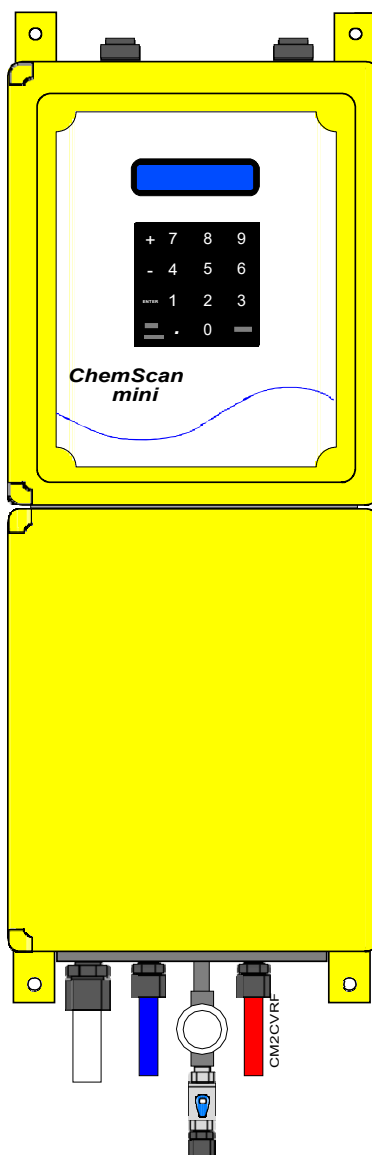


# **ChemScan®**

## **mini UV254 Analyzer Installation, Operation and Maintenance Manual**

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## ChemScan mini UV254 Analyzer

### ***Analyzer Description***

The ChemScan UV254 is a photometric analyzer designed to measure light absorbance (or light transmittance) at 254 nm wavelength in water samples. The sample flows continuously through the analyzer's flow-cell except during the auto-zero and auto-cleaning cycles.

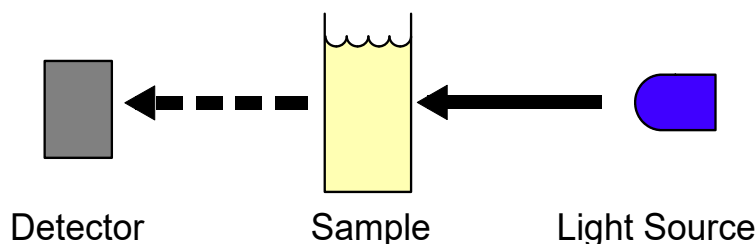
Absorbance is a measurement of the change in light intensity after passing through the sample. In addition to measuring raw absorbance values, absorbance measurements at 254 nm may be correlated with measurements of organic matter. Identical samples that are first measured by the ChemScan UV254 Analyzer can be collected and analyzed by a laboratory using the reference method. Those results are then entered into the UV254 Analyzer to provide a parameter correlation calibration.

Standard measurements of organic content include Total Organic Carbon (TOC-uv), Dissolved Organic Carbon (DOC-uv), Natural Organic Matter (NOM-uv) and Chemical Oxygen Demand (COD-uv). The UV254 Analyzer includes the capability to display and communicate raw absorbance values, adjusted absorbance values or calculated organics values.

Raw absorbance values at 254 nm can also be recalculated and reported as a percent transmittance.

### **Basic Elements of this Analyzer**

- 1.) Light is emitted by a source LED and directed on a sample.
- 2.) Chemicals which absorb the emitted light at a specific wavelength decrease the amount of light transmitted through the sample.
- 3.) A detector measures the amount of light transmitted through the sample.



F#254OPDG3

Figure 1

## ***Installation and Adjustment***

This analyzer is intended for indoor installation in a temperature-controlled environment. Additional environmental requirements can be found in the technical specification.

Select an installation location for the analyzer that can accommodate the pressurized sample required. The installation location should have space for the zeroing and cleaning containers below the analyzer and allow easy access to the analyzer for maintenance.

The UV254 Analyzer is supplied with mounting feet as shown in Figure 2. The analyzer should be mounted securely to an indoor wall or other suitable structure using appropriate fasteners. Indoor installation is recommended because ambient temperature cycles can cause optical instability or freeze the zeroing and cleaning solutions.

A power cord is provided for connection to US standard 120 VAC power. Alternatively, the power cord can be removed and the analyzer connected to 100 to 240V AC 50/60 Hz, single phase power lines and ground as shown in the Figure 2 (Input Power Terminal Detail View).

The sample line should be connected as shown in Figure 2.

Figure 3 illustrates the required pressurized side stream sample, with a sample pressure of 6 -20 psi (41-138 kPa). A pressure regulator should be installed, if needed, to limit the pressure. NOTE: Removing the optional 5 psi check-valve from the sample drain will allow the analyzer to operate with sample pressures as low as 2 psi (14 kPa). A reliable, pressurized sample that matches the process is critical to the operation of the analyzer.

Analog output wires are connected as shown on the analyzer's internal label. (See menu to select analog output range.) Analog outputs are in 4-20 mA format.

## ***Safety***



**Only adequately trained, experienced personnel should operate or maintain this analyzer.**



**This analyzer typically uses an acidic, chemical, cleaning solution (3% HCl) prepared from 32% hydrochloric acid ("Muriatic Acid" - typically available locally from hardware stores). Standard chemical handling precautions must be followed. Always wear safety glasses.**



**NOTE: HARMFUL UV RADIATION IS PRESENT IN THE FLOW-CELL WHEN THE INSTRUMENT IS ON! Exposure will cause severe and permanent eye damage!**

