shut off so the zero reference water can enter the analyzer in its place. Allow the analyzer to run on zero reference water for approximately 10 minutes.
3. When the readings are stable, set the zero reference.
  - a. Enter the SETUP menu.
  - b. Press the **DOWN ARROW** key until **CAL ZERO** is displayed.
  - c. Press **ENTER** to display the current measured value.
  - d. Press **ENTER** again to force the value to zero.

4. Prepare a chlorine standard solution with a value between 3 and 5 mg/L. Determine the value of the standard to the nearest 0.01 mg/L.
5. Remove the container of zero reference water and substitute the chlorine standard solution. Allow the analyzer to run on the standard solution for approximately 10 minutes.
6. When the readings are stable, enter the **SETUP** menu.
7. Press the **DOWN ARROW** key until **CAL STD** is displayed. Press **ENTER**. The current measured value is displayed.
8. Press **ENTER** and edit the value. Press **ENTER** again to accept the value. The measured value will be forced to the entered value. Press the **EXIT** key three times to return to normal display mode.
9. Remove the standard and restore sample flow to the analyzer. The instrument is now calibrated.

### 2.7.5.2 Calibration by Comparison

**Note:** Make sure sample chlorine concentration is relatively stable before taking a grab sample for laboratory analysis. Perform the laboratory analysis as quickly as possible.

Calibration by comparison involves analyzing the sample stream with a reliable, accurate laboratory method, such as a DPD spectrophotometric or amperometric titration method then setting the analyzer to match. Accuracy specifications over the full 0 to 5 mg/L range cannot be assured unless the sample chlorine concentration used for calibration is greater than 3.0 mg/L. Setting the calibration at a lower concentration may provide accuracy at that point but can cause large errors in other portions of the span.

Perform a calibration by comparison as follows:

1. When the sample chlorine concentration is relatively stable, obtain a grab sample for analysis.
2. Perform a laboratory analysis (DPD spectrophotometric or amperometric titration method) on the grab sample and record the value.
3. Enter the **SETUP** menu by pressing the **MENU** key followed by the **UP ARROW** key and **ENTER**.
4. Press the **DOWN ARROW** key until **CAL STD** is displayed. Press **ENTER**. The current measured value is displayed.
5. Press **ENTER** and edit the value to match the value from the laboratory analysis. Press **ENTER** again to accept the value. The measured value will be forced to the entered value.
6. Press the **EXIT** key three times to return to normal display mode.



## MAINTENANCE

### **DANGER**

*Some of the following manual sections contain information in the form of warnings, cautions and notes that require special attention. Read and follow these instructions carefully to avoid personal injury and damage to the instrument. Only personnel qualified to do so should conduct the /maintenance tasks described in this portion of the manual.*

### **DANGER**

*Certains des chapitres suivants de ce mode d'emploi contiennent des informations sous la forme d'avertissements, messages de prudence et notes qui demandent une attention particulière. Lire et suivre ces instructions attentivement pour éviter les risques de blessures des personnes et de détérioration de l'appareil. Les tâches et d'entretien décrites dans cette partie du mode d'emploi doivent être seulement effectuées par le personnel qualifié pour le faire.*

### **PELIGRO**

*Algunos de los capítulos del manual que presentamos contienen información muy importante en forma de alertas, notas y precauciones a tomar. Lea y siga cuidadosamente estas instrucciones a fin de evitar accidentes personales y daños al instrumento. Las tareas de mantenimiento descritas en la presente sección deberán ser efectuadas únicamente por personas debidamente cualificadas.*

### **GEFAHR**

*Einige der folgenden Abschnitte dieses Handbuchs enthalten Informationen in Form von Warnungen, Vorsichtsmaßnahmen oder Anmerkungen, die besonders beachtet werden müssen. Lesen und befolgen Sie diese Instruktionen aufmerksam, um Verletzungen von Personen oder Schäden am Gerät zu vermeiden. In diesem Abschnitt beschriebene Wartungsaufgaben dürfen nur von qualifiziertem Personal durchgeführt werden.*

### **PERIGO**

*Algumas das seguintes secções do manual contêm informações em forma de advertências, precauções e notas que requerem especial atenção. Leia e siga atentamente as presentes instruções para evitar ferimentos pessoais e não danificar o instrumento. As tarefas de manutenção descritas nesta parte do manual só poderão ser executadas por pessoal qualificado para o fazer.*



**CAUTION**

To familiarize yourself with handling precautions, dangers and emergency procedures, always review the Material Safety Data Sheets prior to handling containers, reservoirs, and delivery systems that contain chemical reagents and standards. Protective eye wear is always recommended when contact with chemicals is possible.

**PRUDENCE**

Pour se familiariser avec les précautions à prendre lors de la manipulation, les dangers et les procédures d'urgence, toujours lire les Fiches de Données de Sécurité des Produits avant de manipuler les récipients, les réservoirs et les systèmes de distribution contenant les réactifs chimiques et les solutions étalons. Il est toujours recommandé de porter des lunettes de protection lorsqu'un contact avec les produits chimiques est possible.

**CUIDADO**

Para familiarizarse con las precauciones de manipulación, los peligros y los procedimientos de emergencia, siempre estudie las Hojas de Datos de Seguridad de los Materiales antes de manipular recipientes, depósitos y sistemas de entrega que contengan reactivos y patrones químicos. Siempre se recomienda el uso de protectores oculares cuando sea posible el contacto con productos químicos.

**VORSICHT**

Es wird dringend empfohlen, die Sicherheitsdatenblätter vor der Handhabung von Behältern, Tanks und Zufuhrsystemen, die chemische Reagenzien und Standardsubstanzen enthalten, aufmerksam durchzulesen, damit Sie sich mit den beim Umgang mit diesen Chemikalien notwendigen Vorsichtsmaßnahmen, Risiken und Notfallschutzmaßnahmen vertraut machen. Es wird empfohlen, in allen Situationen, in denen mit einem Kontakt mit Chemikalien zu rechnen ist, eine Schutzbrille zu tragen.

