

Turner Designs Opti-Pro

Opti-Pro



Equipment Specified as Electrical and Electronic Waste

Operation Manual

Opti-Pro

To ensure proper system operation, Turner Designs strongly recommends reading this manual in full. After reading the entire manual, please review the following:

INSTALLATION:	Prior to installation, completely review the Pre-installation/ Installation Checklist located on page 27.
START-UP:	Prior to start-up, completely review the Start-Up Section located on page 7.
CALIBRATION:	Prior to calibrating the Opti-Pro, completely review the Calibration Procedure located on page 12.
TROUBLESHOOTING:	Prior to calling Turner Designs for assistance, completely review the Troubleshooting Guide located on page 24.

Operation Manual

Opti-Pro

TABLE OF CONTENTS

INTRODUCTION	5	TROUBLESHOOTING	23
THEORY OF OPERATION	5	Diagnostics.....	23
SPECIFICATIONS	6	Service Assistance	24
INSTALLATION	6	Troubleshooting Guide	25
Pre-Installation/Installation	6	RESPONSIBILITY FOR SAFE	
Power & Utilities Required.....	6	DELIVERY	26
Required Tools & Accessories	6	APPENDICIES	
Location & Sampling Point	6	A: INSTALLATION CHECKLIST.....	27
Mechanical Connections	7	B: CONFIGURATION RECORD.....	31
Electrical Connections.....	7	C: CONTROL FUNCTIONS	32
START-UP	8	D: SOFTWARE FUNCTIONS.....	33
Start-Up Procedure	8	E: SCREENS FLOW CHARTS.....	34
Table 1. Cal Sol'n. Values	9	System Value Screens	34
Monitoring Mode	12	User ID Screens	34
CALIBRATION	13	Diagnostic Screens.....	34
Calibration Procedure.....	13	Time/Date/Alarm Screens.....	35
Notes on Calibrating.....	14	Data Logger Screens.....	35
Calibration Data Screen	14	Calibration Screens	36
Table 2. Calibration Data.....	15	F: SYSTEM/CLOCK/ALARM VALUES ..	37
INTERNAL DATA LOGGER	16	Table 5. System Default Values	
Parameters	17	& Ranges	38,39,40
Software Installation	17	G: TROUBLESHOOTING.....	41,42
Running IDL Software	17	FIGURES & DIAGRAMS	
Examining Downloaded Data	18	Figure 1. Inlet Plumbing.....	43
PREVENTATIVE MAINTENANCE	18	Figure 2. Outlet Plumbing.....	44
Cleaning Basket Strainer.....	18	Figure 3. Front View	45
Calibrating.....	18	Figure 4. Wiring Diagram.....	46
Cleaning Flow Cell	18	Figure 5. Dimensions.....	47
Replacement Parts	19	EEW Statement.....	48
ALARMS	20	Warranty Information	49
Alarm Delay	20		
Alarm Activation	20		
Multiple Alarms.....	20		
Alarm History.....	20		
Notes About Alarms	20		
Table 3. System Function Alarms....	21		
System Function Alarms Definitions	21		
Table 4. Product Function Alarms ...	21		
Product Function Alarm Definitions .	22		

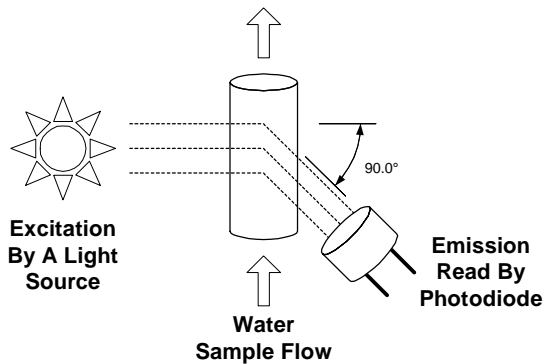
Operation Manual

Opti-Pro

INTRODUCTION

The Turner Designs Opti-Pro continually senses the exact level of fluorescent material in the system. This information is used to control treatment chemical addition on a real-time basis -- even under highly variable operating conditions.

The amount of fluorescent material present in the system is measured in a side-stream of recirculating water passed through a polished, quartz flow cell contained in the optical detection system. An excitation light source shines across the quartz tube and causes the tracing material in the water to fluoresce. A photodiode oriented 90° relative to the light source reads the amount of light emitted. The quantity of light emitted is directly proportional to the amount of treatment chemical present in the system.

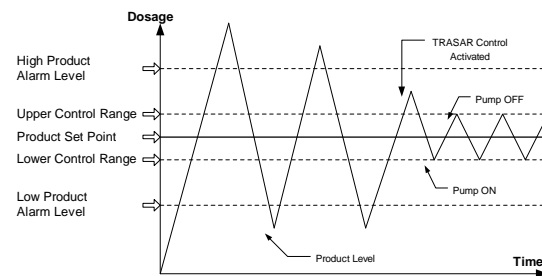


The Opti-Pro is a microprocessor-based fluorometer consisting of optics, an on/off controller with electrical inputs/outputs for a flow switch, 4-20mA signal, and data logging. It is engineered to ensure reliability and pre-assembled to simplify installation, plumbing and calibration. The unit is designed to provide trouble-free operation with only simple, routine maintenance.

THEORY OF OPERATION

As the recirculating water sample flows through the unit, the unit sends a signal to a solid-state relay, which can control a chemical feed pump. A desired product

level (set point) and a control range are selected. When the fluorescent material in the sample stream falls below the lower control range (the product set point minus the control range), the chemical feed pump is activated. Chemical is fed until the level present in the sample stream reaches the upper control range (the product set point plus the control range). The chemical feed pump is turned off until the sample stream again falls below the lower control range.



One or more chemical metering pumps are needed to feed chemical. Chemical pumps are not supplied with the Opti-Pro.

Operation Manual

Opti-Pro

SPECIFICATIONS

Turner Designs P/N: 6000-070

- Power: 90-250 VAC, 50/60 Hz, 5 amps
- Pump Relay: 90-250VAC, 50/60Hz, 5 amps (fused at 3.15 amps, Type "F")
- Signal Output: One 4-20 mA (isolated)
- Dimensions: 8" W x 4" D x 11" H
- Weight: 5 lbs. [2.3 kg]
- Enclosure: Approximates NEMA 4X
- Maximum Water Pressure: 100 psi
- Inlet Pipe Size: ¼" NPT (male)
- Outlet Pipe Size: ¼" NPT (female)
- Ambient Temperature: 40-120°F [4°-49°C]
- Maximum Sample Temperature: 140°F [60°C]
- Relative Humidity: 0-100%
- Overvoltage Category II
- Pollution Category I

INSTALLATION

Pre-Installation/Installation

A pre-installation/installation checklist found in Appendix A provides important guidelines and information to aid in preparing for installation.

Power & Utility Requirements

- Power: 90-250 VAC, 50/60 Hz, 5 amps
- Pump Control: Control pump rated at up to 5 amps, 90-250 VAC (fused at 3.15 amps, Type "F")
- Signal Output: One 4-20 mA signal (isolated)
- Recirculating Water Sample: Supplied to unit at 0.5 gpm minimum and less than 100 psi. (NOTE: Higher flow rates may require more frequent cleaning of the basket strainer.)
- Drain: Sample outlet from the Opti-Pro should be piped to drain with no back pressure, i.e., drain pipes must be below the unit. Do not combine the discharge from other Opti-Pros to the Opti-Pro discharge. In installations where this is

not feasible, contact Turner Designs for assistance.