**TURN THE ANALYZER OFF BEFORE REMOVING THE FLOW-CELL OR INSPECTING THE OPTICS.**

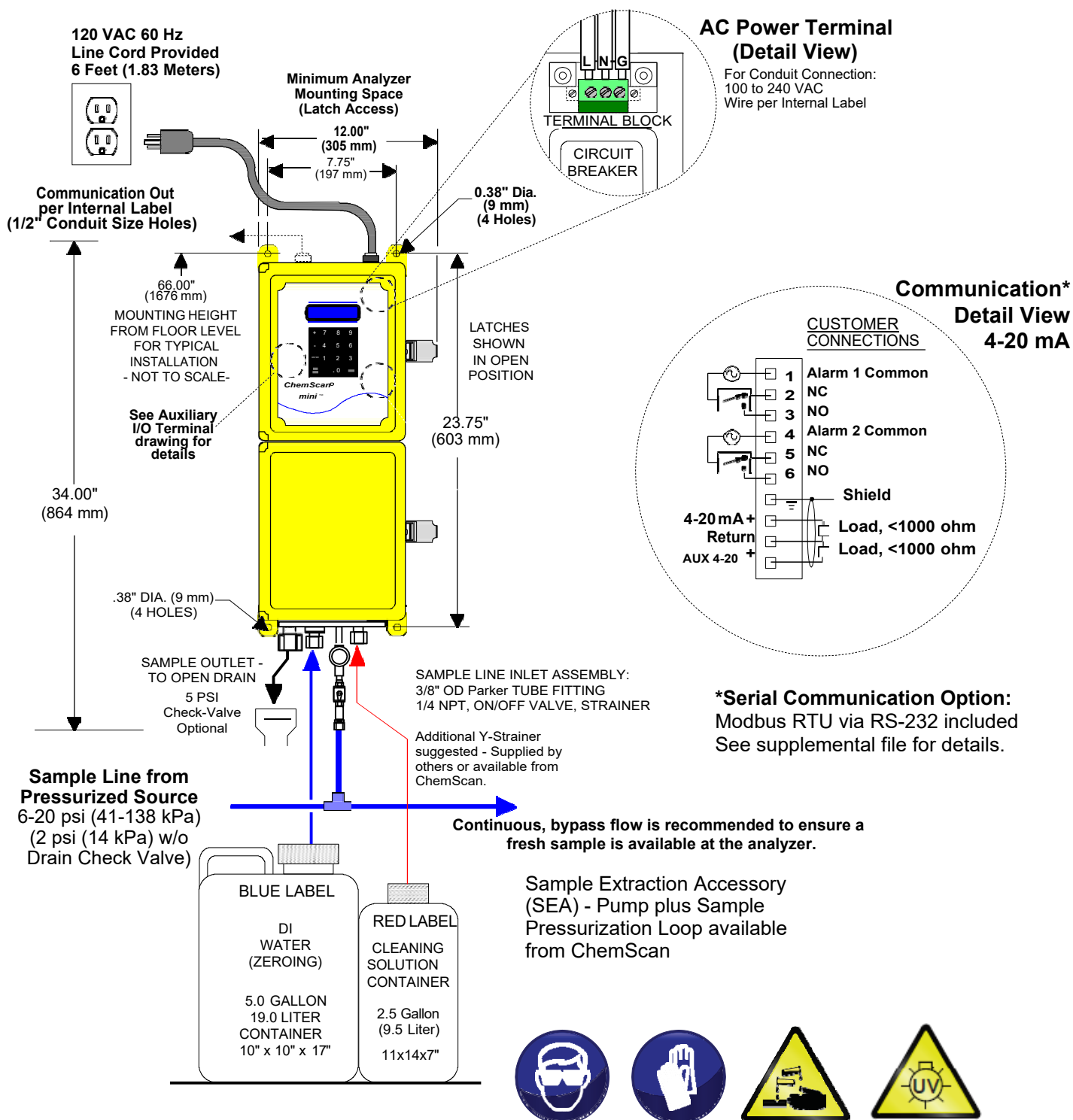


Figure 2

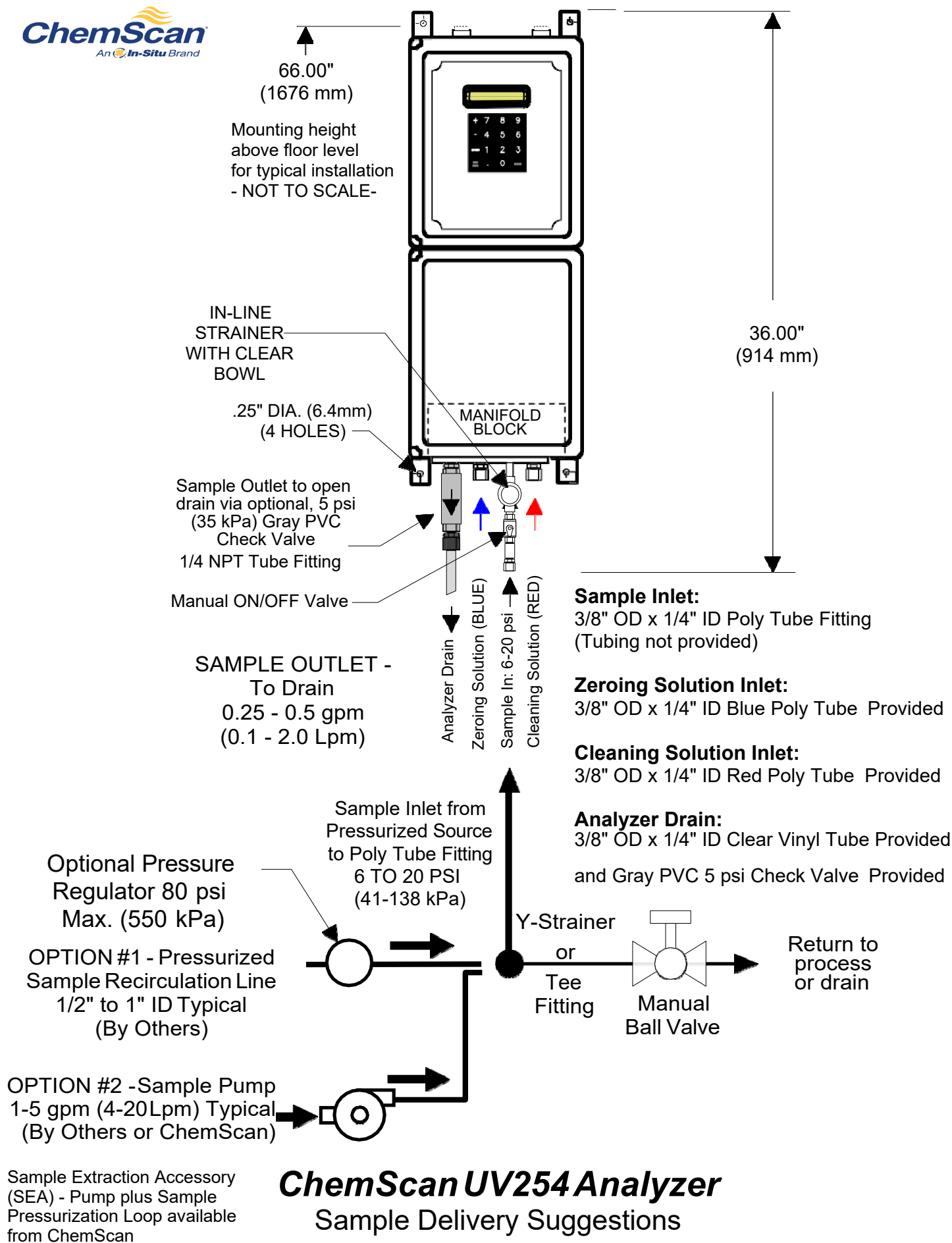


Figure 3

## Startup Procedure

### Verify Fluid Connections

Sample, Cleaning and Zeroing connections must be installed as indicated on the installation drawing. Connections must be firm and vacuum-tight; air drawn into the system will cause erroneous readings.

### Power-Up

With proper connection made to 110/240 VAC, turn the analyzer ON by pressing the red power switch located behind the front panel. (Access the switch by loosening the two captive Phillips screws on the right side of the front panel.) 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. Press the **[MAIN MENU]** key.

The display will now present four options. These four options are the only selections available to the operator. The installer has access to several more.

**The instrument must be allowed to stabilize for at least 20 minutes before zeroing.** While waiting, you may familiarize yourself with installation tools.

### Initial Zero

In normal operation, the instrument automatically cleans, zeros and displays UV254 nm absorbance. Prior to reading samples the analyzer must measure and record the initial, (clean) flow-cell value to use for as a reference for autoclean decisions and diagnostics

**Allow 20 minutes for the instrument to warm up.**

1. Turn off the manual sample ON/OFF valve (the blue handle valve) to stop sample flow through the instrument.
2. Clean the flow-cell by selecting option [3] CLEAN. Press [2] for MANUAL cleaning. Press [+] to turn ON the pump, and pump for about 30 seconds. Press [-] to turn the pump OFF, and allow the cleaning solution to remain in the flow-cell for about 2 minutes. Press **[MAIN MENU]** to exit.
3. Press option [2] ZERO, then [1] MANUAL to pump zeroing solution into the flow-cell.
4. The display shows the current (NEW) value and the previous (OLD) zero's signal levels in volts. NOTE: The new value will vary as it is displayed in real-time. We have not entered this data yet, so disregard these values.
5. Press [+] to pump in zeroing solution. Activate pump for about 1 minute, then press [-] to stop the pump.
6. Observe the NEW value. As air bubbles, formed by the pumping of the zeroing solution, dissipate the value will stabilize.
7. If the NEW Value is between 1.5 and 4.9 and varying by less than 0.005, the cell is clean and usable.
8. Press **[ENTER]** to store the new reference zero. NOTE: The OLD value is now updated to match the new.
9. Press **[MAIN MENU]** to exit this procedure.
10. Open the manual ON/OFF valve, closed in step1, to return sample flow to the analyzer.

## Configuration Variables

Hidden option, key [9] from the main menu screen, provides the installer a series of configuration options not visible to the operator. 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:** Number of auto-cleaning cycles in an autozero/clean process before the operation ceases and flashes a warning message.

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

**CLEANING PUMP TIME:** Number of seconds the cleaning solution is pumped during an autozero/clean cycle. Normally set to 30 seconds.

**ZEROING PUMP TIME:** Number of seconds the zeroing solution is pumped during an autozero/clean cycle. Normally set to 60 seconds.

**SAMPLE REFILL TIME:** Number of seconds required to fully turn over the 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.

**CLEAN SOAK TIME:** Number of seconds to let the cleaning solution sit in the cell during an autozero/autoclean cycle. Normally set to 60.

**AutoClean FLUSH TIME:** Number of seconds to flush the cell with process following the clean soak. Normally set to 30 seconds.

**# of DIGITS after DP:** Number of digits displayed after the decimal point - typically set to 1. NOTE: Increasing the number of digits displayed does not increase the accuracy of the analyzer. Additionally, the resulting, apparent "variations" in readings may be perceived as erratic operation.

**SEND INTERVAL:** Minutes and seconds between reports over the serial channel. Default is 1 minute.

**ON: ZC4 ZERO5 PUMP6:** Controls the ZeroClean Valve, the ZERO valve and the Pump. Pressing key [4] turns ON the ZeroClean Valve (ZC1); pressing [1] turns OFF the ZeroClean Valve. [5] turns On the Zero Valve, while [2] turns it OFF. [6] turns ON the Pump, [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.

**CLEAN IF %T is BELOW:** If the transmittance measured during an auto-clean cycle is adequate, we can omit the cleaning portion, saving on cleaning solution and maintenance. This value is the trigger point for the auto-clean cycle and is normally set at 95. If organics (slimes) or other contaminants accumulate on the flow-cell windows, it is recommended to increase this value to 97 to ensure the cell is cleaned on every auto-zero cycle.

**WAIT FOR STABLE HEAD TEMPERATURE:** If yes, the analyzer will wait for the source LED to be within 0.05 degrees C of optimum before taking readings. Press [.] (decimal point) to toggle.

**SERIAL SETUP MENU:** Set baud rate, parity, enable Modbus, set Modbus address

**INIT LOG:** Press [CLEAR] to clear the internal data log. This may be used if the monitored process had been shut down for a time or the instrument had been idle for an extended period, making the current log information irrelevant. Also displayed is the actual number of used log entries. If desired, the log output can be triggered (to a printer, for example) by pressing the [0] key.

**MAX LOG REPORTS:** Limits the number of reported (via serial channel) logged events to the most recent N, where N is between 1 and 15,000. The maximum 15,000 events are always logged, but this option allows limiting the report size to a lower value. Press [5] to Restore FACTORY DEFAULTS: Restores settings to factory originals. NOTE: Any user settings will be over-written.

**CELL FACTOR:** Observe or modify cell factor (effective path length – default is 0.80)

**CODE REVISION DATE:** The date the software was updated.



## Menu Structure

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. A complete menu structure table can be found at the end of this section.

The keypad is used to enter numerical values and to select menu choices for the analyzer. There are four main menu paths:

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

NOTE: Data from the analyzer is frequently used by process control algorithms. Incorrect analyzer readings due to calibration, testing, or monitoring activities could severely disrupt these control loops. For this reason, the analyzer 4-20 ma communication outputs remain frozen at the most recent ONLINE data in all but the force-output modes when the analyzer is taken offline.

### ONLINE selection

Pressing **[1]** from the MAIN MENU screen places the analyzer in the ON-LINE mode. The flowing sample is continuously analyzed, and the resulting readings are displayed on the front panel. Simultaneously, the same data is sent to the 4-20mA-output channel and to the serial port. Pressing the **[MAIN MENU]** key will return to the **[MAIN MENU]**; if a security code is set, the operator will be prompted to enter the code (default is “0”) before the analyzer will exit the ONLINE mode. Upon leaving the ONLINE mode, the 4-20 outputs will be frozen at the last measured value and the serial output will stop updating.

### ZERO menu

Pressing **[2]** opens a menu, which offers the option of manual zeroing or triggering the automatic clean/zero cycle. Pressing the **[MAIN MENU]** key will return to the MAIN MENU screen.