**CUIDADO**

Para familiarizar-se com as precauções de manipulação, riscos e procedimentos de emergência, examine sempre o Folheto de Dados de Segurança antes de manipular os recipientes, tanques e sistemas de distribuição que contenham reagentes químicos e outros elementos padronizados. Se recomenda sempre o uso de protetores para olhos, quando possa acontecer contato com os produtos químicos.

## 3.1 Scheduled Maintenance

### 3.1.1 Replenishing the Reagents

One 500-mL bottle each of buffer and indicator solution lasts approximately one month. Discard the old containers with any unused contents and install the new bottles as described in [Section 2.3 on page 33](#).

### 3.1.2 Replacing the Pump Tubing

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. 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.

### Install the replacement tubing as follows:

1. Shut off sample flow to the instrument and set the POWER (I/O) switch to OFF (O).
2. Remove the screws securing the pinch plate to the pump/valve module. See [Section 1.9 on page 27](#). 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 four 2-inch lengths of 1/16-inch ID tubing (white). Install one 1/16-to 1/8-barb elbow fittings in one of the 1/16-inch ID tubes (white) and 1/16-inch 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.
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 (I/O) switch to ON (I) and restore sample flow through the instrument. Allow the instrument to run for approximately one hour to fill the reagent lines.

### 3.1.3 Replacing the Analyzer Tubing

Remaining tubing in the analyzer should be replaced annually.

The maintenance kit is available with the tubing harnesses assembled (Cat. No. 54443-01) or unassembled (Cat. No. 54443-00) If you have ordered the unassembled maintenance Kit, use [Figure 19](#) and [Table 3 on page 47](#) to determine the tubing lengths and positions. 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 a time be removed and replaced.

Numbers on the illustration correspond to the item numbers listed in the legend where the size, catalog number, and quantity also are given. The length given in [Table 3](#) 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 to cut the segment from and not the number of the segment itself.

DPD Reagent tubing may darken before the scheduled replacement time but that will not affect the performance of the instrument.