Required Tools & Accessories

- Standard plumbing and electrical tools are required for installation.
- A terminal strip screwdriver is provided for making terminal strip connections.
- The Opti-Pro should be piped as shown in Figures 1 & 2 on pages 41 & 42. Components may be purchased separately or as a package through Turner Designs.

Location & Sampling Point

The sampling point should be located downstream from the recirculating pumps where adequate mixing of the product has occurred. Localized, high concentrations of treatment may occur if the sampling point is located directly downstream of the chemical feed point. Conversely, localized, low concentrations of treatment may occur if the sampling point for the fluorometer is located near the makeup water inlet.

It is extremely important to eliminate air entrapment in the sample line. The best way to accomplish this is to sample from the center of the pipe or from the side of the pipe.

The unit should not be installed in direct sunlight; this could cause the internal temperature of the unit to be significantly higher than ambient and produce errors or damage the components (Note the maximum environment temperature is specified at 120°F/49°C).

Do not install within 10 feet [3 m] of devices such as large generators or transformers, which generate a strong electromagnetic field; cooling water recirculating pumps are not a problem.

Do not mount this instrument on vibrating walls or surfaces. Damage to critical components can occur.

Opti-Pro

Mechanical Connections

Refer to Figures 3 & 5 on pages 43 & 45 respectively for the location of the required mechanical connections.

Two ¼ inch NPT pipe connections are provided for ¼ inch PVC pipe hook-up. The sample outlet line is ¼ inch female; the sample inlet line is ¼ inch male shut off valve.

If the Plumbing Accessory Kit (TD Part No. 6000-955) is purchased, the outlet line is ¼ inch NPT (female) to connect to user-supplied ¼ inch male piping; the inlet line is ½ inch NPT (female) to connect to user-supplied ½ inch male piping.

IMPORTANT: Sample discharge should flow to an unrestricted drain. Pipe rises greater than 10 feet [3 m] should be avoided. In installations where this is not feasible, contact Turner Designs for further assistance.

Mounting eyelets are an integral part of the plastic housing. Mounting the unit at eye level is recommended.

Electrical Connections

Only trained personnel should make electrical connections.

Refer to Figure 4 on page 46 for the "Terminal Connections", showing the terminal strip location and configuration of the required electrical connections for the power, pump, flow switch and 4-20 mA connections.

To access the terminal strip, TURN OFF MAIN POWER TO THE INSTRUMENT AT BREAKER, then remove the enclosure face (6 screws). Remove the enclosure face carefully as the keypad ribbon cable must be removed from the printed circuit board (PCB) to completely remove the enclosure face. The ribbon cable is indexed on the PCB to insure proper alignment upon reassembly. (See Figure 4 on page 46). There are two terminal strips within the instrument. #1-6 are for AC connections and #A-K are for input/output connections.

To connect a wire to the terminal strip, TURN OFF MAIN POWER TO THE

INSTRUMENT AT BREAKER. Loosen the proper terminal screw (screwdriver provided) and insert wire from below into terminal. Tighten screw firmly. A termination legend is provided on the backside of the enclosure door for reference.

To disconnect a wire, TURN OFF MAIN POWER TO THE INSTRUMENT AT BREAKER. Loosen the termination screw and pull the wire out of the terminal.

When finished, carefully insert the ribbon cable onto the PCB and replace enclosure face with the 6 screws.

Signal wires and power wiring should NOT be run in the same conduit. Failure to separate or shield these wires will result in electrical interference.

**IMPROPER INSTALLATION, USE,
APPLICATION OR UNAUTHORIZED
SERVICING OF THIS EQUIPMENT VOIDS
ALL WARRANTIES.**

Operation Manual

Opti-Pro

START-UP

Before start-up, the following items should be obtained:

- Calibration Solution
- Distilled Water
- Dilute Acid
- Calibration Accessory Kit
- Plumbing Kit

These items are not included with the Opti-Pro. They are assigned individual part numbers and can be ordered separately.

The Product Set Point in ppm is in the chemical's Product Knowledge Sheet in the Dosage & Feeding section. The Product Set Point is based on the system's operating parameters.

Background fluorescence (TRA Test Value) can be found via a lab analysis report. In most cases the Calibration Solution Value will equal 1.0.

Start-Up Procedure

A diagram of the screens is located in Appendix E

STEP #1:

Bring sample flow to unit -- check for leaks in plumbing.

STEP #2:

Switch Main Power Switch under enclosure face to the ON position (see Figures 3 & 4 on pages 43 & 44).

When power is first turned on, an ID screen will appear for a few seconds, showing the software version and date. After 10 seconds (or press <ENT> or <HOME> for immediate access), the HOME screen will appear. The HOME screen will display the product dosage in PPM (3 digits) and the pump status (ON/OFF).

XXX PPM
Pump: ON

Sample Home Screen

If the screen is blank or dark, try adjusting the screen contrast using the UP [↑] and DOWN [↓] AROWS.

STEP #3:

During start-up, nine system values must be entered. Record all set-up values in the configuration record located in Appendix B.

Press <ENT>. Before entering/changing the first System Value, the unit will prompt for the User I.D. The screen will read:

Please input ID:

Enter a valid USER ID (default is 8520) and the screen will display:

Current: XXXX
New:

From the HOME screen, press <0> to enter/change the first System Value; Calibration Solution Value.

<0> CAL SOL'N. VALUE

- This value relates the value of the tracer standard to a fluorescence measurement. The value is printed on the label of the calibration solution and listed in Table 1.
- Press <0>
- Press <ENT>
- Key in appropriate Calibration Solution Value
- Press <ENT>
- Press <HOME>

Operation Manual

Opti-Pro

Table 1. Traced Chemical Calibration Solution Values

Calibration Solution Value	Part Number
1.00	Consultation required*

* different chemicals such as fluorescein or PTSA may be used. Expert assistance is required to make this determination.

<1> PRODUCT FACTOR

The Product Factor = 1

This value relates the tracer measurement to the actual level of Traced Chemical in the sample. It is very important that the Product Factor is entered correctly.

- Press <1>
- Press <ENT>
- Key in Product Factor 1.0
- Press <ENT>
- Press <HOME>

<2> TRA TEST VALUE

This value is the background fluorescence [%] for the recirculating water system as measured by a laboratory. It varies from site to site and can be found on the Lab Report (Note: Use unfiltered value.). If you do not know this value, use the value of zero.

- Press <2>
- Press <ENT>
- Enter TRA Test Value [%] ex. 4.0
- Press <ENT>
- Press <HOME>

<3> PRODUCT SET POINT

Obtain the desired dosage [ppm] of Traced Chemical to be maintained in the recirculating system from the chemical's Product Knowledge Sheet.

- Press <3>
- Press <ENT>
- Key in Product Set Point [ppm]
- Press <ENT>
- Press <HOME>

<4> CONTROL RANGE

This value determines the upper & lower control settings (pump on/off) around the Product Set Point. The Opti-Pro uses the Control Range to turn the pump on & off. Typically, the setting is 1-3 ppm.

- Press <4>
- Press <ENT>
- Key in Control Range [ppm]
- Press <ENT>
- Press <HOME>

The unit will reject as INVALID INPUT a new control range value if the Product Set Point minus the new value is not higher than the Low Product Alarm level. It will also reject a new control range value if the Product Set Point plus the new value is not lower than the High Product Alarm value.

