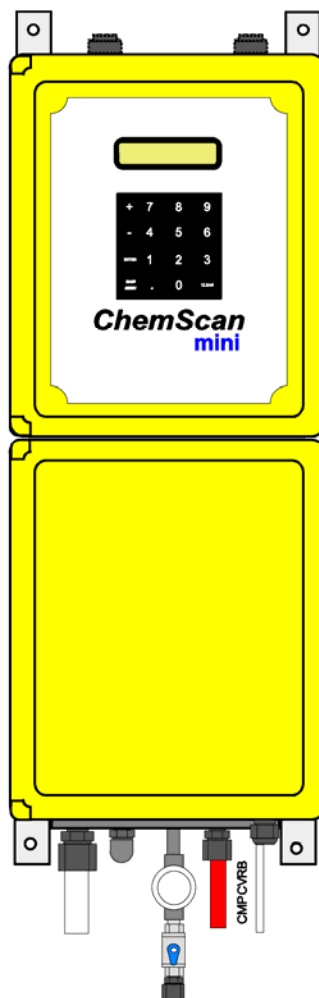


ChemScan® mini oP Analyzer
for Ortho-Phosphorus Monitoring
Installation, Operation and
Maintenance Manual



asaanalytics.com

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Analyzer Description

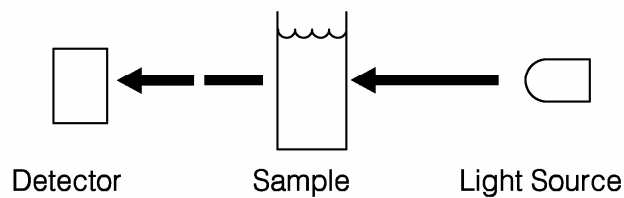
The ChemScan mini oP has been developed utilizing proven technology to provide reliable and accurate analysis of water and wastewater. The device has been designed to reduce maintenance requirements by using large ID sample tubing to minimize plugging and typically only needs quarterly reagent change out.

This analyzer is a photometric instrument configured to measure Ortho-Phosphorus in water samples at High (0.1 – 6.0 mg/L) or Low (0.03 - 3.0) range.

The analyzer consists of two enclosures. An upper enclosure contains the analyzer's power supply, main circuit board, operator interface and electrical connections. The lower enclosure contains the sample control manifold, reagent pump, flow-cell and optical components. Voltage in the lower enclosure is 24 volts. A water-tight cord-grip provides a seal between the two enclosures.

To measure Ortho-Phosphorus the analyzer uses an automated process similar to a typical test kit. It performs an initial measurement of the sample water and stores it as a "blank". Then a reagent is added to the sample and mixed. The sample and reagent is allowed to react for a programmed period of time. A second optical measurement is made and the previous blank measurement is subtracted. The concentration is calculated and the display and 4-20mA signal are updated.

The analyzer results can be adjusted to match split samples with the lab.



Simplified diagram of analyzer optics.

Specifications

Range: (as oPO4-P)	0.03 – 3.0 mg/L (lo), 0.1 – 6.0 mg/L (hi)
Accuracy:	2% of range or 2x detection limit (whichever greater)
Cycle Time:	5 minutes to 9999 minutes (field programmable)
Environment:	5 – 50 degrees C
Power:	100 – 240 VAC, 50/60 Hz, 70 VA
Enclosure:	NEMA 4X
Safety Approval:	CSA-US
Sample:	0.5–1.0 liter/analysis, 2–10 psi (14–70 kPa), <150 mg/L TSS, <60 NTU
Maintenance:	Reagent replacement every 3 months*, pump kit every 6 months
Relay Contacts:	1 SPDT Concentration, 1 SPDT Programmable
Serial Interface:	Serial RS-232
Analog Output	Isolated 4-20 mA

* Reagent replacement every 3 month as follows: low range analysis minimum cycle time is 5 minutes, high range minimum cycle time 10 minutes

Unpacking Analyzer

Check for Damage

Remove the analyzer from the shipping carton. Inspect the analyzer and installation kit for damage. Report any damage to ChemScan Service.

Contents of Installation Kit

The installation kit provides the items necessary to install and operate the analyzer for the first year.

Installation Kit Parts:

<u>QTY</u>	<u>ITEM</u>	<u>PART NUMBER</u>
1	Pump Cassette	800020
1	Cleaning Carboy Assembly	JUG0001
1	Sample Inlet Assembly	300024
1	Drain Tube Assembly	300057
1	Reagent Bottle Holder	800022
1	Injector Syringe Kit	100200
1	Communication Cable	460037
1	Operations and Maintenance Manual	

Initial Reagent Supply

Note: please refer to the MSDS for safe handling of the Reagents.

Four 4 liter bottles of VMO reagent are provided for the first year's operation.

Yearly Maintenance Kit

The yearly maintenance kit contains the items necessary to perform all regular maintenance on the analyzer.

Four 4 liter bottles of VMO reagent are provided for the year's operation.

One complete pump assembly to be replaced upon installation of the 1st bottle of reagent.

One pump head to be replaced upon installation of the 3rd bottle of reagent.

Installation

IMPORTANT: Never mount the equipment in such a way that it is difficult to locate or operate the disconnecting device.

WARNING: If this equipment is installed or used in a manner not specified in these instructions, proper operation cannot be assured, and the safety and protection provided by the equipment may be impaired.

WARNING: UV Radiation inside.

CAUTION: Always wear suitable eye protection.

IMPORTANT: Ne jamais installer l'équipement de façon à rendre difficile l'accès à l'emplacement ou l'opération du mécanisme de débranchement.

AVERTISSEMENT: Si cet équipement est installé ou utilisé d'une façon différente ou non spécifiée dans nos instructions, nous ne pouvons assurer sa bonne opération, et la sécurité et la protection fournies par l'équipement pourrait être diminuées.

AVERTISSEMENT: Rayonnement ultraviolet à l'intérieur

ATTENTION: Toujours utiliser une protection appropriée pour les yeux.

Mounting

The analyzer should be mounted securely to an indoor wall using appropriate fasteners. Refer to Figure 1 for detailed information. Indoor installation is recommended to provide more moderate ambient temperature cycles. Extreme temperatures can cause optical instability and freeze the reagent and cleaning solutions.

Mount the wire bottle rack provided to a vertical surface adjacent to the analyzer as shown in Figure 3. Place the reagent bottle, in the rack and connect the bottle cap to the reagent bottle.

Electrical and Output Connections

Power Requirements: 100 to 240 V 50/60 Hz, 70 VA Maximum

The system may be plugged into any appropriate 120 VAC outlet. Outlet location should be adjacent to the analyzer so that an extension cord is not needed and the system may be readily unplugged. The plug serves as the primary disconnect.

If a more permanent installation is required by design or local code, the water-tight cord-set may be replaced by approved watertight conduit, installed by a qualified person according to local and national codes. In this case, the PRIMARY DISCONNECT IS PROVIDED BY OTHERS. A switch or circuit breaker, clearly marked for this purpose, should be located adjacent to the analyzer.

WARNING: Conduit connected to the fiberglass enclosure will not serve as a grounding means. Bonding must be provided between the labeled ground terminal and electrical ground.

AVERTISSEMENT: Le conducteur branché au boîtier en fibre de verre ne sert pas de mise à la terre-mise de masse. Il faut connecter un fil entre la borne de mise à la terre et la borne électrique.

Analog output wires are connected as shown on the analyzer's internal label. (See menu to select analog output range.) Analog output is 4-20 mA. The analyzer sources current into the analog loop. The loop is fully isolated. The 4-20 mA connection is on terminals 8 & 9 (shield conductor on terminal #7) as shown on the detail view in Figure 1.

Note: A secondary 4-20 mA Auxiliary Channel (AUX) is unused.