Figure 19 Plumbing Diagram

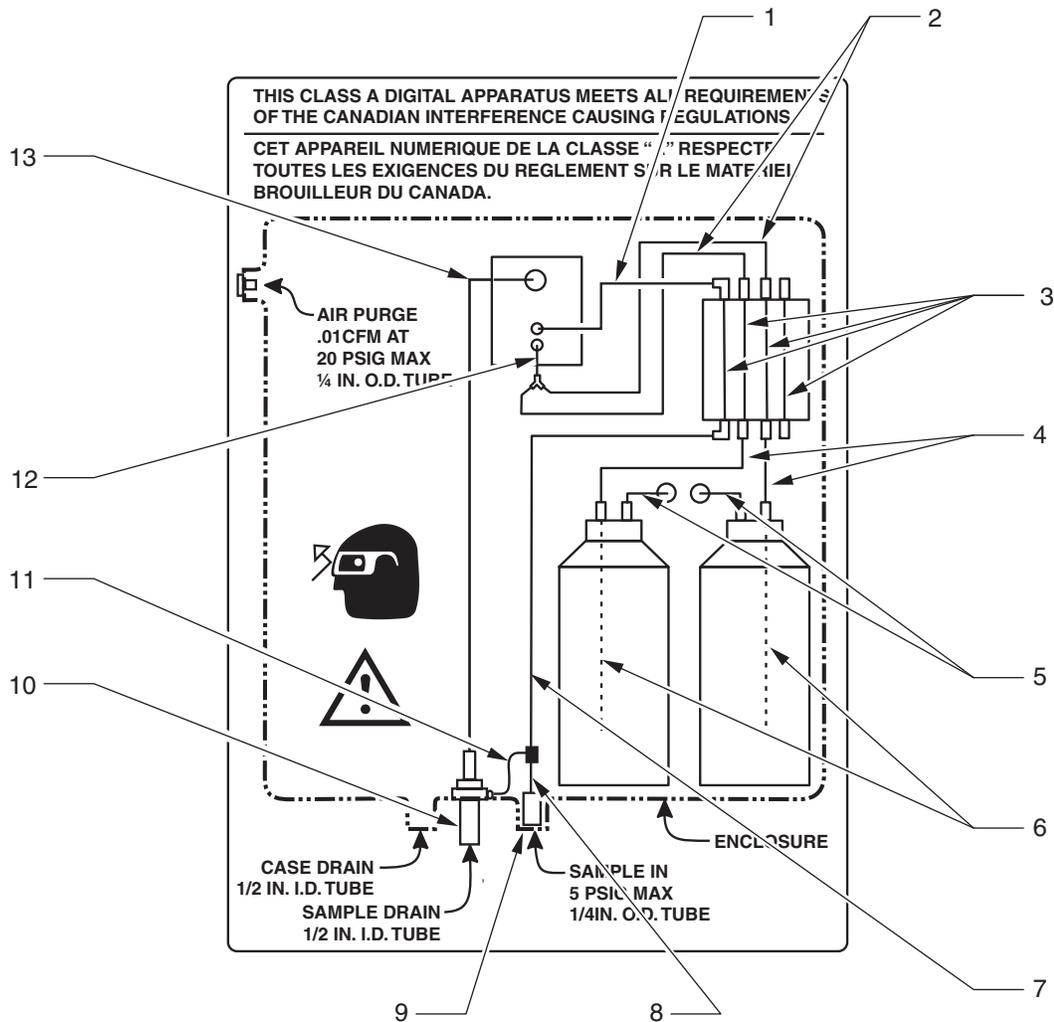


Table 3 Replacement Tubing Lengths for Figure 19

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	7.0 inches (2)	Pump Body Out	Y-Fitting	44253-00
3	1/16" ID, 3/32" OD	2.0 inches (4)	Pump Body In	Pump Body Out	42717-00
4	0.062" ID, 0.125" OD	6.0 inches (2)	Reagent Bottle Cap	Pump Body In	42076-00
5	0.062" ID, 0.125" OD	6.0 inches (2)	Reagent Bottle Cap	Reagent Vent Fitting	42076-00
6	1/32" ID, 3/32" OD	7.0 inches (2)	Reagent Bottle Bottom	Reagent Bottle Cap	45524-00
7	1/8" ID, 1/4" OD	7.0 inches (1)	Sample Bypass Tee	Pump Body In	43293-00
8	1/8" ID, 1/4" OD	1.5 inches	Sample Bypass Tee	Sample Inlet Fitting	43293-00
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	3 inches	Sample Bypass Tee	Drain fitting	44253-00
12	1/32" ID, 3/32" OD	1.0 inch (1)	Y-Fitting	Colorimeter	44253-00
13	0.500" ID, 11/16" OD	12 inches	Colorimeter	Drain Fitting	54108-00

## Section 3

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### 3.2 Unscheduled Maintenance

#### 3.2.1 Fuse Replacement

The T, 2.5A, 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.*

**DANGER**

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

**PELIGRO**

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

**GEFAHR**

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

**PERIGO**

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

**Replace as follows:**

1. Make sure there is no power supplied to the instrument. the instrument power switch does not remove power from the fuses, Power must be disconnected remotely to remove power from the fuses.
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 24](#).

**DANGER**

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

**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.*

**PELIGRO**

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

**GEFAHR**

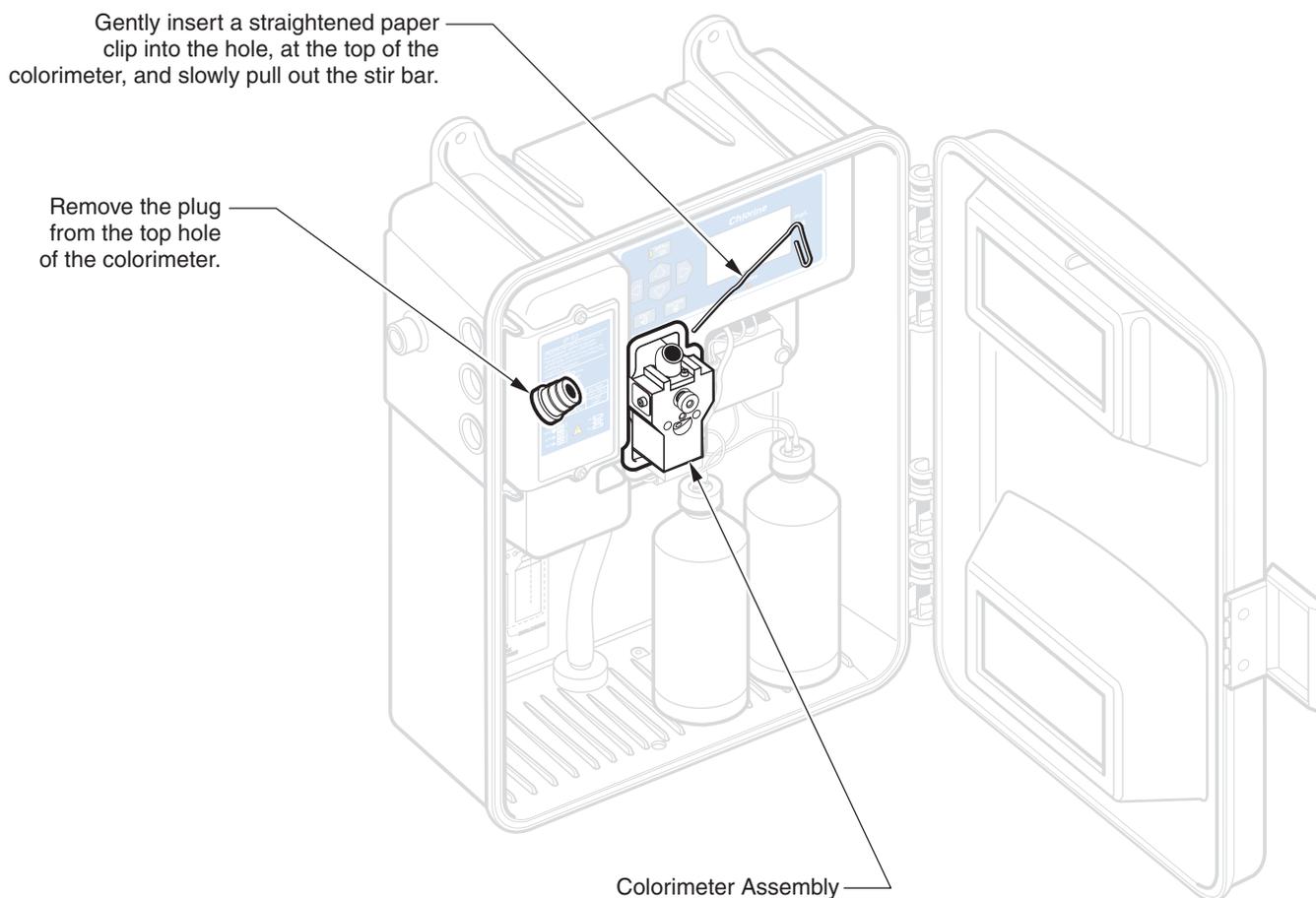
*Zur Wahrung des kontinuierlichen Brandschutzes dürfen die Sicherungen nur mit Sicherungen des gleichen Typs und mit gleichen Stromkennwerten verwendet werden.*

**PERIGO**

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

4. Remove the two fuses (F1 and F2) and replace them with two new fuses with the same specifications (T, 2.5A, 250V). See [Replacement Items on page 67](#).
5. Reinstall the customer access cover and resupply power.