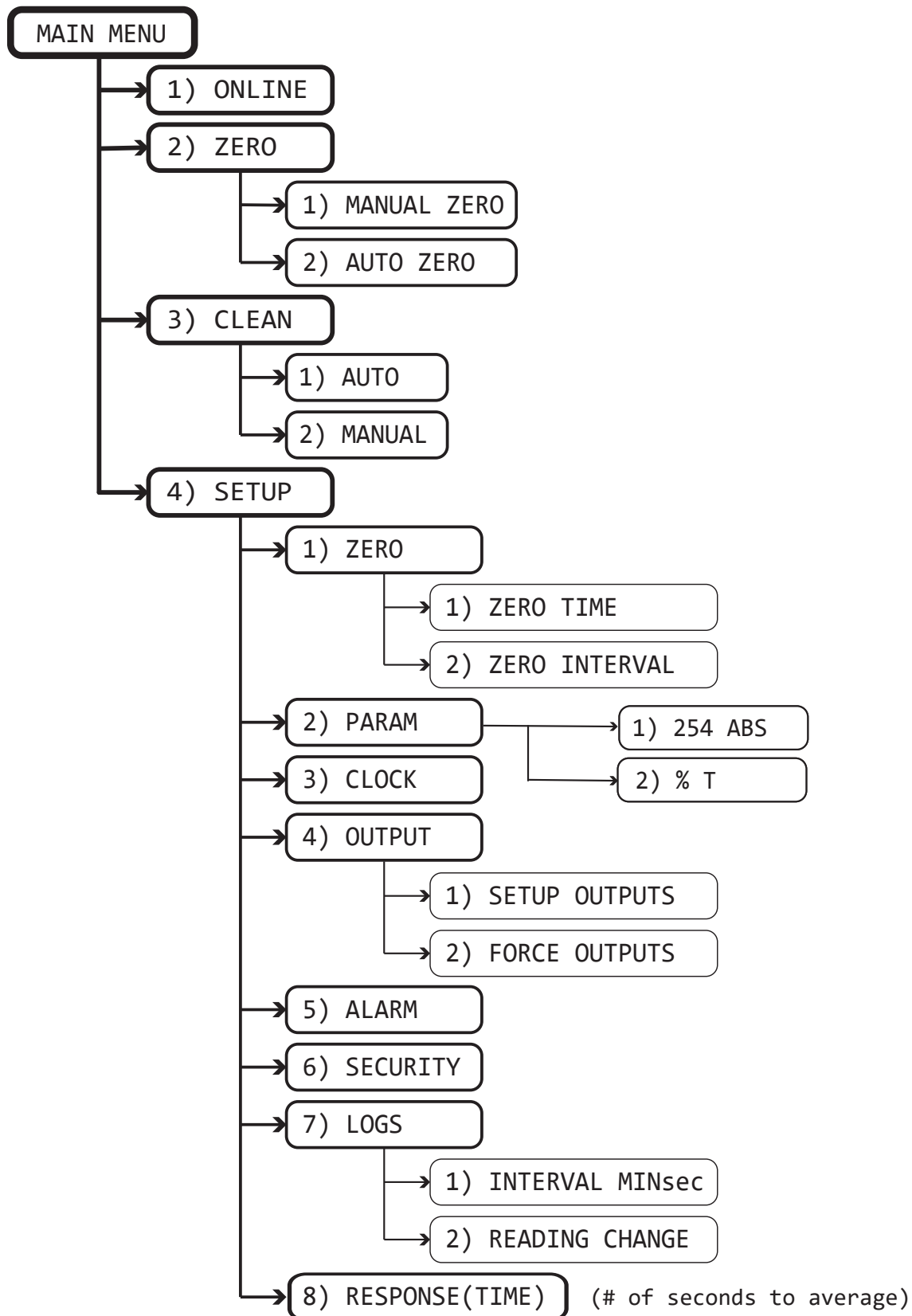
### CLEAN menu

Pressing **[3]** opens another menu layer where the cleaning and zeroing solutions can be manually pumped into the instrument. Select either, then press **[+]** to start the flow and **[-]** to stop the flow. Pressing the **[MAIN MENU]** key will return to the MAIN MENU.

### SETUP menu

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

## UV254 Menu Structure



## Analyzer 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. **Always use safe practices when handling chemicals and avoid exposure to analyzer's UV light.**



## Maintenance Schedule

Routine maintenance of the UV254 Analyzer is limited to a few periodic procedures as follows:

### Daily

- Observe operation looking for abnormal operation

### Weekly (or as needed\*)

- Fill Zeroing and Cleaning solution containers.
- Inspect and clean Inlet Strainer (required schedule varies with site)

### Monthly

- Perform Manual Zero Operation and Log Indicator Numbers (optional)

### Quarterly – Every Three Months (or as needed)

- Perform a Calibration Verification and Adjustment

### Two Years (or as needed - varies with site / application\*)

- Replace Cleaning Solution peristaltic pump assembly. (see Appendix "A" Additional Maintenance Items)

\*NOTE 1: Replacement interval may require adjustment if cleaning solution container requires refilling more frequently than once per week.

NOTE 2: The Zeroing Pump requires no periodic maintenance.

## Maintenance Procedures

The following pages describe the routine maintenance procedures. Additional maintenance details can be found in Appendix "A".

### Interrupting On-Line Operation

To interrupt on-line operation the "Main Menu" key is pressed. If a security code is programmed, the following message will appear:

ENTER SECURITY CODE

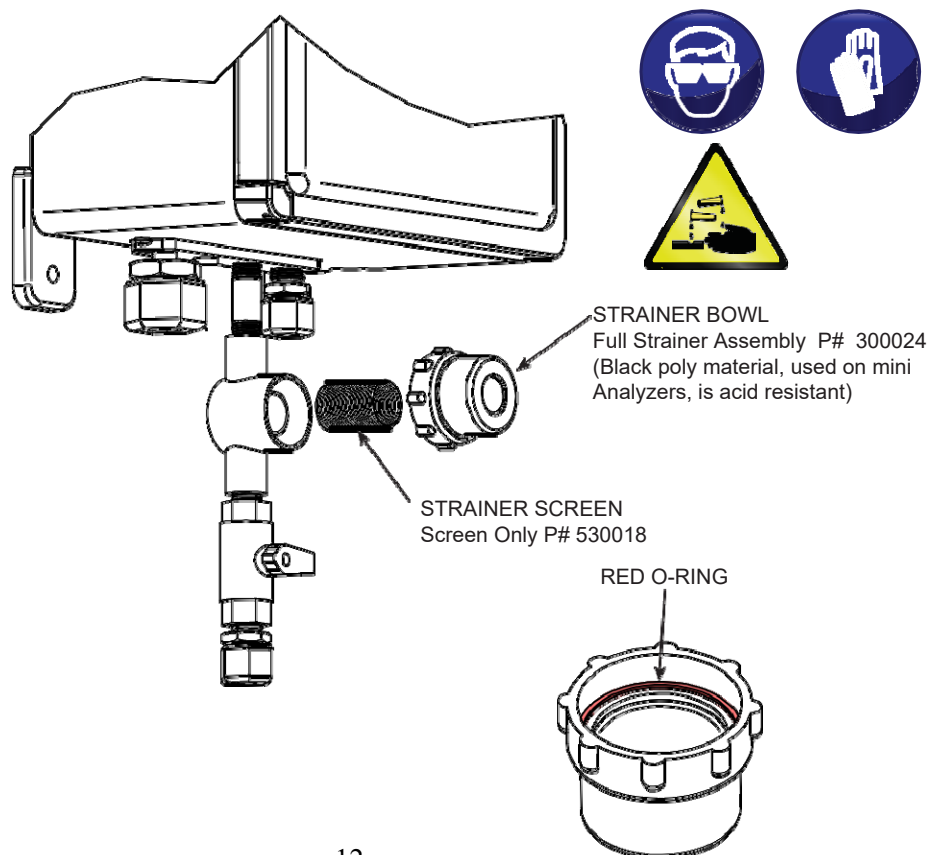
Enter the security code followed by the ENTER key. The display will return to the Main Menu. If an invalid security code is entered or if the entry of the code takes longer than 30 seconds, the following message will be displayed for 5 seconds:

INVALID SECURITY CODE

The instrument will then return to the on-line mode.

### 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 must be inspected, periodically cleaned or replaced as required. To clean the strainer, 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. Reinstall 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 have been cleaned, return the analyzer to the on-line mode.



## Solution Replacement

### Zeroing Solution

The analyzer will automatically perform a zeroing operation at a preset interval. The zeroing solution is typically deionized or distilled water. The zeroing solution must contain no nitrate, nitrite, iron or organics. A 5 gallon (19.5 liter) zeroing solution container is provided with the analyzer.



### Cleaning Solution

While the analyzer is performing an autozero, it will test the need for cleaning the flow-cell. Over time “fouling” of the flow-cell windows can occur due to an accumulation of organic bacteria or non-organic compounds. If the light level falls below a preset level, the cleaning solution is pumped into the flow-cell using the analyzer’s dedicated “cleaning pump”.

The typical cleaning solution is 1 liter of Muriatic acid (32% HCl) into 9 liters of DI water. This creates a cleaning solution with 3.2% hydrochloric acid concentration. A 2.5 gallon (10 liter) cleaning solution container is provided with the analyzer.

Alternative cleaning solutions may be recommended for site-specific conditions. Please call ChemScan Service if cleaning solution usage is excessive. (refilling required more than once per week)

## Manual Instrument Zeroing Procedure

The ChemScan UV254 Analyzer must be zeroed occasionally to correct for drift and flow-cell fouling. The analyzer will automatically perform an Auto-Zeroing Operation on a preset interval (as set in the SETUP menu). However, it is important to periodically perform a Manual Zero Operation to track the indicator numbers. This procedure simply involves rinsing the flow-cell with deionized water, initiating a zero reading and testing the zero.