<5> HIGH PRODUCT ALARM LEVEL

If the product level rises above this level (and remains there for a 10-minute delay period) a High Product Alarm will be triggered. Upon alarm, the unit will default to the High Product Alarm % to control product feed; the High Product Alarm % will be set later in this procedure. (see Alarm Section).

- Press <5>
- Press <ENT>
- Key in High Product Alarm Level [ppm]
- Press <ENT>
- Press <HOME>

The unit will reject (INVALID INPUT) a new High Product Alarm level value if it is not higher than the Product Set Point plus the Control Range.

<6> LOW PRODUCT ALARM LEVEL

If the product level falls below this value (and remains there for a 10-minute delay period) a Low Product Alarm will be triggered.

Operation Manual

Opti-Pro

Upon alarm, the unit will default to Low Product Alarm % to control product feed; the Low Product Alarm % will be set later in this procedure (see Alarm Section).

- Press <6>
- Press <ENT>
- Key in Low Product Alarm Level [ppm]
- Press <ENT>
- Press <HOME>

The unit will reject as INVALID INPUT a new Low Product Alarm level value if it is not lower than the Product Set Point minus the Control Range.

<7> 4 mA OUTPUT

The 4-20 mA output can be connected by a signal wire to a data logger or other device to collect and remotely store data from the unit. Outputs can be set to correspond to a certain range of product reading. Typically, the 4 mA output is set at 0 ppm.

- Press <7>
- Press <ENT>
- Key in 4 mA Output
- Press <ENT>
- Press <HOME>

The unit will reject the entry if the 4 mA value is > the 20 mA output value.

<8> 20 mA OUTPUT

The 4-20 mA output can be connected by a signal wire to a data logger or other device to collect and remotely store data from the unit. Outputs can be set to correspond to a certain range of product reading. Typically the 20 mA output is set at twice the Product Set Point [ppm].

- Press <8>
- Press <ENT>
- Key in 20 mA Output
- Press <ENT>
- Press <HOME>

The unit will reject the new 20 mA value if it is < than the 4 mA output value.

Notes:

1. The narrower the range of the 4-20 mA settings, the greater the resolution.
2. During an alarm condition, the 4-20 mA output will still send out the dosage level.
3. During calibration the 4-20 mA output will send out a 4 mA signal.

<9> MASTER ID

For security, a USER ID is required to change the System Values or calibrate the unit. The original, or default, value is 8520. The MASTER ID is required to view or change the USER ID. To change the USER ID, contact Turner Designs Technical Support at 877-316-8049 for assistance with the Master ID.

- Press <9>
- Key in Master ID
- Press <ENT>
- Key in new User ID.
- Press <ENT>
- Press <HOME>

STEP #4:

During start-up, the date, time, and alarm output values must be entered. Record all set-up values in the configuration record located in Appendix B. Be sure to download data from the data logger before changing the date or time!

The date, time, and alarm output values are accessed from the <⌚> (clock) menu. From the HOME screen, press <⌚> to access the date, time, and alarm values.

<0> Hour

For the data logger to reference the correct time, the hour of day must be entered. Only numerical values 1-12 will be accepted.

- Press <⌚>, from HOME
- Press <0>
- Key in the hour of day (1-12)
- Press <ENT>
- Press <ESC> to return to clock menu

Operation Manual

Opti-Pro

<1> AM/PM

For the data logger to reference the correct time (morning or evening), AM/PM must be entered.

- Press <⊕>, from HOME
- Press <1>
- Press <ENT> to toggle between AM/PM
- Press <ESC> to return to clock menu

<2> Minutes

For the data logger to reference the correct time, the number of minutes after the hour must be entered.

- Press <⊕>, from HOME
- Press <2>
- Key in minutes [0-59]
- Press <ENT>
- Press <ESC> to return to clock menu

<3> Month

For the data logger to reference the correct date, the month of the year must be entered.

- Press <⊕>, from HOME
- Press <3>
- Key in the month (1-12)
- Press <ENT>
- Press <ESC> to return to clock menu

<4> Date

For the data logger to reference the correct date, the day of the month must be entered.

- Press <⊕>, from HOME
- Press <4>
- Key in the day (1-31)
- Press <ENT>
- Press <ESC> to return to clock menu

<5> Year

For the data logger to reference the correct date, the year must be entered.

- Press <⊕>, from HOME
- Press <5>
- Key in year [00-99]
- Press <ENT>

- Press <ESC> to return to clock menu

<6> Start-Up Timer

When the unit is first activated, the Start-Up Timer Alarm will monitor the amount of time it takes the product dosage to fall within the set point, ± Control Range -- and remain there for at least 10 minutes. If the time exceeds the pre-defined value, then it will trigger The Start-Up Timer Alarm.

- Press <⊕>, from HOME
- Press <6>
- Press <ENT> to toggle
- Press <ESC> to return to clock menu

If the time exceeds this pre-defined value (1-168 hours), the Start-Up Timer Alarm will be triggered -- indicating a chemical feed problem. A setting of OFF disables the alarm.

<7> Limit Timer

This alarm monitors the amount of time the inhibitor pump is on. If the time exceeds this period (from 1-1440 minutes), the alarm will be triggered, indicating a possible inhibitor pump or chemical feed problem. A setting of OFF disables this alarm.

- Press <⊕>, from HOME
- Press <7>
- Press <ENT> to toggle
- Press <ESC> to return to clock menu

The Limit Timer Alarm will not begin to monitor until the Start-Up Timer is finished.

<8> Low Product Alarm %

The unit can be set to feed a pre-defined level of product during various alarm conditions. The user can define whether to feed 0-100% product during a low product alarm, a no flow alarm, a fluorometer alarm, a limit timer alarm, a start up timer alarm or a high temperature alarm.

- Press <⊕>, from HOME
- Press <8>
- Press <ENT> to toggle (0-100%)
- Press <ESC> to return to clock menu

Operation Manual

Opti-Pro

If both a High or Low Product Alarm and a System Alarm occur at the same time, the feed setting chosen for Low Product Alarm will take precedence.

<9> High Product Alarm %

The unit can be set to feed a pre-defined level of product during a high product alarm. The user can define whether to feed 0-100%.

- Press <⊕>, from HOME
- Press <9>
- Press <ENT> to toggle (0-100%)
- Press <ESC> to return to clock menu

If both a High or Low Product Alarm and a System Alarm occur at the same time, the feed setting chosen for Low Product Alarm will take precedence.

The Opti-Pro unit start-up has now been completed. After start-up, wait a minimum of 15 minutes before calibrating to allow the unit to come to equilibrium.

Monitoring Mode

To assist in understanding the improvement in control the Opti-Pro achieves; the unit should initially be used to monitor and document the current level of control capability. To do so, do not connect (or disconnect) any control devices from the unit.

Reset the following System Values:

Value	Access Key	Setting
Low Product Alarm	<6>	0
High Product Alarm	<5>	999

Operation Manual

Opti-Pro

CALIBRATION

Calibration Procedure

All calibration steps must be completed for changes to be registered!

Refer to Figures 3 & 5 on pages 43 & 45 respectively, for locations of items. A diagram of display screens is located in Appendix E.

STEP #1

Close flow cell shut-off valve. The valve is closed when oriented horizontally.