Figure 20 Removing the stir bar



### 3.2.2 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.

### 3.2.3 Cleaning the Colorimeter

The colorimeter measuring cell may collect sediment or develop a film growth on the inside walls. Cleaning with an acid solution and a cotton swab on a monthly basis is recommended. Depending on sample conditions, it may be necessary to clean the cell more often.



#### 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 is always recommended when contact with chemicals is possible.*

#### CUIDADO

*Les produits chimiques utilisés dans cette procédure peuvent être dangereux s'ils sont maniés d'une manière inappropriée 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.*

#### 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.*

### **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.*

### **CUIDADO**

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

### **Clean the colorimeter cell as follows:**

1. Press the **MENU** key, then press the down **ARROW** key until the **MAINT** menu appears. Press **ENTER**.
2. Press the down **ARROW** key to scroll to the **CLEAN** option. Press **ENTER**.
3. Refer to [Figure 20](#) and locate the colorimeter.
4. Remove the rubber plug on the top of the colorimeter assembly.
5. Remove the magnetic stir bar using a bent steel paper clip as a retrieval tool. See [Figure 20](#).
6. Wait until **CLEAN** flashes on the status line of the display, then fill the colorimeter with 19.2 N Sulfuric Acid Standard Solution (Cat. No. 2038-32).

***Note:** Lower normality sulfuric acid will NOT be sufficient for cleaning the colorimeter.*

7. Allow the sulfuric acid to stand in the colorimeter for 15 minutes.
8. Insert a wooden or paper cotton-tipped swab\* into the opening and move it up and down with a gentle scrubbing action, cleaning the interior surfaces of the colorimeter cell. Refer to [Figure 21](#). Clean the stir bar with the cotton swab.
9. Reinstall the stir bar.
10. Replace the rubber plug on the top of the colorimeter assembly and make sure the cover is on the viewing port of the colorimeter.
11. Press the **EXIT** key to immediately return to normal operation; the instrument will return to normal operation automatically after 60 minutes.

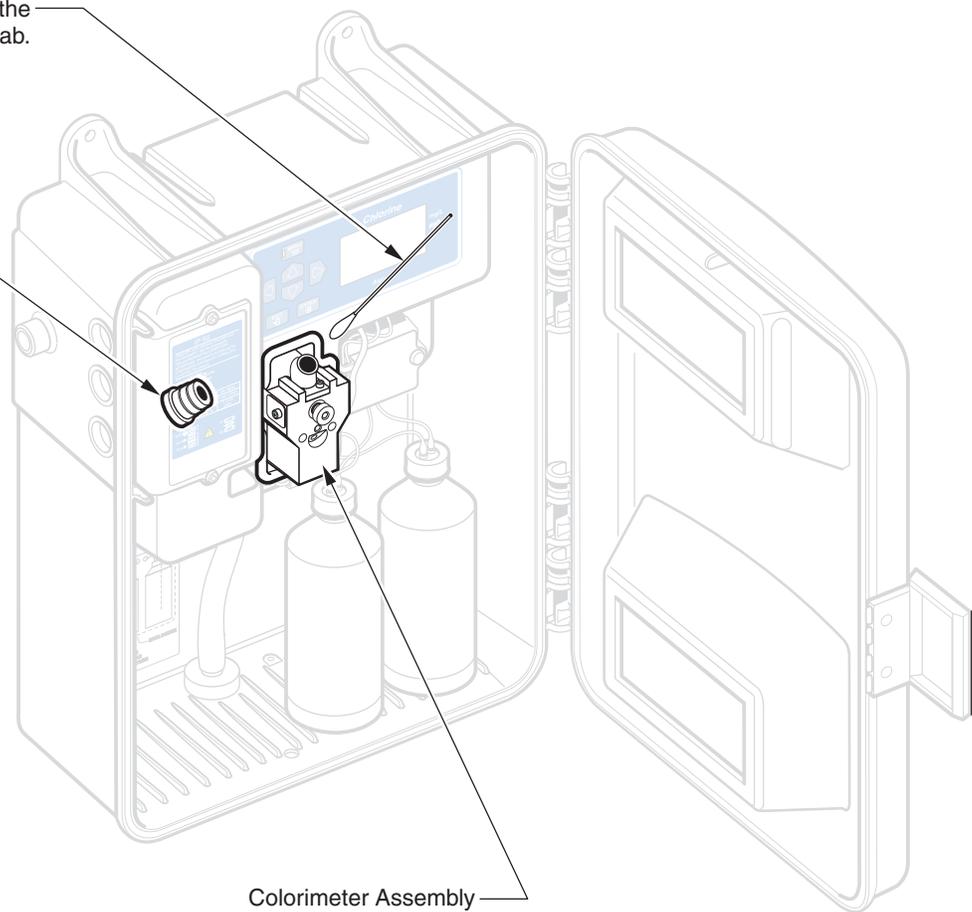
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\* Do not use a plastic swab when cleaning the colorimeter with sulfuric acid, the acid will dissolve the plastic.

**Figure 21 Cleaning the Colorimeter**

Gently scrub the inside of the colorimeter with a cotton-tipped swab.

Remove the plug from the top hole of the colorimeter.



### 3.2.4 Replacing the Sample Conditioning Filter

To insert the filter into the housing:

1. Isolate the filter by turning the valves on each side to OFF.
2. Unscrew the top of the filter housing. See [Figure 6 on page 19](#).
3. Insert the filter element and push until it stays in place.
4. Replace the filter housing top.

### 3.2.5 Reagent Spill Clean Up Instructions

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



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 must be returned. Referring

## 4.1 Troubleshooting Guide

Table 4 supplies troubleshooting information for the instrument. After determining the symptom and probable cause, perform the corrective action steps in the order given.