Alarm relays fused at 5 amps are provided. These are dry-contact. Usage is limited to 24 VAC.

Plumbing Connections

The sample line should be connected as shown in Figure 2. A pressurized side stream sample is required, with minimum sample pressure of 0.5 psi (3.4 kPa) and maximum pressures of 10 psi (68.9 kPa). A pressure regulator should be installed if required.

Sample, Cleaning and Reagent connections must be completed as indicated on the installation drawing. Connections must be firm and vacuum-tight. Air drawn into the system may cause erroneous readings.

The drain tubing must have a free fall to an OPEN DRAIN. Run drain tubing so it completely drains empty following sample flush. Low spots in the drain tubing where liquid completely fills the tubing may cause erroneous readings.

NOTE: Do not over-tighten the plumbing connections. Excessive tightening can result in damage to the fittings or other components.

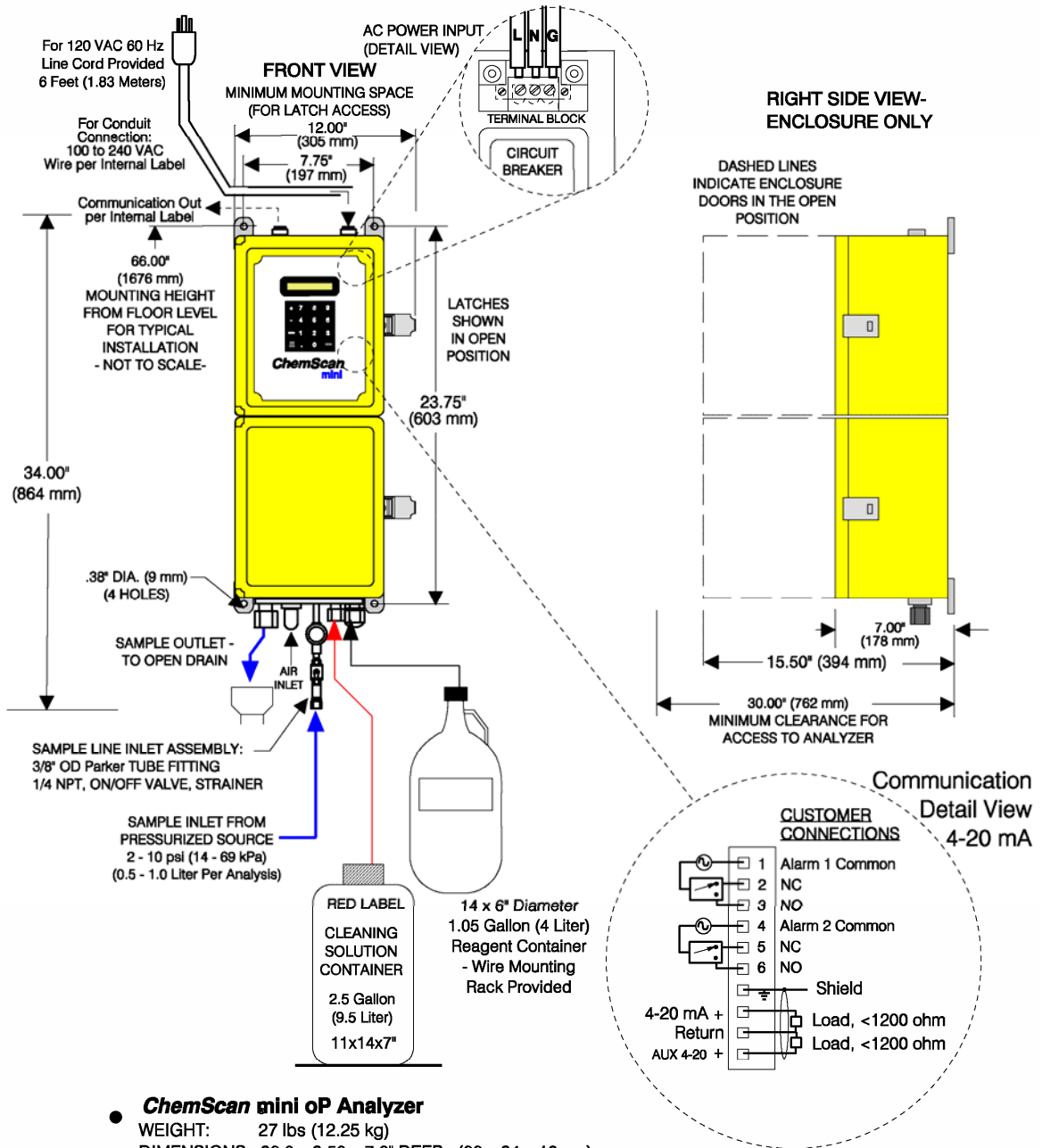
Reagent Installation

Note: Please refer to the MSDS for safe handling of the reagents.

Install the reagents in the wire holder. Remove the bottle cap and slide the reagent tube into bottle and secure cap. Verify the reagent tubing reaches the bottom of the bottle.

In the analyzer's lower enclosure verify the reagent tubing fitting is finger tight.

Mix and install the initial Cleaning Solution as described in the Maintenance Section later in this manual.



- ChemScan mini oP Analyzer**
 WEIGHT: 27 lbs (12.25 kg)
 DIMENSIONS: 26.0 x 9.50 x 7.0" DEEP, (66 x 24 x 18 cm)
 POWER: 100 - 240 VAC, 50 / 60 Hz, 1 AMP
 NEMA TYPE: 4X Fiberglass Enclosure
 Intended for Installation Indoors