STEP #2

Clean unit by injecting acid with a syringe into the flow cell. The syringe screws onto the Luer Lock fitting on the inlet of the flow cell (see Figure 3 on page 43). Fill syringe with 60 ml of dilute acid (10% Sulfuric Acid recommended -- 1:1 HCl is acceptable if the cell is well rinsed). Screw syringe onto fitting. Inject dilute acid at a slow, steady rate into flow cell and allow to stand for 3-5 minutes. Using a clean 60 ml syringe, flush flow cell thoroughly with 60 ml of blank solution.

① A syringe is provided in the Opti-Pro Calibration Accessory Kit (Turner Designs Part No 4000-930).

STEP #3

Press <ENT> from the HOME screen:

1. Calib 2. Cal data Cal
xx Day(s) Ago

STEP #4

Press <1> the unit will request ID entry (unless recently entered).

Please input ID:

Enter valid USER ID (originally 8520) on the keypad if requested.

STEP #5

Press <ENT>:

CALIBRATE SYSTEM
<1> To Start

STEP #6

Press <1>:

BLANK
SOLUTION

Using the syringe for the blank solution, flush flow cell with 60 ml of blank solution via the Luer-lock Injection Port. Then inject another 60 ml blank solution and allow it to remain in the flow cell by leaving the syringe attached.

Bubbles trapped during injection are a possible source of instrument error. With the syringe in a vertical position, tap against a solid object to move bubbles to the needle end of the syringe. Then, force bubbles out by pushing a small amount of solution through the needle end of the syringe.

STEP #7

Press <ENT>:

BLANK %:
XX

Any value < 25% is acceptable. If blank is > 25% and <0> is pressed, an error message will be received. Press <ESC> to abort calibration and check the blank solution.

When reading is stable, press <0>. The unit will display a flashing "WAIT/wait" message in the lower right-hand corner of the screen while the unit registers the blank.

Then, the screen will display:

To continue
Press <ENT>

Operation Manual

Opti-Pro

STEP #8

Press <ENT>:

CALIBRATION SOLUTION

Using a clean syringe, flush flow cell with 60 ml of calibration solution via the Luer-lock Injection Port. Then inject another 60 ml calibration solution and allow it to remain in the flow cell by leaving the syringe attached.

STEP #9

Press <ENT>:

CAL SOLUTION %:
XX

Wait for reading to stabilize. The CAL SOLUTION % should be 1-10%

When the CAL SOLUTION % is stable and between 1-10, press <*>. The unit will display a "WAIT/wait" message in the lower right-hand corner of the screen while it registers the calibration solution.

Then, the screen will display:

To continue
Press <ENT>

STEP #10

Remove the syringe and press <ENT>:

Press <1> to End
Calibration

Press <1> to accept the calibration settings. The calibration is now complete.

**YOU MUST PRESS <1> OR THE
CALIBRATION WILL REVERT TO THE
PREVIOUS SETTINGS!**

STEP #11

Open flow cell shut-off valve. The valve is open when the handle is oriented vertically.

STEP #12

Press <HOME> to return to the HOME Screen and normal operations.

Notes on Calibrating

1. Calibrate the Opt-Pro unit when you have time to go through all steps without interruption (\approx 10 minutes). If the keypad is not used for 15 minutes, the unit will automatically return to the HOME screen. The previous calibration will be maintained.
2. Pump output will be OFF (no chemical feed) during calibration.
3. A request to begin calibration when an alarm is activated will be denied, unless the alarm is for:
 - High Product Alarm ("P-H")
 - Low Product Alarm ("P-L")
4. The following alarms will not be monitored during calibration:
 - High Product Alarm ("P-H")
 - Low Product Alarm ("P-L")
 - No Sample Flow Alarm ("N-F")
5. If an internal unit function alarm ("F-A" alarm) occurs during calibration, when you return to the HOME screen, "ALM" will be blinking in the upper left-hand corner of the screen. Correct the condition causing the alarm, and then recalibrate the unit.
6. During calibration, the 4-20 mA output will send out a 4-mA signal.
7. Use distilled or deionized water as blank solution. If you are not using commercial distilled water, check your source of blank solution against distilled water for background fluorescence. DO NOT USE MAKE-UP WATER AS A SOURCE OF BLANK SOLUTION. Use of the wrong blanking solution can result in inaccurate or low product dosage.
8. Use only approved Traced Chemical Calibration Solutions. These solutions meet strict specifications that cannot be achieved if made at the customer's site. Use of solutions that have not been approved may result in inaccurate product dosages.

Operation Manual

Opti-Pro

9. All solutions are injected with a syringe into the stainless steel Luer-lock Injection Port. Depress plunger at a steady, slow rate.
10. Use separate syringes for blank and calibration solutions.
11. Avoid injecting bubbles into the unit. Bubbles trapped when injecting the blank and calibration solution are a possible cause of instrument error. With the syringe in a vertical position, tap the syringe against a solid object to move the bubbles to the needle end of the syringe. Then, force the bubbles out by pushing a small amount of solution through the needle end of the syringe.
12. The LEFT ARROW [←] may be used to return to previous calibration screens.
13. During calibration sequence, **MAKE SURE** to wait for **BLANK %** and **CAL SOLUTION %** readings to stabilize before pressing the appropriate key on the keypad.
14. Do not allow calibration solution to sit in flow cell longer than necessary (approximately 2 minutes). To abort the calibration and maintain current calibration settings, press <ESC> before step 9 is completed. The unit will prompt:
15. To abort the calibration and maintain current calibration settings, press <ESC> before step 9 is completed. The unit will prompt:

<1> Abort Cal <ESC> Continue

Press <1> to abort.

16. The *entire* calibration procedure must be completed to store the new values entered during calibration.

Calibration Data Screen

This screen provides a check on proper calibration. It is accessed from the HOME screen by pressing <ENT>, then <2>.

Table 2. Calibration Data

	Blank	Cal Std
Access Key	<ENT> & <2>	
Default	0.0	500.0
Range	0-250	0-1,000

[A] Blank: Shows raw data output for blank solution as set during calibration. It can be used to check proper calibration. It is derived by multiplying the Blank % reading in Step 7 of the calibration procedure by 10. Thus, if Blank % reads 10% with blank in the flow cell, then this reading should be between 100-109.

① Blanking capability of the instrument is 25% (e.g. maximum blanking of raw data is 250.0)

[B] Cal Std: Shows raw data output for the standard solution as set during calibration. It can be used to check proper calibration. It is derived by multiplying the CAL SOLUTION % reading in Step 9 of the calibration procedure by 10. Thus, it should read between 20-100 when the unit has been properly calibrated. For example, if CAL SOLUTION % reads 5% with the calibration solution in the flow cell, then this reading should be 50.

INTERNAL DATA LOGGER

The Opti-Pro is equipped with an internal data logger to record the unit's output. Data is saved in a binary (BIN) format to be downloaded and converted to ASCII data with the Internal Data Logger (IDL) software.

Data Logger Parameters

The unit's data logger is accessed from the HOME screen by pressing the data disk <F4> symbol on the keypad. From the data logger menu, you can turn the data logger on/off, set the interval, download, and erase data.

The clock is important to the data logging functions. Once the date and time are set and data has been logged, download the current data before changing the date or time or existing data may be corrupted.

1. From the HOME screen, press <F4> to see the data logger menu. Before entering/changing the data logger, the unit will prompt for the Master ID. At this point, contact Turner Designs Technical Support and they will assist you with the Master ID:

Please input ID:

The Master ID is different than the User ID. After entering the Master ID the screen will read:

Datalogger:
<0> - <3>

2. To log data or stop logging data, press <0>:

Status: Stop
<ENT> to toggle

Press <ENT> to toggle from Stop to Logging.