**Table 4 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, fuses, and power cord connections.
Display does not light and the pump motor operates.	Problem with power supply	Replace the main 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.
Zero reading	No Stir Bar	Place Stir Bar into Colorimeter (Refer to the <i>CL17 Instrument Manual</i> ).
	Pinch Plate thumb screws are not fully tightened.	Tighten the thumb screws.
	Sample is not flowing to the instrument.	Check the sample conditioning and other sample supply lines.
	More than one stir bar	Remove the plug from the top of the colorimeter and use a flashlight to illuminate the inside of the cell. Look into the colorimeter to determine if more than one stir bar is inside. Remove excess stir bars.
Sample is overflowing from the colorimeter	Drain line clogged or air lock in drain line	Clean drain line and/or eliminate air lock from drain plumbing.
Excessive moisture is condensing on the colorimeter	Temperature differential between sample and analyzer environment is too large.	When practical, allow the sample temperature to warm to room temperature before it enters the analyzer.
Low reading	Clogged tubing	Replace tubing.

## Section 4

### 4.2 System Alarms

An alarm message is displayed and the instrument ceases to function normally when a System Alarm is activated. Resolve the alarm to resume normal operation.

**Table 5 System Alarms**

<b>Alarm</b>	<b>What the Alarm Indicates</b>	<b>Alarm Display and Instrument Indication</b>	<b>Resolution</b>
<b>EE Error</b>	Inability to write to the EE ROM	<b>EE ERROR</b>	Press the <b>EXIT</b> key to restart the instrument. If the problem recurs, the main circuit board may need to be replaced. Call Hach Service.
<b>A2D Error</b>	Reference measurement = 0 A/D counts Indicates that the colorimeter is reading zero light throughput. So it is likely the photo detector/analog to digital converter is faulty.	<b>A/D ERROR - EXIT TO RESTART</b> Alarm LED is lit	Press the <b>EXIT</b> key to restart the instrument. If the problem recurs, there is a problem with the colorimeter. The connector between the instrument and the colorimeter may not be making a proper connection. Remove the colorimeter, inspect the connector pins and straighten the pins if necessary. Reinstall the colorimeter. If the problem remains, replace the colorimeter.
<b>LED Failure</b>	The colorimeter's photo detector is reading an extremely low level of light for the reference reading (less than 100 A/D counts).	<b>LED ERROR - EXIT TO RESTART</b> Alarm LED is lit	Press the <b>EXIT</b> key to restart the instrument. If the problem recurs clean the sample cell. If the problem is not yet resolved, remove the plug from the colorimeter's sample viewing port. You should be able to observe a green light. (You must wait several minutes from instrument turn on for the light to come on.) It will remain on continuously thereafter. If the light does not come on and the colorimeter has just been removed and re-inserted, the colorimeter connector is not making a proper connection. Remove the colorimeter and inspect the connector pins. If the pins are bent, straighten them and reinsert the colorimeter. If the problem still remains, replace the colorimeter. Contact Hach Service.
<b>Motor Failure</b>	Indicates that the pump motor's home position flag was not detected.	<b>MOTOR ERROR - EXIT TO RESTART</b> Alarm LED is lit	Press the <b>EXIT</b> key to restart the instrument. If the problem recurs, check the following. If the motor does not turn when the instrument is turned on, try the following: 1. Check that the motor is plugged into the main circuit board. 2. Replace the motor. 3. Replace the main circuit board. If the motor does run and the motor coupler is turning, try the following: 1. Check that the optical switch is properly plugged into the main circuit board and the switch is properly located in the chassis. 2. Replace the optical switch. 3. Replace the main circuit board.
<b>SCR Error</b>	The Cycle Motor does not turn off at the appropriate time, resulting in a short total cycle time.	<b>SCR ERROR - EXIT TO RESTART</b> Alarm LED is lit	Press the <b>EXIT</b> key to restart the instrument. If the problem recurs, replace the main circuit board.

### 4.3 System Warnings

Recall active warnings using the **RECALL WARNINGS** function in the alarm menu. To clear the warnings use the **CLEAR WARNINGS** function in the alarm menu.

**Table 6 System Warnings**

<b>Warning</b>	<b>What the Alarm Indicates</b>	<b>Alarm Display and Instrument Indication</b>	<b>Resolution</b>
<b>POWER</b>	Power failed. In default condition, this warning is disabled.	<b>POWER</b>	Inspect wiring and circuit breakers that deliver power to the CL17.
<b>Low Signal</b>	Reference measurement is less than 2000 A/D counts.	<b>LOWSIG</b>	Clean sample cell Replace sample cell
<b>Marginal Gain</b>	A calibration resulted in a gain correction factor greater than 1.1 or less than 0.9. The calibration standard and the value that the operator is attempting to input do not match. Re-test the calibration standard and perform a new calibration on the CL17.	<b>MARG G</b>	Set CAL Defaults. Verify standard value. Recalibrate the instrument.
<b>Marginal Zero</b>	A calibration resulted in an offset correction factor greater than 0.2 and less than 0.5.	<b>MARG Z</b>	Set CAL Defaults. Verify zero value. Recalibrate the instrument.
<b>Marginal Offset</b>	A high offset count was measured with the LED off. Usually caused by light leaks.	<b>MARG 0</b>	Verify the colorimeter end caps are firmly screwed in place. Check for light leaks.



## Instrument Description

The Hach CL17 Chlorine Analyzer (Figure 22) is a microprocessor-controlled, process analyzer designed to monitor a sample stream continuously for chlorine content. Either free or total chlorine, in the range of 0 to 5 mg/L, can be monitored. The buffer and indicator solutions used determine the choice for free or total chlorine analysis.

**CAUTION**

*This analyzer is intended to be used for aqueous samples only.*

**PRUDENCE**

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

**CUIDADO**

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

**VORSICHT**

*Dieser Analysator darf nur für Wasserproben benutzt werden.*

**CUIDADO**

*Este analizador está diseñado para muestras acuosas solamente.*

The CL17 Chlorine Analyzer 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 uses a DPD Colorimetric Method which includes a N,N-Diethyl-p-phenylenediamine (DPD) indicator and a buffer. The indicator and buffer are introduced into the sample, causing a red color to form with an intensity proportional to the chlorine concentration. Chlorine concentration, measured photometrically, is displayed on the front panel, three-digit, LCD readout in mg/L Cl<sub>2</sub>.