CMPINST6

ChemScan mini oP Analyzer Installation Diagram

Figure 1

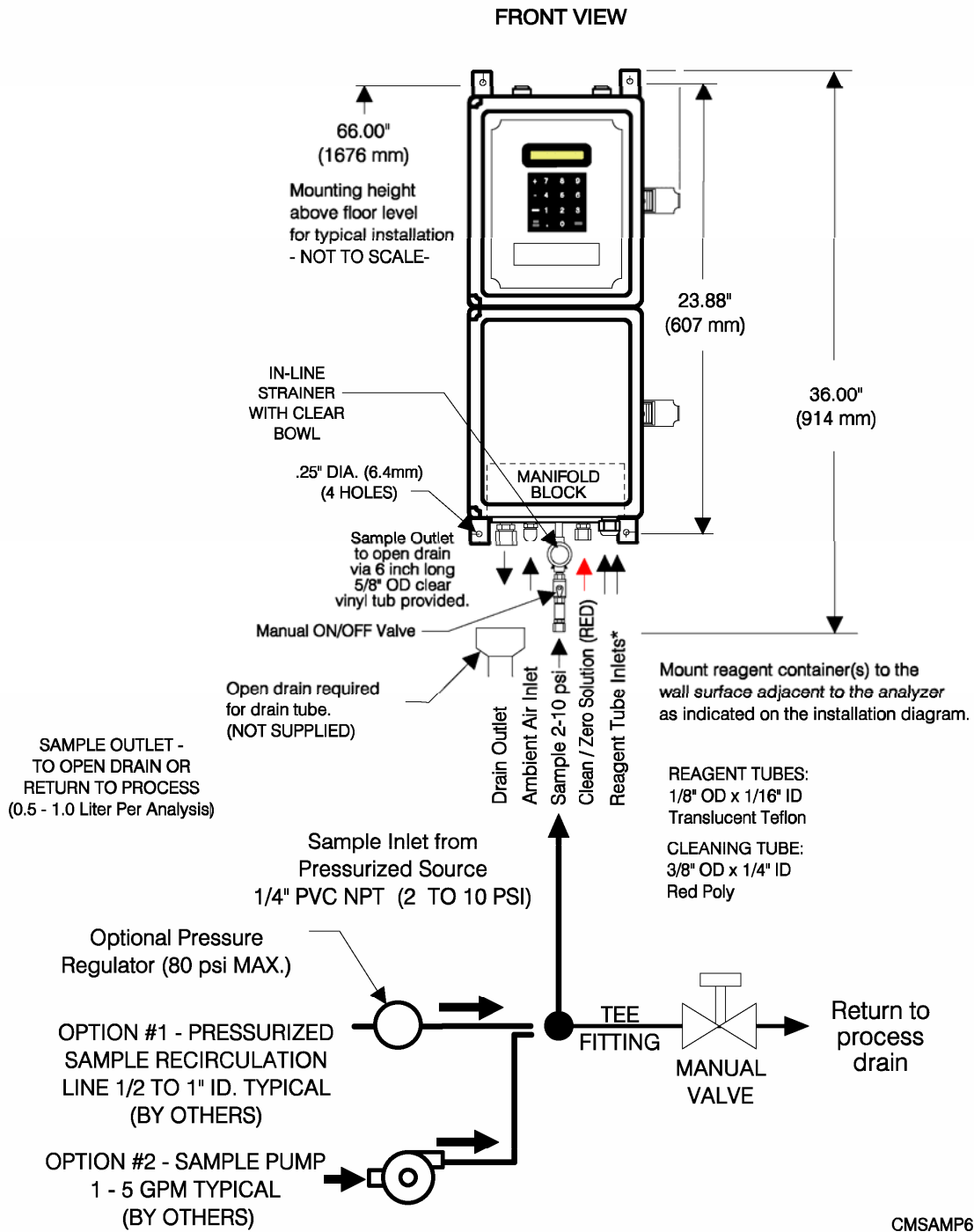


Figure 2



Figure 3

Startup

The following steps will startup the analyzer, typically in 30 – 45 minutes.

- Power Up
- Verify Sample Flow and Pump Operation
- Select Analysis Range
- Perform Initial Zero Reference
- Prime Injector Pump
- Verify 4-20 mA Signals (optional)
- Initiate On-Line Mode
- Initial Calibration Adjustment (optional)
- Additional Configuration Variables (optional)

Power Up

After proper connection are made to 110/240 VAC, turn the analyzer ON by pressing the “1” side of the red circuit-breaker switch located behind the front panel. (Access the switch by loosening the two captive Phillips screws on the right.) The switch should illuminate. Secure the front panel.

The LCD display will display the default sign-on message. At this point the instrument is idle, awaiting configuration. PRESS the “MAIN MENU” key on the keypad.

Four options will be displayed. These four options are the only selections available to the operator. The installer has access to several more.

Verify Sample Flow and Pump Operation

From the MAIN MENU the Technician Level Menu can be accessed by pressing the ‘9’ key. The “+” and “-“ keys will scroll through the configuration options. Press the “-“ key; and the “code revision data” will be displayed. Press the ”-“ key again to display the DIAGNOSTICS MENU used to test the sample valve and pumps.

TURN ON SAMPLE VALVE:	(SAMP4)	press the 4 key
TURN OFF SAMPLE VALVE:	(SAMP1)	press the 1 key
TURN ON CLEANING PUMP	(ZC5)	press the 5 key
TURN OFF CLEANING PUMP	(ZC2)	press the 2 key
TURN ON AIR PURGE PUMP	(AIR6)	press the 6 key
TURN OFF AIR PURGE PUMP	(AIR3)	press the 3 key

Using the DIAGNOSTIC MENU, **VERIFY SAMPLE FLOW:**

Press the “4” key to open the sample valve. Sample should flow through the instrument and out the drain tube. Verify that there is a complete vacuum break in the drain line immediately after the analyzer. If necessary, throttle the supply line to provide 0.5 to 1 liters/min flow through the analyzer.

Press the “1” key to close the sample valve.

Using the DIAGNOSTIC MENU again, **VERIFY CLEANING SOLUTION FLOW:**

Press the “5” key to turn on the pump for the cleaning solution. Initially, there will be air in the tube from the cleaning solution container. As the air is pumped through the analyzer, you may see bubbles

in the clear tubing to the flow cell. Within a minute or two the air bubbles should be replaced by cleaning solution. The analyzer cleaning pump moves approximately 60 milliliters/minute.

If cleaning solution was not properly pumped, check the fittings connection on the cleaning solution tube to the instrument. Verify that the tube is fully inserted into the cleaning solution container.

Press the “2” key to turn off the cleaning pump. Press the “4” key to flush process water through the system; after about 1 minute, press the “1” key to stop the process feed, leaving the flow cell full of process water.

Press the “MAIN MENU” key to exit the diagnostic menu.

Select Analysis Range

The analyzer has two operating ranges. Use the following steps to select the appropriate range of operation:

1. From the MAIN MENU screen , press (4) SETUP
2. From the SETUP MENU, press (1) PARM
3. The display will read “SELECT THE PARAMETER”, and the parameter or units currently selected.
4. If needed, use the +/- keys to scroll through the available parameters until the desired one is found. Then press the ENTER key.
5. Press MAIN MENU to exit this function.

Perform Initial Zero Reference

The analyzer uses the sample as a blank for each analysis. It determines if the flow cell windows need to be cleaned by comparing the initial zero reference with the blank on each reading. This procedure will establish the initial zero reference.

1. From the MAIN MENU screen, press the “2” key, selecting the SAMPLE option. The display will read “(1) ADJUST (2) ZERO”. Press “2” to select the ZERO menu.
2. The top line will display the NEW, real-time throughput of the flow-cell in volts, followed by the OLD, previously recorded zero. Press the “+” key to flush sample into the cell for zeroing. Air bubbles and particulate may make the NEW reading vary slightly. Let the fluid flow for about a minute. Press the “-“ key to stop the flow.
3. Observe the NEW value. It should be between 1 and 4.5. Any reading below 1 indicates either a fouled cell or extremely dirty water. The NEW value should be similar to the OLD value (If this is the first time the instrument has been set up, the OLD value is the throughput when the instrument was initially zeroed at the factory).
4. Verify the NEW number is between 1 and 4.5 volts, and stable (varying less than 0.001 volts). If the NEW reading is not stable, there may be particulate or air bubbles in the cell.
5. Once a proper throughput reading has been achieved and stable, press the 'ENTER' button. The NEW reading will be stored in memory until another zero operation is performed., It will then appear as an OLD zero value.
6. Press MAIN MENU to exit this function.

Prime Injector Pump

The reagent tubing and injector pump needs to be primed with reagent to the flow cell. Verify that the flow-cell is full of sample water. From the MAIN MENU, press “4” for Setup, then use the “+” key to display more options until 7) PRIME INJECTORS, and press the “7” key. Then press “1” to start the injector pumping. The analyzer will activate the injector 100 times. You should see the reagent move through the translucent reagent tubing and into the flow cell. If after 20 pumps no reagent has begun to move up the tube, check the reagent fittings are finger tight . If the problem persists, it may be necessary to “manually wet” the injector pump. This may be required if the analyzer has been unused for an extended time. A detailed procedure for this can be found in the appendix. Pressing the CLEAR/MAIN MENU keys will stop the injector (if it has not completed 100 activation cycles) and return to the MAIN MENU.

Verify 4-20 mA Operation (optional)

The 4-20 mA output signal can be exercised over the full range.

1. From the MAIN MENU, press 4) for SETUP
2. Press “3” for 4-20 mA OUTPUT
3. Press “3” for FORCE
4. Press “1” to select 4-20mA channel one
5. Enter the milliamp value to force the output any value from 4 to 20 can be entered.
6. Press the MAIN MENU key to return

On-Line Operation

Following the completion of the above procedures, the analyser is ready to perform analysis on the sample water. From the MAIN MENU, press 1 for ON LINE the analyser will begin counting down time until the next reading, verify this is the correct time between readings. If not, the time between readings can be adjusted in the SETUP menu as described in the later in the Menu Structure later in the manual. To initiate the reading cycle immediately, press the “Clear” key.