### Items Required:

1 gallon of deionized water

### Interrupt on-line mode:

Press the Main Menu key on the keypad. If a security code is programmed, the following message will appear:

ENTER SECURITY CODE

Enter the current security code followed by the ENTER key and the Main Menu will be displayed:

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

### Instrument Zeroing:

Press 2 for ZERO. The following message will be displayed:

1) MANUAL  
2) AUTO

Selection of 2) AUTO will cause the system to immediately initiate an auto zero cycle. The instrument will automatically flush with DI water, take a reading, compare the values to certain set points, determine if cleaning is necessary, auto clean, re-zero and re-test. For details concerning the autozero cycle, refer to the Selection of 1) MANUAL ZERO will require the operator to manage the zeroing procedure and to interpret the indicator results. This zero once saved, serves as a point of reference for internal diagnostics.

Press 1 for MANUAL ZERO. The following message will be displayed:

NEW: [XXXX] OLD [XXXX]  
+ OR -, Zeroing Pump On/Off

Using the + key to begin flushing the deionized water. Allow the water to flush for 2 minutes and press the - key to stop flushing; wait 30 seconds for the water to settle. Press ENTER to take the reading. The instrument will read the deionized water and store the reading as a zero. The new zero value will be displayed on the right left of the top line. The previous zero displayed to the left. Using the + and - keys to control the pump, allow deionized water to flush for 8-10 seconds.

The Zero Value should be above 0.500. If not, manually clean the flow-cell. If the reading varies by more than 0.005, flush again, pause for 10 seconds, and observe again. Continued noisy zero indicates there may be loose material in the flow-cell, which must be removed by following the cleaning procedure.

## Manual Chemical Cleaning Procedure

Over time the windows in the flow-cell may foul, reducing the light level. For most applications the flow-cell windows must be cleaned occasionally to insure adequate light through the sample. This is typically handled automatically with the analyzer's auto-clean feature. However, the process can be performed manually from the keypad by flushing the flow-cell and tubes with the cleaning solution, (dilute HCl) and rezeroing the instrument.



### Interrupt On-Line Mode:

If the instrument is in the ON-LINE mode, press the Main Menu key on the keypad. If a security code is programmed, the following message will appear:

ENTER SECURITY CODE

Enter the current security code (default is 0) and the instrument will display the MAIN MENU.

### Acid Flush:

Note: The Cleaning solution can cause permanent damage to eyes, skin and clothing. Take proper precautions while handling. **If the cleaning solution contacts eyes, skin or clothing, rinse immediately and heavily with cold water.** Note that the typical cleaning solution is ~3% Hydrochloric Acid (HCl). This information is important for any subsequent treatment that may be required.

On the instrument keypad, press [3] for CLEAN. The CLEAN MENU will be displayed:

Press [2] for MANUAL.

Press the [+] key to begin pumping the cleaning solution. Allow the pump to run for 30 seconds. Press the [-] key to stop the pump. Allow the cleaning solution to stay in the flow-cell and tubes for 2 minutes, THEN PRESS Main Menu to exit.

### Instrument Zeroing:

Zero the instrument using the MANUAL INSTRUMENT ZEROING PROCEDURE.

Following the zeroing procedure, note the Zero instability. If greater than 0.005, the flow-cell must be disassembled and cleaned.

### Returning to On-Line Mode:

From the MAIN MENU, press [1] for ON-LINE.

## Mechanical Cleaning Procedure

Occasionally the automatic cleaning of the flow-cell will not remove enough of the fouling on the flow-cell windows. If the analyzer readings are erratic or the chemical cleaning solution is being consumed more rapidly than normal, perform the MANUAL ZEROING PROCEDURE. If the zero reading is below the specified range, perform a mechanical cleaning procedure.

### Items Required:

One #2 Phillips screwdriver.  
One wide mouth liquid container 50 - 100 ml.  
One box of laboratory lens wipes.  
One gallon of deionized water for zeroing.



**Turn off the manual sample valve.**

### Flush the Flow-Cell:

From the MAIN MENU, press **[2]** for ZERO.

The ZEROING menu will be displayed:

(1) MANUAL      (2) AUTO

Press **[1]** for MANUAL.

Using the + and - keys to control the pump, allow deionized water to flush for 60 seconds. Press the - key to stop the flow. Press the MAIN MENU key to return to the Main Menu.

**Turn off the analyzer using the red power switch behind the front panel. (Phillips screwdriver)**

**NOTE: HARMFUL UV RADIATION IS PRESENT IN THE FLOW-CELL WHEN THE INSTRUMENT IS ON! Exposure will cause severe and permanent eye damage!**

### 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.

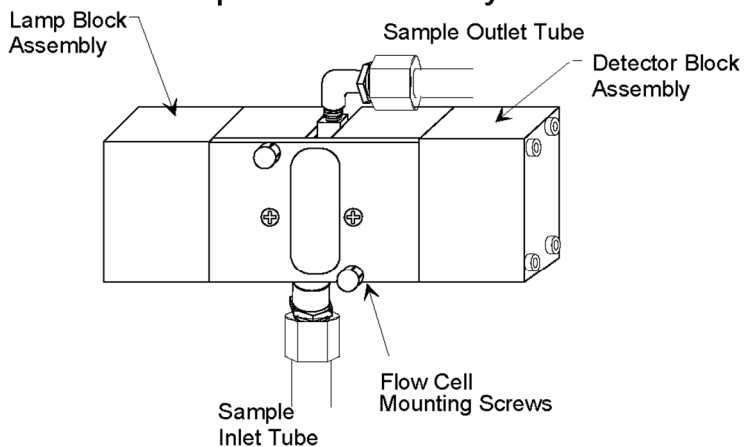
### Disassembling and Cleaning the Flow-Cell Assembly

- 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 and inspect in good lighting to verify they are clean.

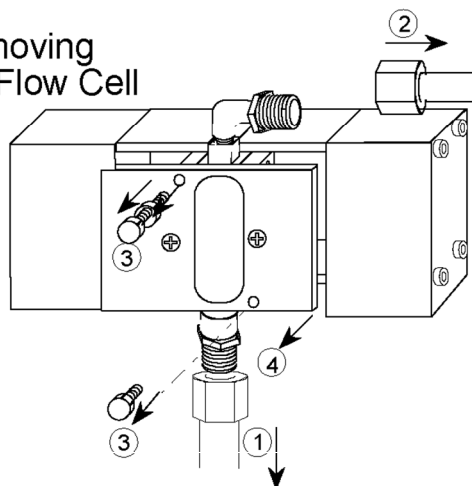




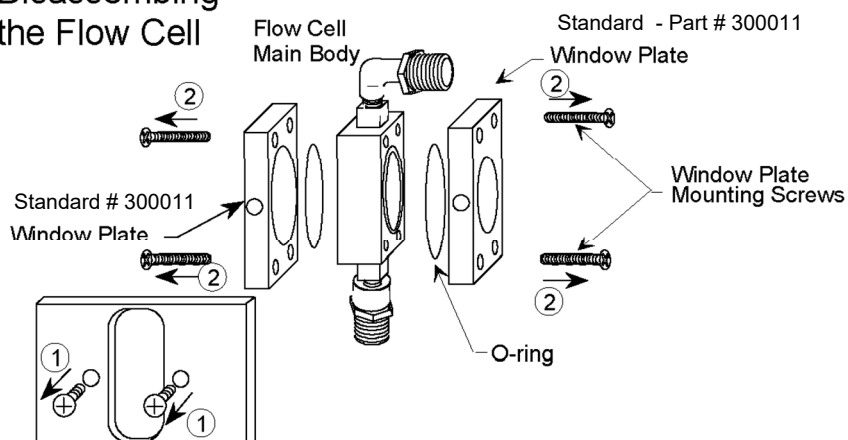
## Optrode Assembly



## Removing the Flow Cell



## Disassembling the Flow Cell



F#FC254B

Figure 5

## **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. Use care to ensure the o-ring is installed and fully seated in the o-ring groove prior to reassembling the window plates.

**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. Use laboratory wipes and isopropyl alcohol to remove any fingerprints.

3) Mount the cover plate to the window plates.

4) Carefully slide the flow-cell assembly into the flow-cell mount and secure using the thumbscrews.

5) Attach the fluid tubing and tighten the fittings.

Turn on the instrument. Allow 20 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 5000, call ChemScan Service for further instructions.

## Retrieving Log Data from the Analyzer \*(alternative, simplified procedure follows on page 26)

The analyzer stores approximately 5,000 log entries. Log entries are made up of events (online, offline, zeroing operations, data readings, etc.), which are time-stamped and stored in non-volatile memory. Memory retention time without power applied is approximately 100 years. Log entries may be read 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 through (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, naming it as you wish, where you wish, on the computer. (For this example "ChemScan" is the file name.) A "ChemScan - 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 - 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 you cannot see what you type, 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 entries is perhaps too much information. You can limit the amount reported to any value you wish. For example, to receive the last 100 entries, type GETLOG 100.

Perhaps you wish to put the log data into a spreadsheet. In that case, 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.

Or if you want to see what's been happening with the operation, 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.

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. Should you wish to do so, however, use the command RESET LOG.

```
GETLOG [ ALL] [value]
          [READINGS][value]
          [EVENTS][value]
RESET LOG
```

## **Analyzer Self-Diagnostics and Error Messages**

### **MAINTENANCE REQUIRED** message:

The UV254 Analyzer performs an autozero at predetermined intervals. As the deionized water is measured, the light intensity values are monitored. If the light intensity values fall below the preset value, the system will attempt to chemically clean the flow-cell. This process will be repeated up to 3 times. If the intensity values are still too low, the ALL CYCLE FAILED CLEAN CELL MANUALLY message will be flashed on the display. The flow-cell will need to be mechanically cleaned to correct the problem.

### ***Analyzer Error Messages:***

#### **MODE: ANALYZER ON-LINE**

##### **MESSAGE: [ ]**

**[ALARM TRIPPED]:** Flashing message indicating that the concentration set point has been reached, triggering the alarm relay.