A recorder output (4-20 mA) is available. Recorder span minimum and maximum values in mg/L Cl<sub>2</sub> are programmed by the operator at the analyzer keyboard.

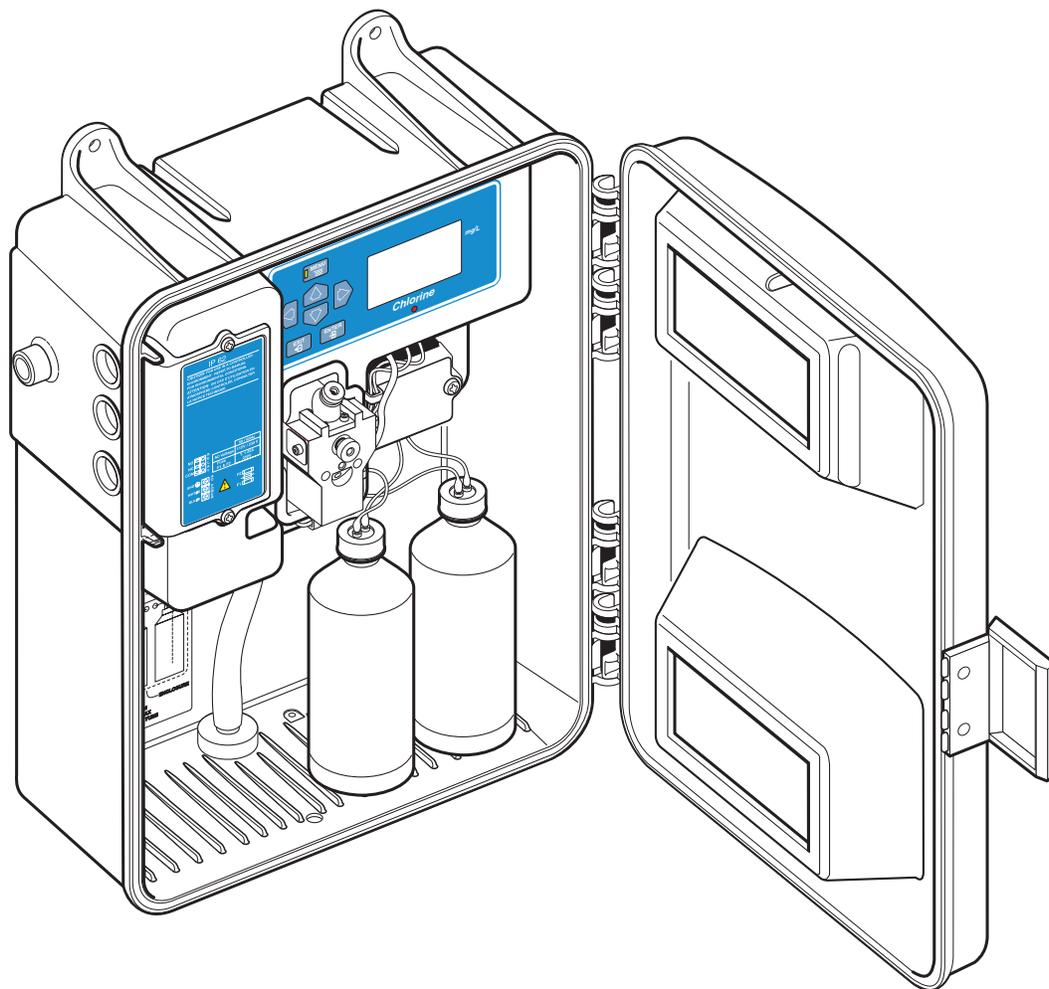
Programmable alarm circuits provide relay closures, both normally open and normally closed, for two selectable chlorine level set points. Set points can be programmed by the operator anywhere within the overall range. System warning and system alarm features provide automatic, self-testing diagnostics that detect a number of possible malfunctions, and provide alarm relay closures indicating a need for operator attention.

The CL17 analyzer can be purchased with a Hach Network Interface Card which allows the CL17 to display its readings on an AquaTrend® display or allows data to be sent to a PC via a Serial Interface Module.

Indicator and buffer reagents (473 mL of each) are placed in the instrument case in the original factory-filled bottles. Reagents are replenished once a month.

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 22 CL17 Chlorine Analyzer



## Method of Analysis

Free available chlorine (hypochlorous acid and hypochlorite ions) oxidizes the DPD indicator reagent at a pH between 6.3 and 6.6 to form a magenta-colored compound. The depth or intensity of the resulting color is proportional to the concentration of chlorine in the sample. A buffer solution specifically for free chlorine maintains the proper pH.

Total available chlorine (free available chlorine plus combined chloramines) is determined by adding potassium iodide to the reaction. Chloramines in the sample oxidize iodide to iodine, which, along with any free available chlorine, oxidizes DPD indicator to form the magenta color at a pH of 5.1. A different buffer solution containing potassium iodide maintains reaction pH. After the chemical reaction is complete, the optical absorbance at 510 nm is compared to the absorbance measured through the sample before the reagents were added. Chlorine concentration is calculated from the difference in absorbance.

## Principle of Operation

The analyzer is designed to capture and analyze a portion of the sample every 2.5 minutes. The sample portion is captured in the colorimeter measuring cell where the blank absorbance is measured. Measurement of sample blank absorbance allows compensation for any turbidity or natural color in the sample, and provides an automatic zero reference point. Reagents are added at this point to develop the magenta color, which is measured and compared to the reference.