3. Important: Download current data before changing the date or time to avoid data corruption.

To set the data logging interval (how often the unit records a sample

measurement), from the data logger menu, press <1>:

Interval: 1 min
<ENT> to toggle

Press <ENT> to toggle from 1, 2, 3, 5, 10, 20, or 30 minutes, or 1 second

4. To download data to a Windows based PC or to erase data, from the data logger menu, press <2> or <3>, respectively.

Installing Internal Data Logger (IDL) Software

The IDL software is designed to interface from the Opti-Pro to a Windows 95 through XP®-based PC. The IDL program is used to download data from the Opti-Pro and convert it to an ASCII format for use with a spreadsheet or other program. To install the IDL software:

- Insert the CD into your computer.
- Using Windows explorer go to the drive containing CD and open the folder titled Opti-Pro Software v. 2.0. Double click on the setup.exe file to begin installation.

Operation Manual

Opti-Pro

Running the Internal Data Logger Software

To download data from the Opti-Pro:

1. Using the cable provided (a male and female DB9 connector at each end), connect computer to the unit's serial port (RJ-11 female). Refer to Figure 4 on page 44 to locate.
2. Start IDL program on PC by clicking twice on the IDL.exe icon. The IDL Main Menu will appear.
3. Click on *Serial Port Setup* to select the appropriate PC COM port (1,2, or 3).
4. Click on *Download Data from Instrument to File* to display the downloading box on the PC.

Data may be downloaded and converted to an ASCII file in a single process by clicking on *Download and Convert Data from Instrument to File*. In this case, IDL will prompt you for downloading, and then conversion, in a single process incorporating steps 5-10.

5. From the Opti-Pro, set the data logger to Stop, by pressing <F4> from the HOME screen, then <0>, then <ENT> to toggle.
6. From the Opti-Pro, access the downloading screen by pressing <2> from the data logger main menu:

Download data:
5x <8> to start

7. On the keypad, press <8> five times to start downloading data. The PC will display a bar graph and data block countdown. The Opti-Pro will display:

Download data:
Data Blks: XX

If there is an error in downloading data, the following screen will be displayed:

Comm Error !!
<ESC> to retry

- If the error screen appears, press <ESC> and make sure the serial cable is securely connected and operational.

- Make sure the correct serial port has been selected (IDL software main menu).
 - Check to make sure the Opti-Pro date and time functions have not been changed for the current data logged.
 - Verify steps 1-7 have been completed. Correct screens must be displayed on both the computer and Opti-Pro.
8. When downloading is finished, IDL will prompt to name the file and select the path (folder) for the downloaded file. Click on Browse to change the name or path; or accept the default name (test.bin) and path. Then, click on OK to return to the Main Menu.

If you would like to wait until later to convert the data to ASCII format in order to save disk space, then skip to step 12. To convert data to an ASCII file now, go on to step 9.

9. To convert a BIN file to a regular ASCII file (PRN file), from the PC click on the *Convert Downloaded Data File to ASCII File*. IDL will then prompt what file you would like to convert to ASCII. Click on Browse to locate the file or click on OK to accept the default file.
10. Click on OK to begin conversion. IDL will display "Conversion has started." IDL will convert the BIN file to an ASCII file of the same name with the extension "PRN". When "Conversion completed" appears, click on OK to return to IDL Main Menu.
11. To exit IDL, click on the "X" in the upper right-hand corner or select "exit" from the file menu.
12. Disconnect computer from the unit. Erase data currently in the Opti-Pro by pressing <F4> from the HOME screen, then <3> from the data logger menu:

Erase data:
5 x <9> to start

Operation Manual

Opti-Pro

When data is erased, the unit will display

Erase data:
All Data Erased

13. Enter new internal data logging parameters on the Opti-Pro, if desired, or resume logging with previous parameters.
14. Return unit to normal operation.

Examining Downloaded Data

The ASCII-format "PRN" files can be opened, viewed, or printed using most standard computer programs. To examine the data, run your program, then open or import the "PRN" file containing the downloaded data. A typical line of data from the internal data logger will look like this (your numbers will vary):

00001:	10/24/91	14:10:28	=	11.300
↑	↑	↑		↑
Index	Date	Time		Sample Reading

PREVENTATIVE MAINTENANCE

Proper preventative maintenance is critical to the success of fluorescent traced technology. Once the unit is installed, started-up, and calibrated, the initial settings should not require change. Any start-up or shutdown must be made using the Opti-Pro Main Power Switch (see Figures 3 & 4 on pages 43 & 44).

- ① System Values are retained in battery back-up memories for up to five years. However, the Start-Up procedure should be followed to ensure fluorometer calibration and control settings are correct if the unit has been disconnected for any length of time.
- ① This unit has been assembled with a new desiccant plug to ensure the area surrounding the flow cell is free of any moisture. As this plug absorbs condensate, it will change from a light blue to light pink at the saturation point

and should be replaced promptly. The unit can remain in operation during this replacement. Readings should be monitored during this replacement time as small variances might occur. Refer to the Replacement Parts Section for replacement plugs.

The following preventative maintenance should be performed to ensure optimum Opti-Pro operation and maximum life.

Cleaning the Basket Strainer

The basket strainer screen should be cleaned as needed:

1. Shut off inlet valve to basket strainer.
2. Remove screen and clean.
3. Replace screen.
4. Open inlet valve to basket strainer.
5. Wait for unit to equilibrate and air to purge from the unit.

Calibrating

Calibration should be checked and performed regularly. Typically, calibration is necessary every two weeks to once a month. The calibration solutions must be carefully selected. Consultation will be necessary:

Traced Chemical Compound	Cal Sol'n. Value	Part Number
**	1.00	**

**Values to be provided by chemical supplier

Cleaning the Flow Cell

Flow cell cleaning frequency is dependent on the quality of the water sample being monitored. The flow cell is unlikely to clog, but occasionally (though rarely) residue can build up on the inside of the quartz cuvette, especially where oily water is involved. A fouled or discolored flow cell can result in low or erratic readings. For routine cleaning, follow steps 1 & 2 in the Calibration Procedure. Be sure to open the

Opti-Pro

flow cell shut-off valve when cleaning is completed.

For cleaning the flow cell with a brush, perform the following steps. Refer to Figure 3 on page 43.

1. TURN OFF MAIN POWER SWITCH
2. Shut off flow to flow cell. Flow is off when valve handle is horizontal. It is recommended that the inlet valve be closed and the 3-way outlet valve also be closed (the outlet valve is then open to atmosphere -- see Figures 1 & 2, pages 41 & 42).
3. Remove clean-out plug. See Figure 3, page 43.
4. **CAUTION:** After injecting acid solution into the flow cell, be sure to flush it out completely BEFORE removing the clean-out plug.
5. Dip flow cell brush into dilute acid solution and insert gently into clean-out opening.
6. Slide brush gently up and down in the opening to remove any coating on the quartz cuvette.
7. Replace flow cell clean-out plug.
8. Turn on flow. Flow is ON when valve handle is oriented vertically.
9. Turn ON Main Power Switch.
10. Calibrate unit after allowing it to warm up for 15 minutes (see Calibration Procedure).