##### **[ AZC CYCLE FAILED]**

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

##### **[AUTOCLEAN FAILED]**

**[AUTOZERO FAILED]:** Flashing error messages, indicating a previous clean/zero failure. Messages remain until system is taken off-line or a successful AZC Cycle concludes.

#### **MODE: ANALYZER OFF-LINE**

##### **[UNABLE TO ZERO]**

**[PLEASE CLEAN CELL] :** Manually triggered autozero cycle failed because the cell transmittance is too low compared to the stored reading from when the cell was clean.

**[ZERO ATTEMPT FAILED]:** Manually triggered autozero cycle failed because the light level was unstable. The system may retry if it has been programmed by the user to do so. If the error continues, check for good zero solution, air bubbles in the cell and/or tubes, loose particulate in the cell. Make sure the analyzer is warmed up (20 minutes) and the environment is stable.

## Analyzer Troubleshooting Guide



### **Symptom**

No Flow/  
Inadequate Flow

### **Cause**

Plugged Strainer or Valve  
Plugged Line or  
Valve

### **Action**

Replace Strainer or Open Valve  
Clear Obstruction or Replace  
Plugged Components

Unstable Test Zero  
Readings

Fouled Flow-Cell  
  
Bubbles/Air in Flow-Cell

Chemically Clean Flow-Cell  
  
Check Plumbing for Air Leaks / Install 5 psi Check Valve

Light Levels Too Low  
After Zeroing

Fouled Flow-Cell

Chemically Clean Cell

Light Levels Too Low  
After Chemically Cleaning Cell

Fouled Flow-Cell

Mechanically Clean

Light Levels Too Low  
After Mechanical Cleaning

Lens Block Windows-  
Fouled / Bad Flow-Cell

Clean Lens Block Windows  
Test Zero Without Flow-Cell

Readings Constantly at  
Standard Maximum of Range

Old/Bad Zero Standard  
Flow-Cell Fouled  
Read Fault

Replace Zero  
Perform Manual Zero  
Check for sample line plug

Readings Inaccurate/  
Unstable On-Line Readings

Needs Zero  
Fouled Cell  
Low Flow  
Cloudy Sample  
Bubbles/Air in Flow-Cell  
Needs Calibration

Zero Instrument / Verify Zeroing Pump Delivers ~300 mL/m\*  
Clean Cell  
Clean Out Strainer / Sample Line  
Install Filters  
Check Plumbing / Install 5 psi Check Valve  
Calibrate

Analyzer Reads Zero,  
Does Not Respond

"0" Entered for  
Flow-Cell Factor

From diagnostics menu  
enter valid cell factor  
(default is 0.80)

\* The zeroing pump requires no periodic maintenance. However, particulates lodged in the pump's valve plates (seals) can compromise pump performance. Call ChemScan Service if the zeroing pump requires repair or replacement.

## Appendix “A”

### Addendae:

1. ALARM 2 RELAY: This output has been linked in software to the zero/clean valve. Whenever the analyzer stops the normal sample flow, this relay is activated. This may be used to turn off an external sample pump, keeping it from dead-heading. Or it may be used to provide remote indication that the analyzer is in the zero/clean cycle.
2. AUTOZERO details: Sample flow is stopped. Zeroing solution (DI water) is pumped into the flow-cell for the time specified by “ZEROING PUMP TIME”. several seconds of delay follow to provide time for any air bubbles to clear. The light level (transmittance) through the flow-cell is monitored. If the transmittance is below that set by “CLEAN IF %T is BELOW”, an autoclean cycle is initiated, after which the autozero cycle is re-initiated.

The analyzer will repeat the test-clean cycle up to the number of times specified by “MAX CLEAN ATTEMPTS”, after which the automatic cycle is ended accompanied by the display of a warning message.

Following successful cleaning (if needed) light through the zeroing solution is monitored until a minimum stability level has been observed for 15 seconds. If stability has not been attained within the period set by “MAX ZEROING TIME” the process is ended.

Following successful stability, zeroing solution is again pumped for a few seconds; transmittance is compared to the level noted when stability was achieved. If there was no change, the zero is considered successful, the new value is stored, and the AutoZero is complete.

Process water is allowed to flow for the time specified in “SAMPLE REFILL TIME” before new readings are taken and the output updated.

Should the zero attempt fail, a failure warning message will be displayed on the LCD, and the previous zero data will be retained. Failure to zero may be due to a badly fouled cell, bad DI water, or a faulty lamp. After verifying that zeroing solution is available and being delivered to the flow-cell, a manual zero should be performed. Data from the manual zero will be used for comparison by subsequent auto zeros.

3. 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 retained 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 water is used to flush in order to minimize consumption of zeroing solution.

## Appendix "A" - Additional Maintenance Items

### Cleaning Head Replacement



#### Items Required:

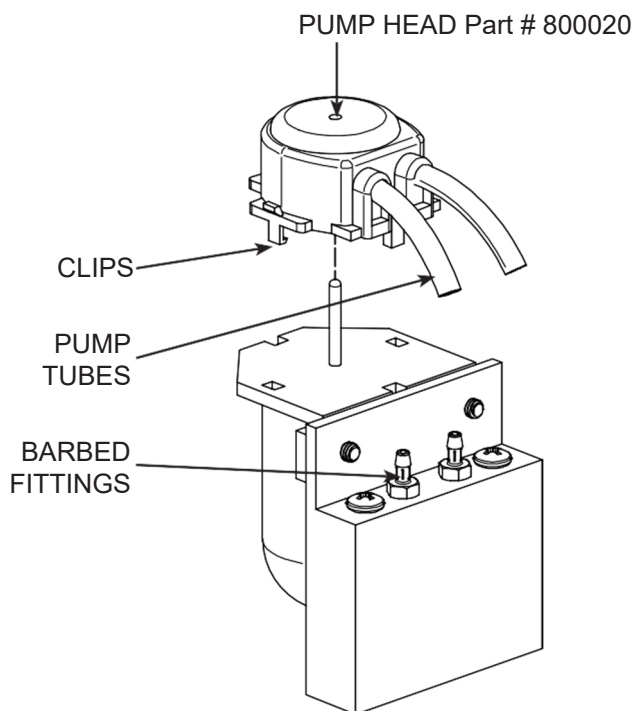
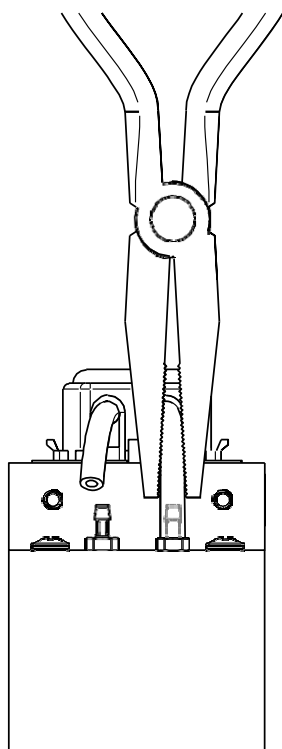
- Long nose pliers
- Paper towel
- New pump head

1. Prepare the analyzer for internal maintenance by turning off AC power to the analyzer and turning the sample valve off.
2. Disconnect the pump tubes from the barbed fittings using long nose pliers.

NOTE: When using the pliers, only grab the tube. Grabbing the fitting may damage the barb and cause a leak.

NOTE: Water may briefly drain out of the tubes when removed. Clean any spills immediately with paper towel.

3. Remove the old pump head. Pinch the two plastic clips and pull the pump head straight off the motor shaft.
4. Install the new pump head. Verify both plastic clips lock into place.
5. Using your fingers, press the new pump tubes onto the barbed fittings.
6. Return the analyzer to online mode.



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## Cleaning Pump Replacement



1. Interrupt on-line operation and close the sample line valve.
2. Unplug the pump from the power hub by pulling on the plastic connector.

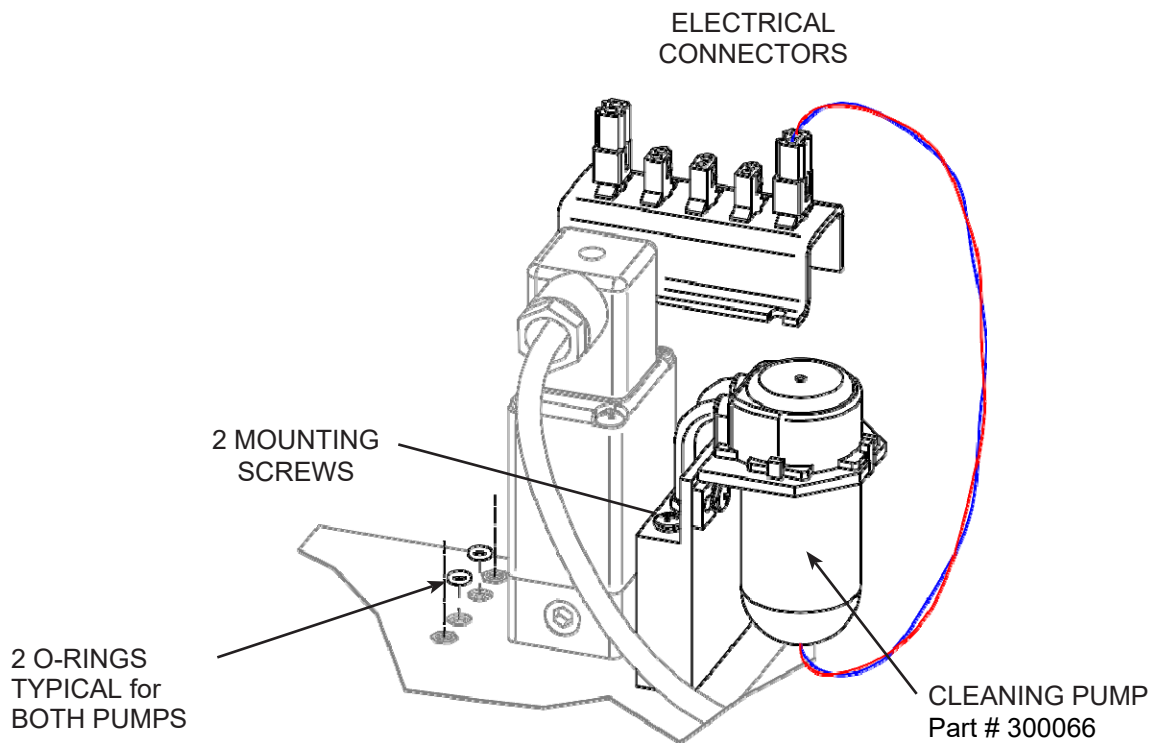
NOTE: DO NOT pull on wires



3. Loosen the captive mounting screws and remove the pump assembly from the sample manifold.
4. Before installing the new pump assembly, verify the two o-rings are seated in their o-ring grooves on the manifold block.