A linear peristaltic pump/valve module controls the flow of incoming sample and injects metered volumes of the buffer and indicator reagents in a 2.5 minute cycle. The pump/valve module uses a motor-driven cam to operate pinch blocks that squeeze special thick-walled tubing against a fixed plate. The cycle operates as follows:

1. The sample inlet line is opened, allowing sample under pressure to flush sample tubing and the colorimeter sample cell where the measurement is made.
2. The sample inlet line is closed, leaving fresh sample in the cell. Cell volume is controlled by an overflow weir.
3. As the sample inlet line closes, reagent lines open, allowing buffer and indicator solutions to fill tubing in pump/valve module.
4. A measurement of untreated sample is taken to determine an average reference measurement prior to reagent addition.
5. The reagent outlet block opens, allowing buffer and indicator to blend and enter the colorimeter cell to mix with the sample.
6. After a delay for the development of color, a measurement of treated sample is taken to determine the chlorine concentration.

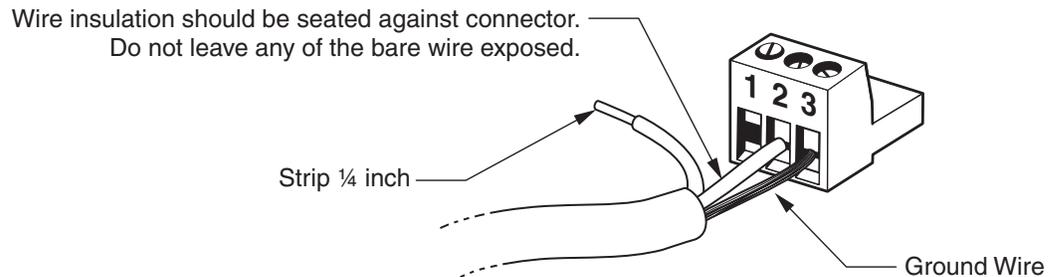
This sequence is repeated every 2.5 minutes.



The CL17 analyzer can be purchased with a Hach Network Interface Card that allows the analyzer to be attached via the AquaTrend® software to one master AquaTrend Interface, one Serial Input/Output (SIO) Module, one Signal Output Module (SOM) with two relays and one recorder output, and two MOD I/Os. Remote AquaTrends and Digital Display Modules are not supported. Integration of the CL17 Analyzer into an existing Hach Network is discussed in the following section. Refer to the *AquaTrend Interface Instruction Manual* for complete details on configuring the Hach network.

1. Route a Hach-approved network cable to the CL17 Analyzer. Route the network cable through the middle wiring access hole in the CL17 housing. (This hole is also used for routing Recorder output wiring.) Use appropriate hardware to maintain the NEMA 4X and IP66 ratings.
2. Strip the ends of the network cable. Strip back the wire insulation ¼ inch.
3. Refer to [Figure 23](#) and insert each bare wire end into the 3-pin connector using the information in [Table 7](#). Make sure the wire insulation is seated against the connector. Do not leave any of the bare wire exposed.
4. Plug the terminated cable into J1 on the Interface Card.
5. Reattach the access panel to the instrument enclosure with the two screws.
6. Reapply power to the CL17 Analyzer.

**Figure 23 Proper Wire Preparation**

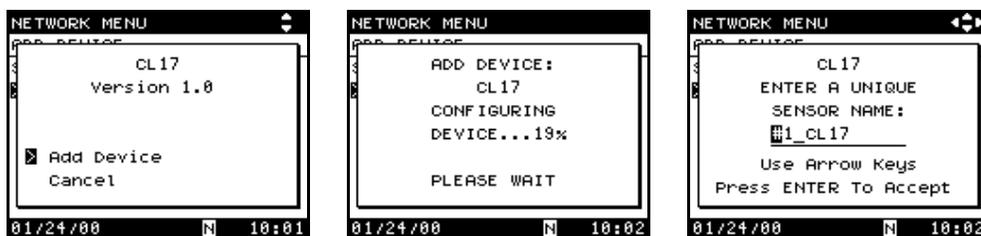


**Table 7**

Position	Signal	Wire color
1	NET_A	White
2	NET_B	Green
3	GND	Shield

## Attaching the CL17 Analyzer to the Network Via an AquaTrend Interface

1. Make network connections from the CL17 Analyzer to the AquaTrend Network. Hach recommends making those connections at the junction box. Be certain to connect the cable shield.
2. From the Master AquaTrend Interface add the CL17 Analyzer to the network as follows:
  - a. Press the **MENU** key and select **NETWORK MENU**.
  - b. Select **ADD DEVICE**. Wait while the AquaTrend Interface searches for devices on the network. The AquaTrend display will show the instrument name and version number.
  - c. When the display prompts **ADD DEVICE**, press **ENTER**. The AquaTrend display will show **CL17 CONFIGURING DEVICE. PLEASE WAIT**.
  - d. After the sensor is added to the network a message will be displayed with the name of the sensor. Press **ENTER** to accept the displayed sensor name. Press the **MENU** key to return to the main menu.



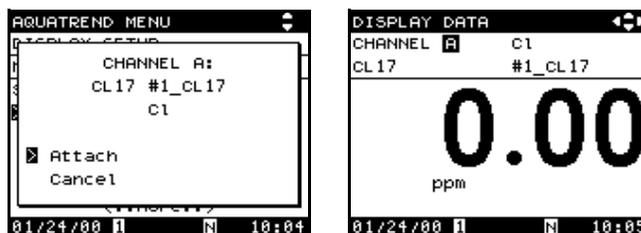
## Adding the Measurement to a Channel

The measurement from the CL17 Analyzer must be associated with a channel on the AquaTrend Interface so the measurement will be shown on the AquaTrend display. Attach the measurement to a channel as follows:

1. Select **AQUATREND MENU** and press the **ENTER** key.
2. Select **DISPLAY SETUP** and press **ENTER**.
3. Select **MEASUREMENT TO CHANNEL** and press **ENTER**.
4. Select **ATTACH** and press **ENTER**.