Replacement Parts

Common Replacement Parts:

6000-970	Desiccant Plugs (Pkg. 3)
6000-350	Flow Cell Brushes (Pkg 3)
6000-119	Data Cable
120-0110	Flow Switch
4000-930	Calibration Accessory Kit

IMPROPER INSTALLATION, USE, APPLICATION OR UNAUTHORIZED SERVICING OF THIS EQUIPMENT VOIDS ALL WARRANTIES.
--

ALARMS

Alarms have been built into the Opti-Pro to warn about conditions relating to product levels and internal instrument functions.

Two general types of alarms exist:

1. System Function Alarms: Fluorometer (lamp) and No Flow ("F-A" & "N-F" alarms). Refer to Table 3.
2. Product Function Alarms: Refer to Table 4.

Refer to Appendix F (Table 5) for alarm default values.

Alarm Delay

To avoid unnecessary triggering of alarms, the condition must be in effect for a certain delay period (see Tables 3 & 4).

Alarm Activation

When an alarm is triggered, "ALM" will blink in the upper left-hand corner of the HOME screen. From any other screen, when the alarm is first activated, the unit will return to the HOME screen, where it will display the "ALM" message in the upper left-hand corner. Pressing the <ESC> key will display the current alarm. Take the appropriate action to clear the condition (see Troubleshooting Section).

When the condition triggering the alarm is cured, "ALM" will disappear from the HOME screen.

Alarms cannot be aborted without curing the problem.

NOTE: When an alarm is triggered, chemical feed will default to the High Product % and Low Product % settings.

Multiple Alarms

If multiple alarms are triggered, alarms will be listed on the alarm screen when <ESC> is pressed from the HOME screen. Alarms are not listed in the order they occur. For example, the alarm screen might display:

N-F	P-L	F-A
-----	-----	-----

Certain alarms will trigger other alarms because a failure in one part of the unit causes what appears to be a failure in another part of the unit. For example: If the lamp light source is bad (F-A), this condition may also trigger the Product Too Low Alarm (P-L) even if there is really nothing wrong with the product level.

Alarm History

The alarm history can be viewed, by pressing <↔> (Left Arrow) from the HOME screen. This shows which alarms have been activated since the alarm history screen was last cleared. To clear this screen, press <*> five times while the alarm history screen is displayed; "No Alarm Since Last Reset" will be displayed.

Notes About Alarms

1. No alarms are monitored when the unit is turned OFF.
2. Certain alarms are not monitored during calibration (see Notes on Calibrating in Calibration Section).
3. When the unit is first powered up, the Low Product Alarm will begin to be monitored 10 minutes after the dosage rises above the Lower Control Range (set point minus the control range). However, if the dosage falls below the Lower Control Range within the 10-minute delay period, then the 10-minute delay period will be restarted. Thus, a problem or spike during start-up will not mis-trigger the Low Product Alarm.
4. When the unit is first powered up, the High Product Alarm will begin to be monitored 10 minutes after the dosage falls below the Upper Control Range (set point plus the control range). However, if the dosage rises above the Upper Control Range within the 10-minute

delay period, the 10-minute delay period will be restarted. Thus, a problem or spike during start-up will not mis-trigger The High Product Alarm.

5. All alarms will reset automatically if the alarm condition is corrected except the START-UP TIMER and LIMIT TIMER, which are latched-in and require manual reset (refer to the Alarm Help Screen). Alarms cannot be stopped without fixing the problem.
6. When the unit is first activated, the Start-Up Timer Alarm will monitor the amount of time it takes the product dosage to fall within the set point, \pm control range -- and remain there for at least 10 minutes. If the time exceeds the pre-defined value, then it will trigger the Start-Up Timer Alarm. The Start-Up Timer Alarm defaults to the Low Product Alarm Pump settings.
7. The Limit Timer Alarm will not begin to monitor until the start-up timer is finished. The Limit Timer Alarm defaults to the Low Product Alarm pump output settings.
8. During an alarm condition, the 4-20 mA will still send out the dosage level.
9. During an alarm condition, the chemical will or will not feed as set by the user using the High and Low Product Alarm Settings.

Table 3. System Function Alarms

Alarm	Delay (min.)	Alarm Condition	Normal
Lamp (F-A)	1	OFF	ON
No Sample Flow (N-F)	10	OFF	ON

System Function Alarms Definitions

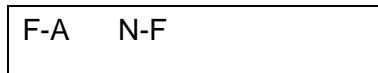
[A] Lamp (F-A): Indicates the status of the excitation light source. Reports whether the lamp is OFF or ON. If the power is ON and the lamp is good, the diagnostic screen will display "Lamp: ON".

[B] No Sample Flow (N-F): If there is a problem with the sample flow lasting for the 10 minute delay period, a "N-F" alarm will be displayed. The flow switch used is rated at 0.5 gpm minimum flow (tolerance is 0.4-0.6 gpm).

If there is a "N-F" alarm, check terminal connections to the flow switch. Check the sample feed lines and the unit's flow cell for any restriction.

NOTE: Only trained personnel should perform electrical connections.

If a system function alarm is activated, the screen will display "F-A" (lamp) or "N-F" (no flow) when <ESC> is pressed from the HOME screen.



Press <*> from the HOME screen to access the diagnostic screens (refer to Appendix F, Table 5, for default values).

If the Lamp displays "OFF" and there is power to the unit, contact Turner Designs at 877-316-8049 in the USA. International Customers should call Turner Designs at 408-212-4046.

Table 4. Product Function Alarms

Alarm	Delay (min.)	Range	Default
High Product (P-H)	10	0.2-999	999 (ppm)
Low Product (P-L)	10	0-997	0 (ppm)
Start-Up Timer (S-A)	10	1-168 hours	OFF
Limit Timer (L-A)	10	1-1440 min.	OFF

Opti-Pro

Pressing <ESC> from the HOME screen allows the user to determine which product function alarm is activated.

Product Function Alarm Definitions

[P-H] Product Too High

If the product level rises above the user-set level (see Appendix B), and remains there for the 10-minute delay period, a "P-H" alarm will be noted.

If there is a "P-H" alarm, check pump status on the HOME screen against actual pump action. Check terminal connections from the unit to the pump and chemical feed lines. Is the High Product Alarm Level set too low? Verify that calibration has been performed properly.

[P-L] Product Too Low

If the product level falls below the user-set level (see Appendix B), and remains there for the 10-minute delay period, a "P-L" alarm will be noted.

If there is a "P-L" alarm, check pump status on the HOME screen against actual pump action. Check terminal connections from the unit to the pump and chemical feed lines. Is the Low Product Alarm Level set too high? Verify that calibration has been performed properly.

[S-A] Start-Up Timer

When the unit is first activated, the Start-Up Timer Alarm will monitor the amount of time it takes the product dosage to fall within the set point, \pm control range -- and remain there for at least 10 minutes.

If the time exceeds the pre-defined value, then it will trigger the Start-Up Timer Alarm.

If the time exceeds this pre-defined value (1-168 hours), the Start-Up Timer Alarm will be triggered indicating a chemical-feed problem. A setting of OFF disables the alarm. When triggered, The Start-Up Timer defaults to the Low Product Alarm pump output settings.

The Limit Timer will not start to monitor until the Start-Up Timer Alarm is finished. To clear a Start-Up Timer Alarm, press <ESC> <8> from the Home Screen.

[L-A] Limit Timer

This alarm monitors the amount of time the solenoid pump is on. If the time exceeds this period (from 1-1440 minutes), the alarm will be triggered, indicating a possible solenoid pump or chemical feed problem. A setting of OFF disables this alarm.

When triggered, the Limit Timer defaults to the Low Product Alarm pump output settings.