Verify sample flow volume is within specification. Following the analysis cycle, the resulting concentration value is displayed and the 4-20 mA signal can be verified. After 3 – 6 analysis cycles, verify the stability of the values. After 1-2 hours of operation, the analyser calibration can be verified and/or adjusted as described in the next section.

Initial Calibration Adjustments (optional)

The analyzer is factory calibrated to be accurate in most applications. Occasionally, the calibration will need to be adjusted to better match laboratory results. In this case, please refer to the Calibration Adjustment Procedure in the Operation Section of this manual.

Additional Configuration Variables (optional)

The analyzer has been configured at the factory to operate in most applications meeting the specifications. It is suggested these factory configurations not be changed. A description of these configuration settings can be accessed through the Technician Level Menu as described in the Appendix.

Operation

Menu Items

The analyzer is equipped with an operator interface consisting of a display and keypad. The operational parameters can be adjusted through the operator interface. NOTE: Whenever a “+” is displayed in the lower right of the display, use the + key to display more menu choices.

The keypad is used to enter numerical values and to select menu choices for the analyzer. There are four options from the MAIN MENU:

- 1) ONLINE
- 2) SAMPLE
- 3) CLEAN
- 4) SETUP

NOTE: The analyzer outputs remain frozen at the most recent ONLINE data in all but the force-output modes when the analyzer is taken offline.

ONLINE selection

The ONLINE menu selection puts the instrument in the ON-LINE mode. The flowing sample is analyzed based on the programmed read interval and the result is displayed on the front panel. Simultaneously the same data is presented on the 4-20mA-output channel and sent over the serial port. Pressing the MAIN MENU key will return to the MAIN MENU upon leaving the ONLINE mode, the 4-20 outputs will be frozen at the last measured value and the serial output will stop updating.

SAMPLE menu

In this menu, the instrument displays “(1) ADJUST (2) ZERO”. Pressing the “1” key accesses the ADJUST menu used to adjust the calibration SLOPE and/or OFFSET. Pressing the “2” key accesses the ZERO menu, which is used to force a manual zeroing. Pressing the MAIN MENU key will return to the MAIN MENU.

CLEAN menu

The CLEAN menu is used to manually draw cleaning solution through the flowcell. Select either, then press + to start the flow and – to stop the flow. Option 2, QUICK CLEAN SETUP, allows setting of the behavior of a quick 'touch-up' cell cleaning cycle, which doesn't take as much time or solution as a full clean. During normal operation, buildup on the windows starts slowly and reaches a critical 'tipping point'. Flushing through a little cleaning solution every few readings helps keep the windows clean to prevent or delay this buildup.

The INTERVAL sets how many readings are taken between QUICK CLEAN cycles. 'PUMP' sets how many seconds to pump the cleaning/zeroing solution. SOAK sets how many seconds to let the solution sit in the cell. Pressing the MAIN MENU key will return to the MAIN MENU.

SETUP menu

Provides for configuration of the analyzer and the various output channels.

MENU STRUCTURE

MAIN

1) ONLINE

CONTINUOUS MONITORING

- Display reflects current analysis
- Exit ONLINE mode by pressing MAIN
- Outputs are frozen at last online reading

2) SAMPLE

1) ADJUST

- 1) SLOPE
- 2) OFFSET
- 3) CALCULATE

- current slope is displayed, may be edited
- current offset is displayed, may be edited
- enter lab and instrument values, and the instrument will calculate the slope/offset.

2) ZERO

- triggers the automatic zeroing cycle.
- press + to start flow of zeroing solution,
- press – to stop. ENTER to read zero.
- This Zero is used for subsequent evaluations of cell cleanliness - it is not used in the analysis.

3) CLEAN

- 1) Begin Manual Cleaning
- 2) Quick Clean Setup

- 1) Setup Quick Clean Interval
- 2) Pump Time
- 3) Soak Time

4) SETUP

- 1) PARAMETER SELECT
- 2) SET CLOCK
- 3) 4-20mA OUTPUT
 - 1) 4mA point
 - 2) 20mA point
 - 3) FORCE

- configure analyzer
- select between lo or hi range
- set the time of day clock

- sets the concentration at 4mA
- sets the concentration at 20mA
- forces the output to the specified current - Select Channel “1” then enter the desired value

4) ALARM

1) SETPOINT

- sets the trigger point for alarm relay
- alarm when ABOVE or BELOW setpoint.
- “+” Selects next menu option (plus key)

5) SECURITY CODE

- change the current security code to interrupt the On Line Mode – if set to 0, no security code is required

6) READ INTERVAL

- set the time between reading cycles (from beginning of cycle to next beginning of cycle) the value is in hours and minutes - hh:mm

7) PRIME INJECTOR

- exercise the injector pump to test and/or prime the reagent

“-” Selects previous menu option (minus key)

Calibration

The Analyzer has been shipped with a factory calibration. Typically this calibration is accurate enough for most applications. Lab standards can be used to verify the analyzer's accuracy. When using a laboratory standard, allow at least 500 mL of sample to flush through the cell before the analysis.

Simple Calibration Adjustment

The best method for determining accuracy is by collecting a split sample to be analyzed by a laboratory or test kit. When collecting the split sample, never use the analyzer waste from the drain for collection of the lab sample because it can be contaminated with reagent from the previous reading. Use a sample port prior to the analyzer.

Typically 3 – 6 samples are collected and analyzed prior to calculating the calibration adjustment. The analyzer's readings are must be recorded at the same time the samples are collected for the laboratory. Upon receiving the lab data, calculate the average difference between analyzer and lab results.

To enter the calibration adjustment, from the MAIN MENU, press 2) for SAMPLE, then 2) for OFFSET. Note the currently entered OFFSET value, mathematically add the calculated adjustment to the currently entered value. (if the current value is -0.2 and calculated is -0.3 result would be -0.5 or if current value is 0.2 and calculated is -0.3 result would be -0.1). Enter the result in the offset and press the ENTER key twice.

Calculated SLOPE/OFFSET Adjustments

A new slope and offset can be automatically calculated using the CALCULATE feature in the analyzer. Results of a low and high concentration sample are entered and a new slope and offset is calculated. For this procedure to provide accurate results, the low level sample must be in the lower 25% of the operating range and the high sample must be in the upper 75% of the operating range. Prepare required samples prior to performing this procedure.

1. Take the instrument offline by pressing the MAIN MENU key
2. Press the "2" key for SAMPLE
3. Press the "1" key for ADJUST
4. Press the "1" key for Slope and record the values then enter a value of 1.
5. Press the "2" key for Offset and record the value then enter a value of 0.
6. Read the low and high level samples and note the values.
7. Press "3" to allow the instrument to perform the necessary calculation
8. Option 3 requires 4 entries: A low level split sample recorded from analyzer and reported from lab; a high level split sample, recorded from analyzer and reported from lab.

The screen will display	LI: 0.0	Lh: 0.0
	CI: 0.0	Ch:0.0

LI represents Lab low level value
Lh represents Lab high-level value
CI represents Analyzer low-level value
Ch represents Analyzer high-level value.

9. Enter the collected value in the appropriate slot. Use the “+” and “–” keys to move the cursor to the desired fields. Key in the value, then press ENTER. If needed, correct a value by re-entering it.
10. When all fields are filled correctly, press the ‘MAIN MENU’ key.
11. Newly calculated slope/offset values will be displayed.
12. You may accept the new values or disregard them.

The calculated value may display “NaN”, which means “Not a rational number”. This may be due to the original slope/offset settings being irrational. In this case, repeat the procedure. If this does not solve the problem, reenter the original slope and offset and perform the Simple Adjustment above.