5. Select a available channel on the AquaTrend and press **ENTER**.
6. Press **ENTER** again to select **ATTACH TO CL17**.
7. Press the **MENU** key to return to the AquaTrend main display. The reading will be displayed and updated every 2.5 seconds.



## Alarms and Warnings

If an alarm or warning condition exists at the CL17 Analyzer, the alarm or warning will be indicated at the AquaTrend via the alarm annunciator. The actual alarm or warning must be viewed and resolved at the CL17 Analyzer. The CL17 Analyzer alarms and recorder outputs can also be connected to a Signal Output Module. Please refer to the *Signal Output Module Manual*.



## Logging Data via the Hach Serial Input/Output Module

The CL17 Analyzer sends the chlorine reading (in ppm) to a SIO on the network, if one is present. The service diagnostic data must be disabled before outputting data to the SIO as follows:

1. Press the **MENU** key then the **DOWN ARROW** key until **SETUP** is displayed.
2. Press **ENTER**.
3. Press the **DOWN ARROW** key until **DIAG OUTPUT** is displayed. Press **ENTER**.
4. Use the up or **DOWN ARROW** key to toggle the selection between **ON** and **OFF** then press **ENTER** to select the displayed option. Press the **EXIT** key to return to the measurement display.



The format of the data is illustrated below, where *n* is the SIO channel number for the CL17. (The channel number (1–8) is assigned based on the order in which devices were added to the network.) Please refer to the AquaTrend Interface Manual for information on determining the channel number.

## Appendix B

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**Note:** In the following commands, *n* signifies the channel number.

[*n*] 3.00, <CR><LF><NULL>

Additional diagnostic strings will be present if service diagnostics is enabled. These diagnostics are for service personnel only.

### Manually Polling Data

**Note:** Refer to the *Signal Input/Output (SIO) Manual* for additional information on communicating with the SIO.

Data is normally sent out (polled) every 2½ minutes. The automatic polling function cannot be modified but the system can be manually polled as follows:

Enter the following to enable manual polling mode:

nRMR1

Enter the following to receive the latest reading:

nRMR?

To return to automatic polling mode enter the following:

nRMR0

### Using the Signal Output Module

Refer to the *Signal Output Manual* (Cat. No. 51250-18) to configure up to two relays and one 4–20 mA outputs. The relays and recorder output mirror the outputs of the relays and recorders internal to the CL17.

### Logging Data via the Hach MOD I/O Module

Measurement and alarm data from the CL17 Analyzer can be converted to a Modbus®\* protocol using the Hach MOD I/O Module. The data can then be polled by any Modbus Master Device (PLC/DCS) including the Hach OPC server/OPC data logger. Refer to the *MOD I/O Module Manual* for additional information.

The CL17 Analyzer has the following setup information for the MOD I/O Module:

Number of Integer Measurements	1
Number of Floating-point Measurements	1
Number of Alarms	2
Sensor ID	8

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\* Modbus is a registered trademark of Modicon Corporation.



## 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

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## Replacement Parts and Reagents

Description	Unit	Cat. No.
Circuit Board Assembly, main .....	each.....	54404-00
Colorimeter Module.....	each.....	54455-00
Colorimeter Plug .....	each.....	51224-00
Connector for Alarm or Recorder .....	each.....	44582-00
Cam/Coupler Assembly .....	each.....	54452-00
Follower Block, Reagent .....	each.....	42741-00
Follower Block, Sample.....	each.....	42742-00
Fuse, (T, 2.5 A, 250V) UL/CSA/CE accepted, 2 needed.....	each.....	49526-00
Installation Kit.....	each.....	55164-00
Maintenance Kit .....	each.....	54443-00
Maintenance Kit, preassembled.....	each.....	54443-01
Motor Assembly .....	each.....	54446-00
Pressure Plate .....	each.....	54118-00
Reagent Kit for Free Chlorine testing .....	each.....	25569-00
Includes:		
Free Chlorine Buffer Solution.....		23141-11
Free Chlorine Indicator Solution .....		23140-11
DPD Indicator Powder .....		22972-55
Reagent Kit for Total Chlorine testing.....	each.....	25570-00
Includes:		
Total Chlorine Buffer Solution .....		22635-11
Total Chlorine Indicator Solution .....		22634-11
DPD Indicator Powder .....		22972-55
Screen, 40-mesh, replacement for Sample Conditioning.....	each.....	54184-00
Stir Bar, Micro, 3mm x 8mm.....	each.....	54129-00
Thumb Screw, to hold Pressure Plate.....	2.....	54101-00

## Optional Accessories

Flow Meter with ¼-inch OD tubing .....	each.....	46436-00
Power Cord kit with strain relief, 115 V, North American Operation .....	each.....	54488-00
Power Cord Kit with strain relief, 240 V, European Operation .....	each.....	54489-00

# How to Order

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## U.S.A. Customers

### By Telephone:

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

### By Mail:

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

### By Fax:

(970) 669-2932

### 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

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](mailto: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](mailto:intl@hach.com)

# Warranty

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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.

# Certification

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Hach Company certifies this instrument was tested thoroughly, inspected, and found to meet its published specifications when it was shipped from the factory. The CL17 Chlorine Analyzer has been tested and is certified as indicated to the following instrumentation standards:

## Product Safety

The CL17 Chlorine Analyzer 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 CL17 Chlorine Analyzer was tested for Industrial level EMC per:

**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 61000-4-4:1995) 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 Electro-Magnetic Field from Digital Telephones (Criteria A)

## Emissions

The CL17 Chlorine Analyzer 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 CL17 Chlorine Analyzer from its power source to verify that it is or is not the source of the interference.
2. If the CL17 Chlorine Analyzer is connected into the same outlet as the device with which it is interfering, try another outlet.
3. Move the CL17 Chlorine Analyzer away from the device receiving the interference.
4. Reposition the receiving antenna for the device receiving the interference.
5. Try combinations of the above.