5. Tighten the new mounting screws to approximately 12 in-lbs.
6. Plug in the new pump's power connector. (Location shown below)
7. Re-open the sample line valve.
8. Return the analyzer to on-line mode and check for leaks.





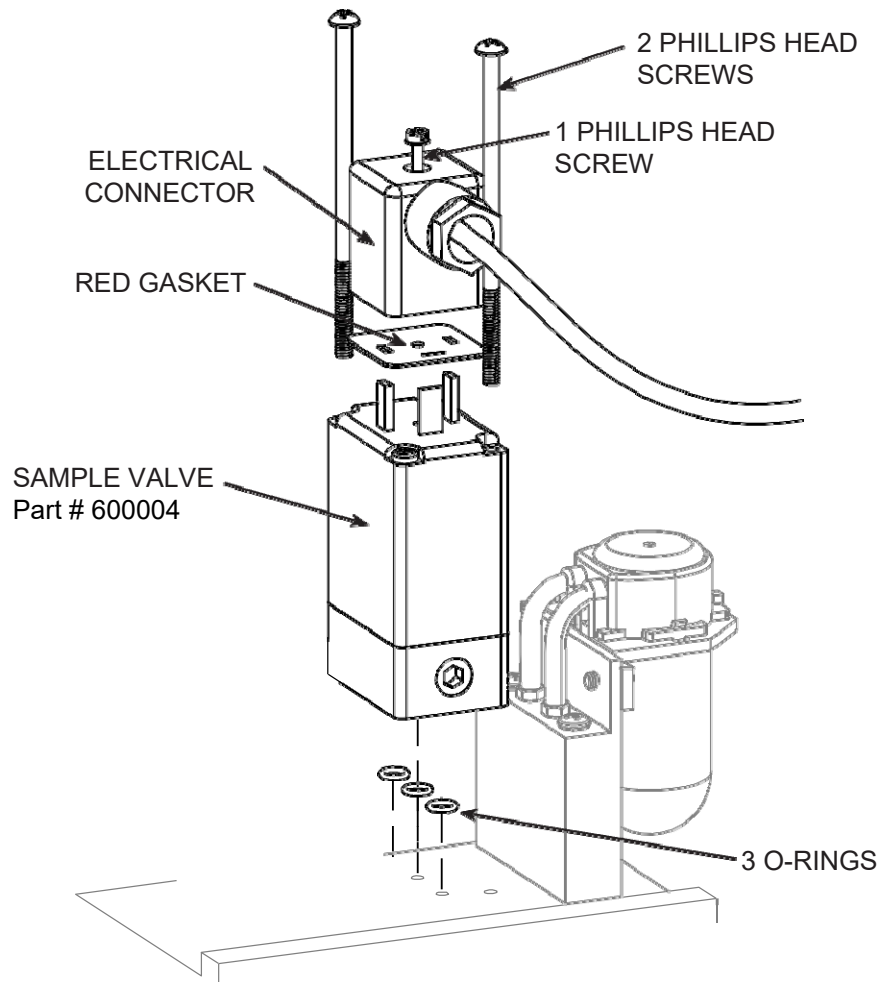
## Sample Valve Replacement



1. Interrupt on-line operation and close the sample line valve.
2. Loosen the center Phillips head screw and remove the electrical connector and the red gasket.
3. Unscrew the two Phillips head screws and remove the old valve.

NOTE: Don't remove the torx screws (red paint).

4. Verify the new valve has three o-rings seated in the bottom grooves and secure it to the manifold with the two Phillips head screws. Note the orientation.
5. Place the red gasket onto the valve, then re-secure the electrical connector with the single Phillips head screw. Note the orientation.
6. line valve and check for leaks.



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## Simplified Data Download Procedure

### Internal Data Log

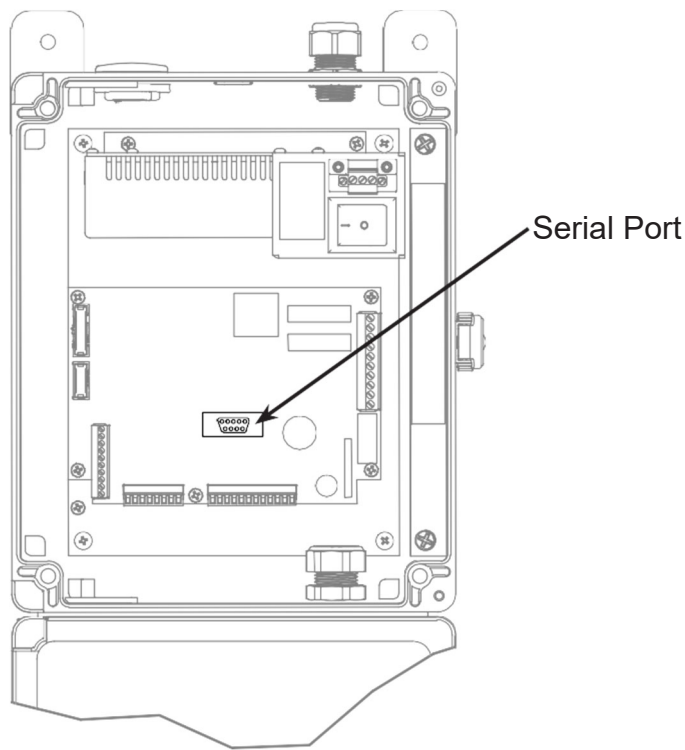
The analyzer stores approximately 5,000 log entries. Log entries are made up of events (data readings, cleaning operations, analyzer online/offline, etc.), and are time-stamped and stored in nonvolatile memory. Log entries may be downloaded using the analyzer's serial channel.

**NOTE:** Use of the analyzer's Modbus communication option precludes download via the serial port. The data may be available from the Modbus receiver, typically the plant's SCADA.

### Retrieving the analyzer's internal data log:

#### Items Required:

- laptop
  - DB9-DB9 Serial cable (provided)
  - B to Serial converter (optional)
1. Go to the ChemScan.com website.
  2. Under the "Service" tab, select "Software Utilities"
  3. Click on the "CS Mini Log Reader SF3" to download and install the data log software.
  4. Open the software and follow the instructions provided.



**ChemScan® mini UV254 Analyzer**  
**TECHNICAL SPECIFICATION**

**FUNCTIONS AND OUTPUTS**

Measurement Principle	High Resolution, Ultraviolet Absorbance @ 254nm
Number of Parameters	1
Parameter Options	Absorbance Units, % Transmittance
Data Communications	4 - 20mA, RS-232 MODBUS RTU
Data Log	10,000 Values Time/Date Stamped (optional)
Auto Zeroing	Pumped Zero Standard
Auto Cleaning	YES
Analyzer Pump	Internal Zero and Clean (Std), External Sample Pump (optional)
Sample Conditioning	External filter for high solids and turbidity (optional)
Number of Sample Lines	1

**PERFORMANCE SPECIFICATIONS**

Reading Interval	Continuous
Response Time (1/2 scale)	1 second – 60 seconds (selectable)
Range	0.1 to 100% Transmittance, 0.00 to 2.00 Absorbance Units 0.05
Accuracy	AU
Precision	0.001 AU
Zero Drift	0.1% of range

**SAMPLE PARAMETERS**

Sample Pressure	6 to 20 psi (42-138 kPa) (Std), higher pressure: contact factory
Sample Flow	1.0 l/min
Filtration Requirement	NONE (for samples meeting turbidity and solids requirements)
Strainer Recommendation	Mesh Opening of 2.0 mm Max.
Sample Temperature	34-140 F (1 – 60 C) (Std)
Sample Turbidity	0 - 60 NTU (Std)
Sample Suspended Solids	0 - 150 mg/l TSS

**MAINTENANCE**

Zero/Clean Solution Refill	As Required (2-4 weeks typ.)
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**INSTRUMENT SPECIFICATIONS**

Size	22 x 9 x 6 inches (635 x 230 x 153 mm)
Weight	25 lbs (12 kg)
Enclosure	Fiberglass (UV resistant)
Mounting	Wall (Std)
Power	100-240 VAC, 1.0 Amp max.
Power Connection	Plug (Std) / Hard wired (Field)
Power Condition	30 ms max dropout
Operator Interface	2 x 20 LCD and 4 x 4 Keypad Polymer
Sample Cell Material	(Std)
Sample Connection	¼" FNPT Fitting
Waste Connection	¼" FNPT Fitting (Open Drain Required)

**OPERATING ENVIRONMENT**

Enclosure Ratings	NEMA 4X (Electronics Enclosure) NEMA 4X (Flow Cell Enclosure)
Ambient Temperature	41-105 F (5 - 40 C) (Std)
Relative Humidity	0 - 95% (Non-Condensing)

**Notes:**

1. Technical Specifications are subject to change without prior notice.
  2. Organics correlation is site specific and is based on data collection and analysis by the customer.
- \* Performance Specifications are based on analysis of deionized water and/or neutral density filters.