The Limit Timer Alarm will not begin to monitor until the Start-Up Timer is finished.

To clear a Limit Timer Alarm press <ESC> <7> from the Home Screen.

TROUBLESHOOTING

Because the Opti-Pro includes hardware, software, and chemistry, it is important to collect all diagnostic data first. A troubleshooting worksheet is provided in Appendix G to facilitate data collection. After collecting all data on the worksheet, most problems can be solved over the phone. Refer to the Service Assistance Section for the appropriate telephone numbers.

When using this guide, it is assumed that all problems associated with an alarm have been resolved first. Something as simple as a clogged basket strainer can lead to other alarm messages, which could all be solved at one time simply by cleaning basket strainer. Generally speaking, if there is no System Function Alarm ("F-A" alarm), this is persuasive evidence that the electronics of the instrument are functioning properly. In that case, it is likely that any problem is either mechanical, or has resulted from another system problem, or from the operator's unfamiliarity with the unit.

The troubleshooting procedure works best in this sequence:

1. HANDLE ANY ALARMS FIRST (see Alarms Section)
2. Determine whether or not System Values have been entered correctly (see recorded values in Appendix B, and the System Default Values in Appendix F, Table 5).
3. Perform Diagnostics procedure as described on the following page.
4. Determine whether or not the chemistry is behaving as expected. Does the blank read close to zero on the HOME screen and calibration solution read between 1-10% on the diagnostic screen "CAL SOLUTION %"? Check the "Cal data" screen (see Calibration Data Screen) to determine whether the last calibration seems correct.
5. Complete the Troubleshooting Worksheet (Appendix G).

6. In the U.S., contact Turner Designs at 877-316-8049 (see Service Assistance/Returned Goods Section).

International customers should contact Turner Designs at 408-212-4046.

Diagnostics

The Opti-Pro contains diagnostic screens and functions to aid in troubleshooting. These functions are accessed from the HOME screen by pressing <*>, then <ENT> to page through the series of 4 screens. Press the <LEFT ARROW> to return to a previous screen, or <ESC> or <HOME> to return to the HOME screen.

1. From the HOME screen, press <*>:

Turner Designs Ver G5UL-1X XXXX

2. From the above screen, press <ENT>:

Raw: XXX FS% XX

Raw: The "raw" signal output from the unit's light detector. This is the output the Opti-Pro uses (in conjunction with the Product Factor, Cal Solution Value, TRA Value, etc.) to arrive at the [ppm] readout on the HOME screen. It can be used to diagnose problems with the unit. For example, if the HOME screen always reads zero, and the raw reading is also zero, there may be an optics problem. If the HOME screen reads zero but the Raw reading does not read zero, then check the Cal Sol'n. Value or the Product Factor Value to make sure the proper value is entered.

FS%: Acts like an analog meter. Indicates the raw signal output as a percentage of the maximum that can be read.

Value	Range
Raw	0.00 to 1000.00 (reading >1000.00 will display "OVER")
FS%	0 to 208 (if Blank equals 0)

Operation Manual

Opti-Pro

3. From the above screen, press <ENT>

Test:1:
PUMP

1: PUMP: A solid-state relay controls one chemical pump through connections (terminal strip connections 4-6). If the Opti-Pro is connected to a pump or other control device via terminal strip connections 4-6, this function allows you to test whether the unit's internal circuitry is operating and terminal strip connections are correct. To test the pump/device control of the Opti-Pro, the pump/device itself must be on, working, and properly connected to the terminal strip. Then, press <1> from this screen, then <ENT> to toggle the pump/device ON and OFF. The pump/device should go on when ON is selected and off when OFF is selected. If it does not, then be sure to check the pump/device itself first, and then check the terminal strip connections (trained personnel ONLY). When the test is finished, return to the HOME screen and pump/device control will revert to control by current unit values.

This function can serve as a "manual override" for pump control tests. While on this screen, you can turn a pump/device on and off regardless of the unit values previously entered.

4. From the above screen, press <ENT>

Oper: XXXX Hrs
Lamp ON Flow: ON

- Oper: Indicates how many hours the unit has been in operation since installation.
- Lamp: Indicates whether the LED light source is operating properly.
- Flow: Indicates whether the flow is ON/OFF.

5. From the above screen, press <ENT>

Blank: X.X
Cal std: XXX.X

For definitions, ranges, and default values of these items, see Calibration Data Screen Section.

Service Assistance

IMPROPER INSTALLATION, USE,
APPLICATION OR UNAUTHORIZED
SERVICING OF THIS EQUIPMENT VOIDS
ALL WARRANTIES.

Troubleshooting Guide

[HANDLE ANY ALARMS FIRST]

SYMPTOM	POSSIBLE CAUSE	SOLUTION
<p>HOME screen displays over/OVER (blinking from over to OVER).</p> <p>A blinking 'over/OVER' is a different symptom than a steady 'OVER' and indicates that the sample reading exceeds 999. This is most likely related to the System Values entered for the site. If, for example, a Cal Sol'n Value of 200 was erroneously entered, the unit's numerical calculation of the sample reading might exceed 999. (NOTE: Examine "Possible Cause"/"Solution" in the numbered order.)</p>	1. System Values are incorrect (i.e. Product Factor, Cal Sol'n Value, etc.).	Check the Configuration Record for the site. Access the System Values and verify that they are entered correctly.
	2. Incorrect calibration	Check the Calibration Data screen. Recalibrate the unit; be sure to use the correct calibration solution and that the reading is between 1% - 10%. Check the expiration date of the solution.
	3. Chemical feed too high.	Check feed pump. Confirm high concentration using wet test.
	4. The Opti-Pro is, or has been, in alarm. Back-up control has forced chemical feed on.	Deactivate chemical feed by setting the High & Low Product % settings to 0%. Once the system returns to a normal level, reset the alarm responses to the desired settings.
<p>HOME screen displays OVER (not blinking from over to OVER).</p> <p>A steady 'OVER' is a different symptom than a blinking 'over/OVER' and indicates that the sample reading is too high for the unit's light detector. This is related to the chemistry of the sample and displays that the sample readings are too high for the unit at the current sensitivity level. (NOTE: Examine the "Possible Cause"/"Solution" in the numbered order.)</p>	1. Possible optics problem.	Check the FS% reading in the Diagnostics sequence.
	2. Incorrect calibration.	Recalibrate the unit, making sure that you are using the correct Calibration Solution, and that it reads between 1 – 10%. Check the expiration date of the solution.
	3. System Values are incorrect (i.e. Product Factor, Cal Sol'n Value, etc.).	Check the Configuration Record. Access the System Values and verify they are entered correctly.
	4. Chemical feed too high.	Check feed pump. Confirm high concentration using wet test
<p>HOME screen displays minus sign (negative readings), i.e., sample is reading less concentrated than blank value as set during last calibration.</p>	1. Fouled flow cell.	Thoroughly clean and rinse flow cell with recommended solution, using a flow cell cleaning brush if necessary.
	2. Calibrated with contaminated blanking solution, or the calibration solution was used instead	Recalibrate

Operation Manual

Opti-Pro

SYMPTOM	POSSIBLE CAUSE	SOLUTION
	of the blank solution.	