Maintenance

The analyzer has been designed to minimize the total amount of maintenance time. Typically the analyzer requires less than 2 hours of maintenance per month.

Maintenance Schedule

Routine maintenance of the analyzer is limited to a few periodic procedures as follows:

Daily

- Observe analyzer and confirm normal operation

Quarterly*

- Fill Cleaning solution and reagent containers.
- Inspect and clean Inlet Strainer
- Perform a Calibration Verification and Adjustment

Semi-Annually*

- Replace the "Air Pump" head

Annually*

- Replace the "Air Pump" assembly

*Approximate Time Interval - Varies with interval between readings

Maintenance Procedures

The following pages are procedures describing the routine maintenance operations.

Interrupting On-Line Operation

To interrupt on-line operation the “Main Menu” key is pressed. If the security code has been set to a value other than 0, the security code must be entered.

Sample Line Screens

The sample line inlet is equipped with a small mesh screen to prevent the entry of large particles and debris into the system. This screen may need to be periodically cleaned.

To clean the strainers, INTERRUPT on-line mode and close the sample line valve. Unscrew the strainer bowl and remove the screen. If algae is growing on the screen clean it with a bleach solution. Rinse the screen and bowl thoroughly with tap water. Install the screen into the strainer bowl. Be sure the o-ring is installed and screw the bowl onto the housing. Open the sample line valve and check for leaks.

After the strainer has been cleaned, return the analyzer to the on-line mode.

Cleaning Solution

The analyzer will automatically clean. The typical mixture is 1 liter of Muriatic acid (HCl) into 9 liters of DI water. A 10-liter container is provided with the analyzer.

Reagent

An appropriate reagent container and reagent is provided with the analyzer. This reagent supply should be sufficient for 3 months of operation based on parameter range and cycle time. For additional reagents call ASA, Inc. or your local ASA authorized supplier.

Reagent Replacement Procedure

Place the analyzer in the off-line mode by pressing MAIN MENU

Unscrew the bottle cap of the new reagent container and the cap / tube assembly from the depleted reagent bottle.

Install the new reagent bottle in the bottle rack and secure the cap assembly.

Place the analyzer back On-Line by pressing the “1” key and observe the analyzer for proper operation.

Date and initial the “Maintenance Record Label” located inside the lower enclosure door.

Note: If reagent container has been completely used and air is in the reagent tube, the injector must be primed using the 7 option in the Setup Menu.

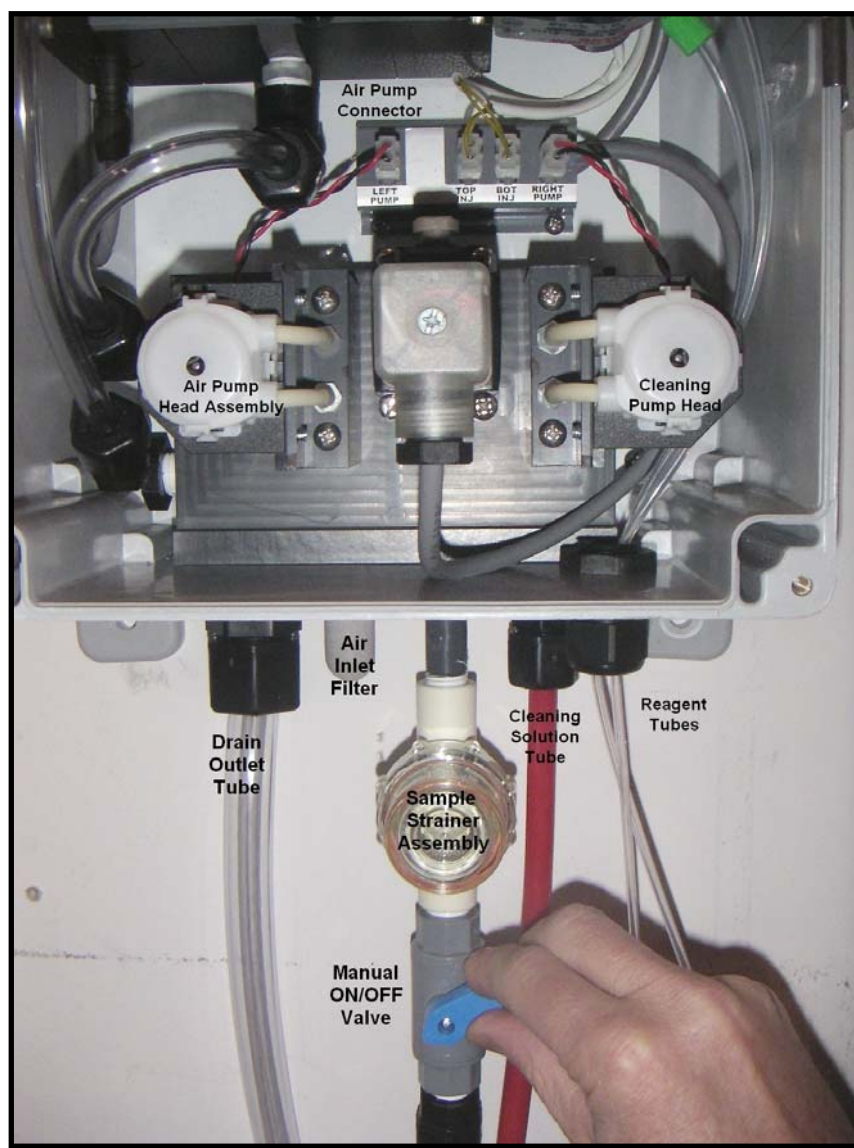
Peristaltic Pump Maintenance

To ensure reliable operation of this analyzer the peristaltic Air Pump requires the following maintenance procedures:

- 1.) The **Air Pump Head Assembly** requires replacement on a periodic basis – every second reagent change – typically every six months. A replacement pump head is provided in the “Startup Kit” and also in the “Maintenance Kit”. The “Cleaning Solution Pump” head requires no regular maintenance due to its less frequent operation.
- 2.) Replacement of the **Complete Air Pump Assembly** is required after four reagent changes – typically one year of continuous operation.

When working with chemicals always follow typical lab safety procedures to protect people and equipment from chemical, electrical and other hazards.

! CAUTION: ALWAYS WEAR APPROPRIATE EYE PROTECTION

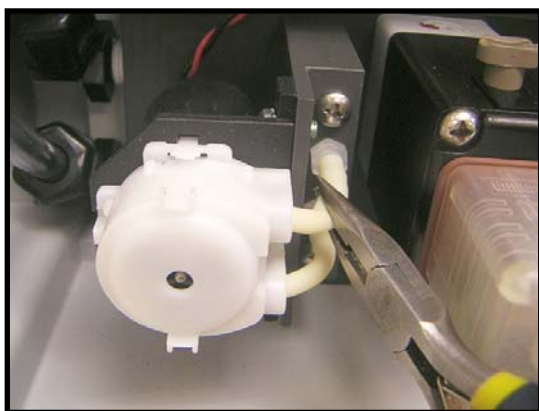


Manifold Block Assembly Components

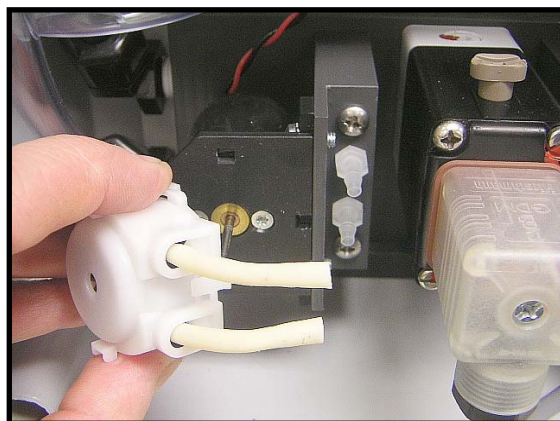
Peristaltic Pump – Pump Head Replacement:

- 1.) Place the analyzer in “Off-Line” mode by pressing the “MAIN MENU” key and close the blue handled, manual, sample valve on the strainer / inlet assembly.
- 2.) The “Air Pump” is located on the left side of the manifold block as shown in the photo.
- 3.) Sample water will drain from the upper barbed fitting when the pump tube is removed. Prepare to capture this in a small container or use absorbent materials.
- 4.) Remove the peristaltic pump tubes from the barbed fittings on the pump mounting block by pulling on the tubes by hand or use long-nosed pliers. When using pliers be certain to grasp the tube beyond the barbed fittings to avoid damage to the fittings. (See photos that follow)
- 5.) Release the two plastic clips that hold the pump head to the pump motor by pinching them towards the center of the pump head as shown below. Pull the pump head assembly straight off the motor shaft to avoid damage to the motor.
- 6.) Align the center of the new pump head with the motor shaft and carefully press the new pump head onto the motor shaft and clip in place.
- 7.) Press the new pump tube ends securely onto the two barbed fittings.
- 8.) Place the analyzer back in operation by opening the blue handled, sample inlet valve to the original position and select ONLINE (1) from the Main Menu screen.
- 9.) Verify the pump operates and air leaves the sample drain during the air purging or mixing portion of the read cycle.
- 10.) Initial and date the appropriate boxes on the maintenance log sticker located on the inner door of the analyzer.

Pump Head Removal Illustrated:



Peristaltic Pump Tube Removal



Peristaltic Pump Head Removed

Peristaltic Pump - Full Replacement:

- 1.) Place the analyzer in “Off-Line” mode by pressing the “MAIN MENU” key and close the blue-handled, manual, sample valve on the strainer / inlet assembly.
- 2.) The “Air Pump” is located on the left side of the manifold block as shown in the photo. The “Cleaning Pump” is on the right side and does not need to be replaced on a regular basis. Disconnect the corresponding pump’s electrical connector from the terminal block by gently pulling on the plastic connector housing. Do not pull on the wires.
- 3.) Loosen the two Phillips head screws that secure the pump mounting block to the manifold block using a # 2 Phillips screwdriver. NOTE: These screws are “captive” and should not be removed completely from the pump mounting block.
- 4.) Install the new pump assembly in the reverse order of this process. Tighten all fasteners to approximately 12 inch pounds of torque. Do not over-tighten.
- 5.) Place the analyzer back in operation by opening the blue handled, sample inlet valve and select ONLINE (1) from the Main Menu screen.
- 6.) Initial and date the appropriate boxes on the maintenance log sticker located on the inner door of the analyzer.



Pump Mounting Block Removal

Flow Cell - Physical Cleaning

In most applications, the acid based reagent and cleaning solution will keep the flow cell windows clean. However, in some waste-water or industrial installations or under severe operation conditions, a film may build up on the windows that the cleaning solution does not remove. (as evidenced by, for instance, less than 1 volt detector signal when doing a manual zero).

Removing the Flow Cell Assembly

- 1) Hold a small container under the flow cell sample inlet fitting. Loosen the fitting and capture the deionized water into the container. Remove the tubing from the fitting.
- 2) Remove the tubing from the top of the flow cell.
- 3) Remove the two thumbscrews securing the flow cell.
- 4) Carefully remove the flow cell assembly by sliding it out the front of the flow cell mount.

Disassembling and Cleaning the Flow Cell Assembly

- 1) Remove the two Phillips head screws securing the mounting plate.
- 2) Remove the four window plate mounting screws.
- 3) Clean the windows using laboratory lens wipes dipped in water or cleaning solution.
- 4) Wipe the windows and flow cell completely dry.

Assembling and Mounting the Flow Cell Assembly

- 1) Mount the window plates to the flow cell body with the larger window against the o-rings and the cover plate mounting holes facing the same direction. Be sure the o-ring is installed and fully compressed but do NOT over-tighten the screws. **One window plate has a “field stop” and needs to be installed on the left side of the flow cell when installed in the analyzer**

Note: Tighten the four window plate screws in an alternating sequence to evenly compress the o-ring and avoid breakage of the windows.

- 2) Wipe the outside of the flow cell.
- 3) Mount the cover plate to the window plates.
- 4) Carefully slide the flow cell into the flow cell mount and secure using thumbscrews.
- 5) Attach the fluid tubing and tighten the fittings.

Turn on the instrument. Allow 2 minutes for warm-up.

Testing the Flow Cell Assembly

- 1) Perform the MANUAL ZEROING PROCEDURE.

Following the zeroing procedure, note the zeroing value. If the value is less than 1.000 volts, call ASA Inc. Service for further instructions.

Retrieving Log Data From the Analyzer

The analyzer stores approximately 15,000 log entries. Log entries are made up of events (analyzer online, analyzer offline, zeroing operations, data readings, etc.), which are time-stamped and stored in nonvolatile memory. Retention time without power applied is approximately 100 years.

Log entries may be downloaded using the analyzer's serial channel.

Communications settings:

9600 baud

8 bit data

2 stop bits

No parity

No handshaking

Procedure for using a computer running a terminal emulator program

(HyperTerminal, PCPlus, etc.):

Connect a straight thru (no crossover) DB9 to DB9 serial cable between the computer and the female DB9 connector located in the center of the analyzer's circuit board (found behind the control panel).

Open a serial channel, with the above settings.

The Following Detailed Description Applies to "HyperTerminal" Found in Most Windows Operating Systems:

Click on "Start", "Programs", "Accessories", "Communication" and "HyperTerminal".

A "Connection Description" dialog box will open. Enter a file name "ChemScan mini", where you wish, on the computer. A "ChemScan mini – HyperTerminal" communication box will open with the file name you specified.

When the "Connect To" dialog box appears select "COM 1" (or other suitable COM channel) under the "Connect Using" heading and select "OK". There is no need to specify "Country/Region, Area Code, or Phone Number" information.

A "Com 1 Properties" box will open. Specify "Port Settings" as indicated above, (Bits Per Second: 9600, Data Bits: 8, Parity: None, Stop Bits: 2, Flow Control: None), then select "OK".

The cursor prompt should appear inside the "ChemScan mini – HyperTerminal" box.

This concludes the detailed description relevant to the Windows OS HyperTerminal Software. The following text is also relevant for other terminal emulator programs.

On the computer keyboard, enter the command to initiate download: GETLOG.

The command should echo to the computer's display. If your keyboard entries are not displayed, there is a problem with the serial channel or the cable.

After you press the ENTER key, the instrument will send its internal log. When the data transfer is finished, close the file you opened, and terminate the terminal emulator.

15,000 data log entries may be more than required. You can limit the amount downloaded to any value specified. For example, to receive the last 100 entries, type GETLOG 100.

The log data may be put into a spreadsheet. However, the non-reading events such as power up, cleaning, etc., would need to be removed. To eliminate the need to remove the non-reading events manually you can tell the analyzer to report only "readings" by typing GETLOG READINGS 500. This will return the last 500 stored readings without operational information.

To observe the operational history, type GETLOG EVENTS 100 to get the last 100 events without any reading data. If you want all the data included, you can type GETLOG ALL 1000 to get all of the last 1000 log entries. To end log output, press the “Ctrl” and “Q” keys simultaneously.

When the internal log reaches the end of its storage space it begins overwriting the earliest data, so there is no need to manually erase the log file. The command RESET LOG will erase the log file.