## MENU STRUCTURE with Comments for Reference

### MAIN

- 1) **ONLINE** CONTINUOUS MONITORING
- 2) **ZERO** -outputs are frozen at last online reading display reflects current analysis
  - 1) ZERO
    - 1) AUTO -triggers the automatic zeroing cycle.
    - 2) MANUAL -press + to start flow of zeroing solution, press – to stop. ENTER to read zero.
- 3) **CLEAN** -outputs are frozen at last online reading
  - 1) AUTO
  - 2) MANUAL
- 4) **SETUP** -configure analyzer
  - 1) AUTOZERO
    - 1) TIME-sets Time of Day when analyzer autozeros
    - 2) INTERVAL -sets PERIOD of time between autozeros
  - 2) PARAMETER SELECT
    - 1) 254
    - ABS 2)
    - %T 254
  - 3) SET CLOCK
  - 4) 4-20mA OUTPUT
    - 1) 4mA point -sets the concentration at 4mA
    - 2) 20mA point -sets the concentration at 20mA
    - 3) FORCE -forces the output to an entered current - Select Channel “1” then enter the desired value
  - 5) ALARM
    - 1) SETPOINT -sets the trigger point for alarm relay  
- alarm when ABOVE or BELOW setpoint.
  - 6) SECURITY CODE -sets the security password, if active.
  - 7) LOGS
    - 1. INTERVAL MINsec -- log based time  
LOG INTERVAL: 10:00 [current tin minutes, seconds] NEW INTERVAL: [enter new value]  
press CLEAR to start over  
press ENTER to save value; logging will be based on INTERVAL. Press MAIN MENU to exit
    - 2. CHANGE OF READING – log based on a step in the reading  
LOG STEP: 0.1 [current; a change of 0.1% will trigger log] NEW STEP: [enter new value]  
press CLEAR to start over  
press ENTER to save value; logging will be based on change press MAIN MENU to exit
  - 8) RESPONSE TIME -- seconds to average readings  
RESPONS SECS: 7 [current; enter a value between 1 and 60] press enter to save value  
press MAIN MENU to exit

## **ChemScan**

### UV-254 Analyzer Modbus Communication - Rev: 12/20/19 COMMUNICATION PORT

CONNECTION: Female DB-9 on main circuit card  
connect with straight-thru cable to PC  
pin 2: TX  
pin 3: RX  
pin 5: GND

Default Settings:  
9600 baud (2400,4800,9600,19200,38000)  
8 bits  
1 stop bit  
no parity

#### Serial Setup

Settings are available by entering the configuration menu (press '9' when analyzer is off-line).  
Scroll thru the options using the + and – keys until seeing “SERIAL SETUP MENU”; press ENTER.

- 1) Baud rate - Adjust to the desired setting.  
Press ENTER to save and move to the next option.
- 2) Parity and stop-bits - Adjust to the desired setting.  
Press ENTER to save and move to the next option.
- 3) MODBUS enabled - Toggle the value with the decimal-point (‘.’) key.  
Press ENTER to save and move to the next option.
- 4) If MODBUS is disabled, skip this step.
  - a. MODBUS address – (If enabled) – Adjust to the desired setting.
- 5) User is returned to SERIAL SETUP menu.
  - a. You may return to the main menu, or scroll through to other setup options.

Instrument data is available in 4 registers.

#### Register 0 – Operation Flags

Bit	Description	Comments
0	POWER flag	Always 1
1	ONLINE flag	Set when online.
2	Maintenance Required flag	Set when the analyzer requires maintenance. Alarm output should also be set.
3	AutoClean flag	Set when AutoClean is running.
4	AutoZero flag	Set when the analyzer is flushing.
5	Refilling flag	Set when the analyzer is flushing the cell with process water after cleaning or zeroing.
6	QuickClean flag	Set when the analyzer is in a 'Quick Clean' cycle.
7	Unused flag	Value may be either 0 or 1.
8	Zero failure flag	Set when zero fails.
9	AutoZero Clean failure flag	Set when autozero clean cycle has failed and the user needs to clean the cell manually.
10	Sensor head fault flag	Set when there is a problem with the head.
11	Unused flag	Value may be either 0 or 1.
12	Unused flag	Value may be either 0 or 1.
13	Unused flag	Value may be either 0 or 1.
14	Unused flag	Value may be either 0 or 1.
15	Unused flag	Value may be either 0 or 1.

#### Register 1 – Current Reading (Integer)

Holds the current reading as an integer, multiplied by 100 for decimal point.

#### Registers 2 and 3 - Current Reading (Floating Point)

Holds the current UV254 reading as a floating point value. (CD AB)

## ChemScan mini UV254 Analyzer Operators's Screen Guide

Description	Display Name	Default Value	Keys Sequence	Notes:
OnLine Starts Continuous Readings	ONLINE	na	1	Normal operating mode
Place "Offline" with [MAIN MENU] key	OFFLINE	na	Main Menu	
<b>Zero</b>	Zero	na	2/1/	
Zero performed automatically	Auto	3.137 V	2/1/1	Factory set value on DI water
Zero performed manually	Manual	3.117 V	2/1/2	Factory set value on DI water
<b>Clean</b>	Clean	na	3/1/	
Clean Automatically	Auto	na	3/2/1	
Clean Manually	Manual	na	3/2/2	
<b>Setup</b>	Setup	na	4	
Autozero	Autozero	na	4/1	
Time of day when analyzer autozeros	Time	12:00	4/1/1	12:00 Noon
Time between each Autozero	Interval	24:00	4/1/2	Every 24 hrs
Parameter Select	Parameter Select	na	4/2	
Absorbance at 254nm	254 ABS [1]	No	4/2/1	
% Light Transmittance of 254nm	%T 254 [2]	Yes	4/2/2	
Sets Date and Time	Set Clock	na	4/3	Today's date and time
4-20mA Output (powered)	4-20mA Output	na	4/4	
Sets the concentration at 4mA	4mA point	0	4/4/1	%T
Sets the concentration at 20mA	20mA point	100	4/4/2	%T
Outputs test mA signal (powered)	Force	4,12,20	4/4/3	Test with meter 4, 12 and 20mA
Alarm	Alarm		4/5	
Sets Alarm %T Value and < or >	Setpoint	<50	4/5/1	Alarms when below 50%T
Set Security Code	Security Code	0	4/6	
Logs	Logs	na	4/7	Arrow shows which option below is active
Log Results - based on time	Interval Minsec	Yes	4/7/1	Option only selected if change is made
Log Results - based on reading change	Change of Reading	No	4/7/2	Option only selected if change is made
Time in seconds to average results	Response Time	7	4/8	

na = Not Applicable

Rev: Operator - 200520Q.PDF

## ChemScan mini UV254 Analyzer Technician's Diagnostic Screen Guide

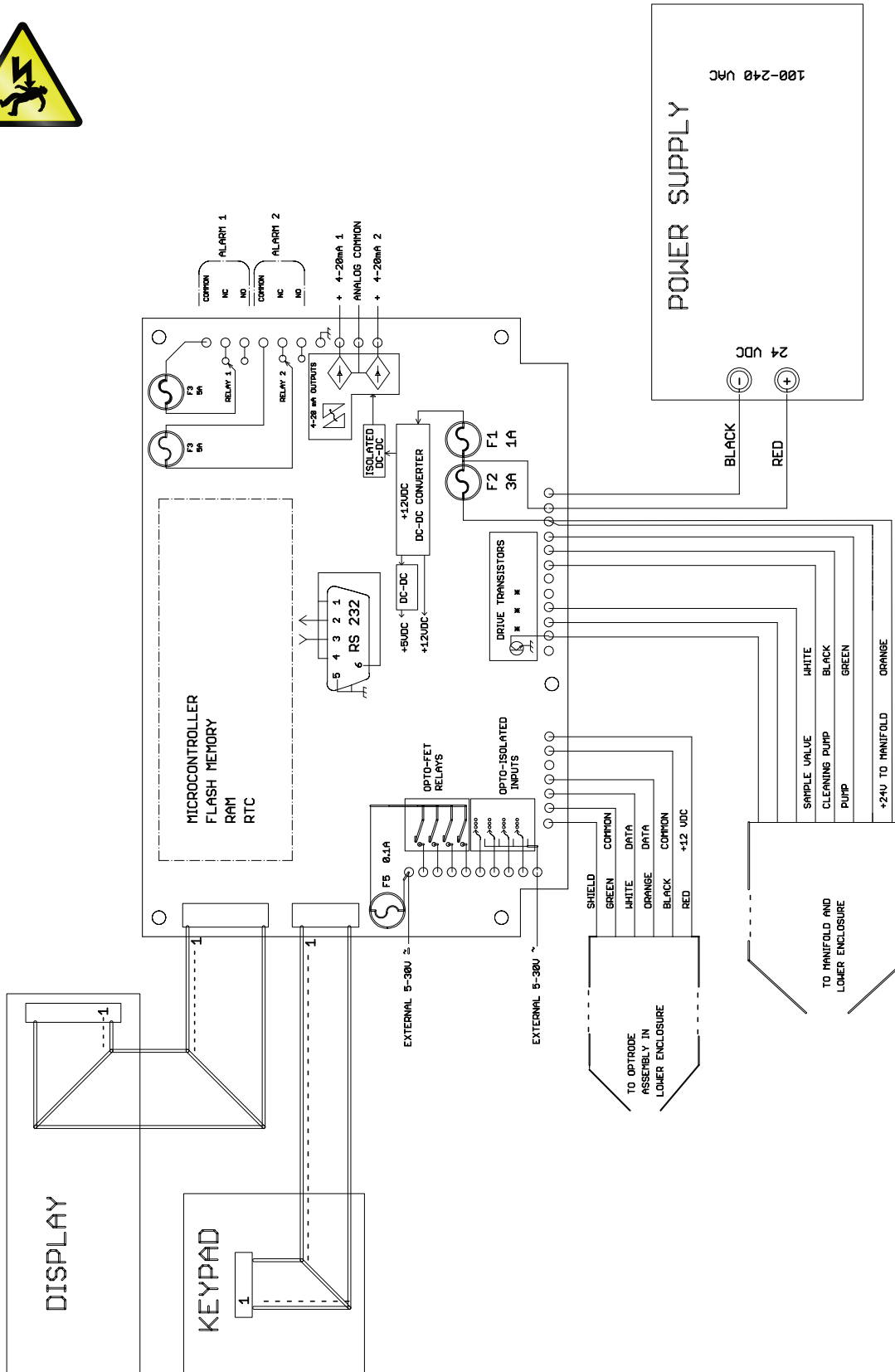
Description	Diagnostics Mode Scroll Using +/-	Default	Keys	Notes
Number of attempts to clean flow-cell If %T is still too low, Error Message is Sent	MAX CLEAN ATTEMPTS	3	<b>Press [9] Key</b> 9/+ (1x)	<b>from Main Menu Screen</b> Runs autoclean sequence 3x
Time the sample is flushed after Clean,Zero	Sample Refill Time - Seconds	30	9/+ (2x)	Increase to purge stagnant sample
Time the QuickClean pump is ON	QC Pump Time - Seconds	30	9/+ (3x)	
Time of Pause in QuickClean Cycle	QC Soak Time -Seconds	30	9/+ (4x)	Allows acid* to stay in flow-cell
Time interval between QuickClean cycles	Quick Clean Interval - HR:MN (Hours:Minutes)	06:00	9/+ (5x)	*(~3% HCl Cleaning Solution)
If %T is above 101, clean and rezero	AUTO ZERO if %T >	101	9/+ (6x)	
Time the Zero Pump is ON	Zeroing Pump Time - Seconds	40	9/+ (7x)	
Time the Zero Cycle pauses	Zero Settling Time - Seconds	10	9/+ (8x)	Allows time for bubbles to clear for stable reading
Time Cleaning Pump is ON	Cleaning Pump Time - Seconds	40	9/+ (9x)	
% T Lower Limit Trigger for Clean Cycle	Clean if %T is Below	50	9/+ (10x)	
Time the AutoClean cycle pauses	Clean Soak Time - Seconds	40	9/+ (11x)	Allows acid to stay in flow-cell
Time the Sample Flows after Cleaning Cycle	Autoclean Flush Time - Seconds	20	9/+ (12x)	
Time Limit to wait for stable Zero reading	Max Zeroing Time - Seconds	190	9/+ (13x)	
Time for Zero Reading to Stabilize	Zero Stability Time - Seconds	180	9/+ (14x)	
Allowable Tolerance of Zero Read +/-0.001%T	Good Zero Stability - %T	0.001	9/+ (15x)	
# of Digits Displayed after Decimal Point	# of Digits after D.P	1	9/+ (16x)	Default setting recommended
Time between Sending Serial Comm. Reports	Send Interval - Minutes	05:00	9/+ (17x)	
ON / OFF Device Function Test (pumps, valve)	ON: Zero[4], Valve[5] Clean[6] OFF: Z1, V2, C3	na	9/+ (18x)	
LED Temperature Monitored for Stability	Wait for Stable Head Temperature? [.] Y/N	Yes	9/+ (19x)	
Serial Communication Settings	Serial Setup Menu	na	9/+ (20x)	
Sends log data to external data log program	0: Int Log ____ enter to send log	na	9/+ (21x)	
Maximum # of Data Logs to Send	Max Log Reports	16128	9/+ (22x)	
Adjusts Calibration Offset	Offset	0.00	9/+ (24x)	
Adjusts Calibration Slope	Slope	1.00	9/+ (26x)	
10mm / 12.5mm Optical Path Length Ratio	Cell Factor	0.8	9/+ (27x)	
	Press 5 to Reset Factory Defaults	na	9/+ (28x)	
Date YYYY/MO/DD software was updated	Code Revision Date	2020/05/12 13:16 AT89	9/+ (29x)	Atmel Chip

na = Not Applicable

Rev. 200520Q.PDF

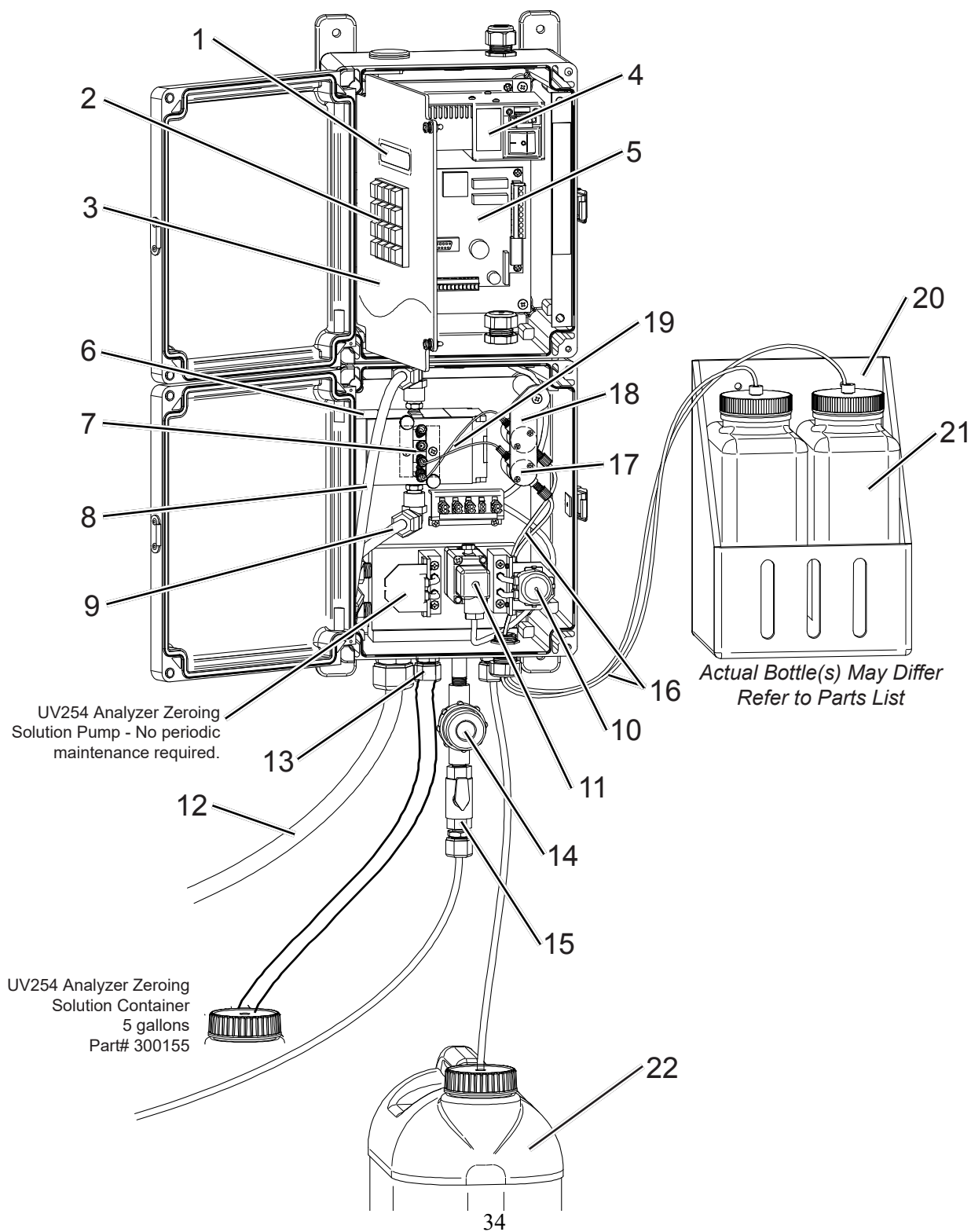


## Electrical Diagram for ChemScan mini UV254 Analyzer



## Replaceable Parts for ChemScan mini Series Analyzers - UV254

**Parts Diagram is for Reference Only.** This diagram represents a typical ChemScan mini Analyzer. Refer to the Parts List on the following page for specific part names and numbers. Reagents and related components are not applicable to the ChemScan UV254 Analyzer. Please call if clarification is needed.



## Replacement Parts List for ChemScan mini UV254 Analyzer

Periodic Maintenance Parts		Other Parts	
21 - Reagents Not Applicable to UV254		* 1 - LCD Display	300014
21 - Reagents Not Applicable to UV254		2 - Keypad Assembly	300007
* 10 - Clean/Air Pump Assembly	300066	3 - Control Panel Assembly	300064
* 10 - Clean/Air Pump Cassette Head	800020	4 - Power Supply	300003
		5 - Main Circuit Board for UV254	Call
* Sample Tubing and Fitting Kit	100317	6 - Optrode for UV254 Analyzer	Call
8 - Flow-cell Outlet Tubing		7 - Flow-Cell Ass'y (UV254)	300030
9 - Flow-cell Inlet Tubing		* 11 - Manifold Valve	600004
12 - Drain Tube, 5 ft.		* 14 - Sample Strainer	300024
13 Air Diffuser Not Applicable to UV254		14 - Inlet Strainer Screen	530018
15 - Mini Sample Inlet		* 17 - Reagent Injector Pump	N/A
Drain Fitting (Straight 5/8)		18 - Injector Mounting Plate	N/A
Clean Sol. Fitting (Straight 3/8)		20 - Reagent Bottle Rack	N/A
		21 - Spare 2-Liter Reagent Bottle	N/A
		22 - Cleaning Solution Container	300154
		Reagent Injector Priming Syringe	N/A
* Reagent Tubing Kit- 2x4L	N/A	* Mini Flow-cell Window's	
16 - Not Applicable to UV254		7 - Standard Window Plate	300011
16 - Not Applicable to UV254		7 - Apertured Window Plate	300012
19 -Not Applicable to UV254			

**(Both window plates identical on the ChemScan UV254 Analyzer) (standard)**

\* Go to ChemScan.com, click on "Parts", then click "ChemScan Mini" to view and confirm the web site photo and description matches the existing part.

For other parts not listed, Call ChemScan at 262-717-9500

Maintenance Notes:

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