GETLOG [ALL] [value]

[READINGS][value]

[EVENTS][value]

RESET LOG

RESET PASSWORD

ONLINE

OFFLINE

Analyzer Troubleshooting Guide

Symptom	Cause	Action
No Flow/ Inadequate Flow	Plugged Strainer Plugged Line or Valve Low or No Pressure	Clean or Replace Strainer Blow Out or Replace Plugged Items Correct to specified range
Unstable Test Zero Readings	Fouled Cell	Chemically Clean Cell
	Bubbles/Air in Flow Cell	Check Plumbing for Air Leaks
Light Levels Too Low After Zeroing	Fouled Cell	Chemically Clean Cell
Light Levels Too Low After Chemically Cleaning Cell	Fouled Cell	Mechanically Clean
Light Levels Still Too Low	Dirty or Wet Lens Block Windows	Clean Lens Block Windows
	Bad Flow-Cell	Test Zero without Flow-Cell
Readings Constantly at Maximum of Range	Old/Bad Zero Standard Flow Cell Fouled Read Fault	Replace Zero / Cleaning Standard Chemically Clean Flow-Cell Check for sample line plug
Readings Inaccurate/ Unstable On-Line Readings	Needs Zero	Zero Instrument
	Fouled Cell	Clean Cell
	Low Flow	Clean Out Line
	Cloudy Sample	Install Filters
	Bubbles/Air in Flow Cell	Check Plumbing
	Needs Calibration	Calibrate
	Reagent Pump(s) Not Functioning	Test and Correct or Replace
Depleted or Incorrect Reagents	Correct as needed	
Analyzer Reads Zero, Does Not Respond	“0” Entered for slope	From Main Menu Press SAMPLE then ADJUST then SLOPE. Enter appropriate value.

NOTE: Adequate sample flow, sufficient cleaning / zeroing solution and properly maintained reagents / pumps are the critical maintenance items for this analyzer. Please contact your service provider for additional assistance if required.

Appendix

Additional Settings

MAIN OUTPUTS

240V SPDT 5 AMP individually fused

ALARM 1: May be set to activate when the displayed concentration is above or below the Alarm 1 setpoint.

ALARM 2: May be set to activate when the displayed concentration is above or below the Alarm 2 setpoint. May be set to instead activate when the analyzer is drawing sample, or to be inactive.

AUXILIARY INPUTS

5-30V AC/DC 10mA nominal, opto isolated

EXTERNAL RUN: INPUT 0
Normal operation, where TIME BETWEEN READS is greater than zero; This input is tested at the beginning of the timed read cycle. If the input is active the read cycle will be skipped, and the NEXT READING countdown timer will start over.

External run operation, where TIME BETWEEN READS is zero; This input is continually tested. When it goes active, a read cycle is triggered. The analyzer will do back-to-back readings until the External Run input goes inactive. Once triggered, the analyzer will complete the current read regardless of the state of the External Run input.

EXTERNAL LOSS OF FLOW SWITCH: INPUT 1
The analyzer samples this input whenever it is drawing a sample. Should the External Flow Switch input go active, indicating a flow failure, the internal sample valve will turn off, to prevent reverse flow. The analyzer will display the "WAITING FOR SAMPLE" message. When the input goes inactive, the analyzer will restart the sample drawing process.

AUXILIARY OUTPUTS

30V AC/DC 100mA maximum TOTAL, opto isolated and fused

MAINTENANCE REQUIRED: OUTPUT 3 Contact closed when analyzer detects a fault condition.

DRAWING SAMPLE OUTPUT 2 Contact closed when analyzer is drawing a sample

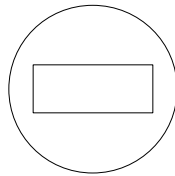
BUSY READING: OUTPUT 1 Contact closed when analyzer is in a read cycle.

ON LINE: OUTPUT 0 Contact closed when analyzer is in ON LINE mode.

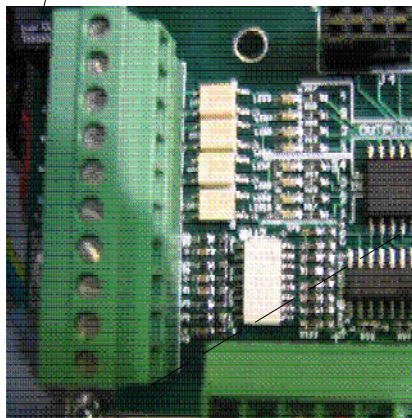
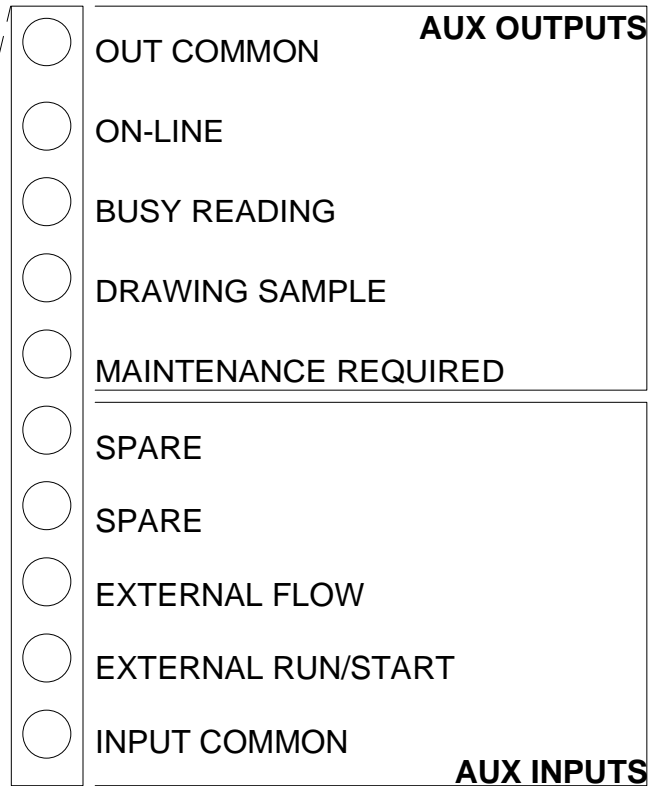
Note: All inputs and outputs have LEDs to indicate state.

AUTOCLEAN details: Sample flow is stopped. Cleaning solution is pumped into the flow cell for the time specified by "CLEANING PUMP TIME". The cleaning solution is allowed to sit in the flow cell for the time specified by "CLEAN SOAK TIME". Cleaning solution is flushed from the flow cell using process water for the time specified in "Auto Clean FLUSH TIME"; process is used to flush in order to minimize consumption of zeroing solution.

Analyzer Auxiliary I/O Terminal Block Diagram



100mA FUSE



ASA, Inc.	PHONE: 262-717-9500 FAX: 262-717-9500
Applied Spectrometry Associates, Inc.	
DATE: 3/7/11	
Analyzer Auxiliary I/O Terminal Block	
FILE# AUXIO4	

Analyzer Error Messages:

Message: []

[ALARM TRIPPED]: Flashing message indicating that the concentration setpoint has been reached triggering the alarm relay.

[RAPID FOULING]: Analyzer successfully cleaned itself, but the flow-cell quickly refouled. To avoid depleting the cleaning solution by doing numerous, successive cleanings, further cleaning attempts are disabled. The analyzer will continue to run, but results may be questionable. The operator or technician should determine what is causing the flow-cell to foul.

[CLEAN CELL MANUALLY] : Auto Zero, Clean Cycle Failed – Display following an unsuccessful AZC Cycle

[SYSTEM HALTED]

[LOW LIGHT THROUGHPUT]: System was unable to clean itself; too little light is getting through the cell; analyses are suspended. Sample flow continues. The operator or technician should determine what has caused the drop in light throughput and correct the problem. If sample opacity was the problem and the sample clears, the analyzer will resume on-line operation.

Reagent Injector Pump Priming Procedure

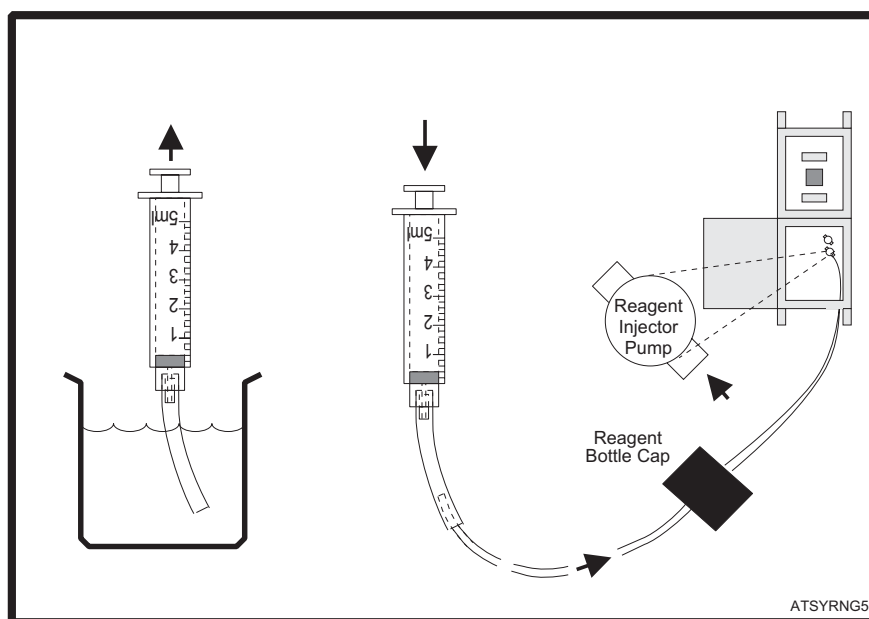
NOTE: Use this procedure **ONLY** if the injector pump does not prime using the standard Startup Procedures.

When working with chemicals always follow typical lab safety procedures to protect people and equipment from chemical, electrical and other hazards.

! CAUTION: ALWAYS WEAR APPROPRIATE EYE PROTECTION

Occasionally a reagent injector pump will not prime on the initial startup of the analyzer or after extended storage. Use the following procedure to apply positive pressure to the reagent injector to loosen a “stuck seal” and provide the initial liquid to the pump.

- 1.) **Fill the 5cc syringe** provided by drawing **distilled water** into the syringe via the two inch long clear vinyl tube attached to the syringe tip.
- 2.) **Insert the end of the injector inlet tube into the syringe tube** approximately one inch. (The injector inlet tube normally rests on the bottom of the reagent bottle.)
- 3.) **Initiate the “Priming Procedure”** from the keypad (Main Menu, #4 “Setup”, #8 “Prime”, select appropriate injector number) **While the injector pump is attempting to pump, gently press on the syringe plunger to pressurize the reagent injector pump.** (This will force open the seals in the injector pump if they have been stuck closed.) The liquid from the syringe will also “wet” the seals and eliminate any minor air seepage past the injector pump seals that may prevent the pump from priming.
- 4.) **Verify that the reagent injector pump is operating normally** by viewing the progress of the liquid in the translucent inlet tubes. Each activation “click” of the injector pump should move the liquid up through the tube assembly with no backward progress between pump “clicks”.
- 5.) **Remove the reagent injector pump inlet tube from the syringe tube** and reinstall it in the appropriate reagent bottle.
- 6.) **Prime the pump following the typical “Start-Up Procedure”** in the O&M manual to ensure all air and distilled water is removed from the reagent tubes before placing the analyzer in the on-line mode.



Reagent Injector Pump Priming Procedure

Technician Level Menu

Hidden option (9) from the Main Menu screen offers the installer a series of variables. Use the + and - keys to scroll through the options. The current value is displayed, and a new value may be entered at the cursor. To store a new value, press the ENTER key. Starting from the beginning, these are:

“MAX CLEAN ATTEMPTS”: The number of times the instrument will attempt to clean itself in an autozero/clean cycle before it stops and flashes a warning message.

“MAX ZEROING TIME”: The number of seconds the instrument will wait for a stable reading from the zeroing solution. This is normally set at 120 seconds.

“CLEAN IF %T is BELOW xxx” : At the beginning of each reading, as part of recording an initial “cell blank”, the transmittance is measured, referencing the initial zero (performed at installation or during maintenance). If this transmittance is below the entered value, a cleaning operation is triggered. The factory default value for this is 20%.

“%T CLEAN OK VALUE: xxx”: After a cleaning cycle, the transmittance is again measured; if the cell's transmittance has increased to at least the entered value, it will be considered sufficiently clean and the read operation continues. The factory default value is 40%.

“CLEANING PUMP TIME”: The number of seconds the cleaning solution is pumped during an autozero/clean cycle. Normally set to 30 seconds.

“CLEAN SOAK TIME”: The number of seconds the cleaning solution resides in the cell during an autozero/autoclean cycle. Normally set to 60.

“AutoClean FLUSH TIME”: The number of seconds the flow-cell will be flushed with process water following the clean soak. Normally set to 30 seconds.

“SAMPLE REFILL TIME”: The number of seconds to fill the flow-cell with fresh process sample. This time does not include any sample line distance between the instrument and the process. Normally set to 30 seconds.

“# of DIGITS after DP”: The quantity of digits displayed after the decimal point. Normally set to 0. Additional displayed digits do not produce more instrument accuracy. Additional displayed digits can create the illusion of dramatic process fluctuations when, in reality, the changes are at an insignificant level.

“ZERO ON [SAMPLE FLUID] [CLEANING SOL] PRESS ',' TO CHANGE:

The initial zero is used as a reference point for calculating actual absorbance and % transmittance for self-maintenance. While analyses using reagents perform a 'sample blank' against which calculations are made, making the analyzer fairly immune to process water variations, an initial zero taken on process water which is dirty may confuse the internal diagnostics if the water becomes clearer later. Since the cleaning solution has virtually no absorbance (consisting mainly of distilled water) it can be used as a 'maximum throughput' reference for the initial zero. To select the cleaning solution as a zero reference press the ',' button. Note that additional “.” key activations toggle this selection. Remember to press the 'ENTER' key after changing the selection.

“PUMP SLOW PWM VALUE” The speed of the air pump may be adjusted from 0 (stopped - not recommended) to full speed (32) to ensure the sample in the cell is properly isolated but also does not blow the sample out the drain. A normal value is 24.

“PUMP KICK VALUE” A brief interval of full voltage is required to start the air pump. This is the amount of time measured in microseconds that the full voltage will be applied to the air pump before reducing to the slow run rate. Normally set at 3000.

“READINGS TO AVERAGE”

Specifies the number of voltage measurements from the flow cell detector to average into a “reading”. This is a moving average, performed constantly. The normal value for this is 3. It is recommended that this value not be changed.

“(0) INIT LOG:: XXXX ENTER TO SEND LOG” press enter to send the XXXX log events to the serial port. Pressing the “0” key CLEARS the internal data log.

“PRESS ‘5’ TO RESTORE FACTORY DEFAULTS”

Pressing the '5' button at this point will return the instrument's setting to what they were when you received it. There is no way to undo this once initiated. Therefore, it's a good idea to keep a record of any changes made to the initial settings.

“ON: SAMP4 ZC5 AIR6...”: Controls the Sample Valve, Zero/Clean pump, and the Air pump. pressing digit 4 turns ON the Sample Valve; pressing digit 1 turns OFF the Sample Valve. Pressing 5 turns On the Zero/Clean Valve, while 2 turns it OFF. 6 turns ON the Air Pump, while 3 turns it OFF. Not listed on the screen, 7 turns on alarm relay one; 8 turns on alarm relay two. CLEAR turns everything off.

“CODE REVISION DATE”: The last time the software was updated.