Troubleshooting Guide Continued

SYMPTOM	POSSIBLE CAUSE	SOLUTION
HOME screen reads zero.	System Values incorrectly set	Make sure valid System Values were entered (see Appendix F).
Screen blank or black.	LCD's screen contrast too high or too low	If screen is blank, adjust contrast by pressing UP ARROW (if screen is black, use the DOWN ARROW) continuously until screen is visible. Use $\uparrow\downarrow$ arrows to fine adjust.
Unit does not calibrate.	Failure to complete entire calibration procedure	You must press <1> at the end of the calibration sequence for the unit to accept the values. Recalibrate.
Pump is not operating properly.	1. Problem with "Product Feed During Alarm" settings (if alarm active); or terminal strip connections; or pump itself.	If there is an alarm, check the High & Low Product Alarm %. Settings on unit (System Values). Refer to Diagnostics Section; pump test function, to test if the unit is properly controlling the pump. Make sure pump itself is powered and operational.
	2. Fuse has "blown."	Replace fuse with spare located on the Main PCB.
TRA value ineffective (i.e. HOME screen reading does not change when the TRA value is changed).	This is not usually cause for alarm as the HOME screen reading is a result of a combination of factors.	Do not attempt to change current settings unless you are <u>certain</u> something is wrong. Consult Turner Designs at 877-316-8049. For example, a low product factor will cause the TRA value itself to have a minimal effect.
Unit does not respond to calibration solutions.	System Values incorrectly entered	Insure correct Product Factor, TRA Test Value, and Cal Sol'n Value have been entered (see Appendix F).

Opti-Pro

RESPONSIBILITY FOR SAFE DELIVERY

Turner Designs has done everything possible to protect this equipment from damage due to normal transportation hazards. After the product leaves the manufacturing site, responsibility for its safe handling and delivery is assumed by the transportation company handling the equipment.

If the crated unit shows evidence of rough handling, request that the person making the delivery write "Received In Damaged Condition" on the delivery receipt. If concealed damage is revealed after the shipment is unpacked, contact a representative of the Transportation Company and request that a "Damaged Goods" report be completed.

In either event, the Transportation Company should be notified immediately of any damage to the shipment to protect your rights of recovery.

Operation Manual

Opti-Pro

APPENDIX A

[INSTALLATION CHECKLIST]

CUSTOMER INFORMATION: To be completed by Water Engineer

Customer: _____ Date: _____

Location: _____

System or Tower Name: _____

Estimated Start-up Date: _____

Water Engineer Name: _____

Water Engineer Telephone Number: _____

Chemical(s) to be Fed: _____

Target Dosages for Each Chemical: _____

CHECKLIST

The following checklist is provided so the appropriate preparations may be made prior to equipment start-up. Completion of the listed items is mandatory to assure proper installation and a properly functioning piece of equipment. Although it may be tempting to compromise on the initial requirements, history has proven that "doing it right the first time" pays off in the long run.

You and your Customer should jointly complete the following checklist. For each item, check either WORK TO DO or WORK REQUIRED

Operation Manual

Opti-Pro

INSTALLATION CHECKLIST

To Do	Complete	Requirements
INITIAL REQUIREMENTS -- WATER ENGINEER		
1. _____	_____	Check recirculating water background fluorescence (TRA test code).
2. _____	_____	Ensure turbidity is less than 150 NTU. (NOTE: Install appropriate filter/strainer on inlet; see Figure 1 on page 41).
3. _____	_____	Assure water temperatures of 32-140°F.
INSTALLATION REQUIREMENTS -- WATER ENGINEER		
1. _____	_____	Locate unit within 125 feet from sample point.
2. _____	_____	Locate unit out of direct sunlight.
3. _____	_____	Ensure Traced Chemical is sufficiently distributed in recirculating water at the sample point to make continuous and accurate Traced Chemical measurement possible
4. _____	_____	Locate unit where ambient temperatures are 40-120°F/4-49°C.
5. _____	_____	Locate unit at least 10 feet [3 m] from devices such as large generators, which require a great deal of electrical power, or generate a strong electromagnetic field.
CUSTOMER REQUIREMENTS – PLUMBER		
1. _____	_____	Sample stream must be plumbed to the unit to deliver at a rate >0.5 gpm (0.5-1.25 gpm optimal) & <100 psi. One ½ inch & one ¼ inch NPT pipe connections (both female) are provided for PVC pipe hook-up (see Figure 3 on page 43). Ensure sampling point avoids air entrapment.
2. _____	_____	Sample from side of water line to avoid air entrapment.
3. _____	_____	Provide free, unrestricted drain for sample stream, preferably to tower basin (no back pressure, max. 10 ft/3 m rise).
CUSTOMER REQUIREMENTS – ELECTRICIAN		
1. _____	_____	Ensure environment will support a NEMA 4X-type enclosure.
2. _____	_____	Provide 100-130/200-250 VAC, 50/60 Hz, 5-amp electrical service to TSR3000.
3. _____	_____	Provide 100-130/200-250 VAC, 50/60 Hz, 5-amp electrical service to any pump or pump system to be used with the TSR3000.
4. _____	_____	If the unit's 4-20 mA output signal will be used, check to see if an isolator should be purchased.
5. _____	_____	Terminate flow switch wiring on terminal strip (refer to Figure 4 on page 44)
FINAL REQUIREMENTS -- WATER ENGINEER AND CUSTOMER		
1. _____	_____	Obtain an appropriately sized metering pump system or other type of feeding system for start-up.
2. _____	_____	If the unit is to be installed by a third party arrange a time during start-up when you and the customer can be trained together.
3. _____	_____	Obtain needed materials (calibration solution, distilled water, dilute acid, calibration kit, flow cell cleaning brushes) and site System Values (Product Factor, Product Set Point, TRA Analysis, Calibration Solution).

Water Engineer Responsibilities: It is the Water Engineer's responsibility to ensure appropriate calibration solutions and other needed materials are available for installation

Customer Responsibilities: This checklist outlines work required prior to start-up. This work is necessary to ensure quality and proper operation. However, if any of these requirements cannot be met, contact your Water Engineer.

Operation Manual

Opti-Pro

APPENDIX B [CONFIGURATION RECORD]

Date Configured: _____

Salesman/Technician: _____

System: _____

System Value	Access Keys	Range	Value
Cal Sol'n. Value:	<HOME> <0>	0.000-998.000 ppm	_____
Product Factor:	<HOME> <1>	0.000-999.000 ppm	_____
TRA Value:	<HOME> <2>	0.0-100.0%	_____
Set Point:	<HOME> <3>	0.001-998.000 ppm	_____
Control Range:	<HOME> <4>	0.0001-100.000 ppm	_____
High Product Alarm:	<HOME> <5>	0.004-999.000 ppm	_____
Low Product Alarm:	<HOME> <6>	0.000-997.000 ppm	_____
4 mA Output:	<HOME> <7>	0.000-998.000 ppm	_____
20 mA Output:	<HOME> <8>	0.002-999.000 ppm	_____
Startup Timer:	<HOME> <⊕> <6>	1-168 hours	_____
Limit Timer:	<HOME> <⊕> <7>	1-1,440 minutes	_____
Low Product Alarm %:	<HOME> <⊕> <8>	0-100%	_____
High Product Alarm %:	<HOME> <⊕> <9>	0-100%	_____

APPENDIX C

The Turner Designs Opti-Pro provides the following control functions:

1. Activates a relay for chemical addition based on a Traced Chemical reading below the Set Point.
2. Deactivates a relay for chemical addition based on a Traced Chemical reading above the Set Point.
3. At the user's option, the Opti-Pro can be set to feed product at a predefined rate during an alarm condition, or not to feed product (see Appendices B & C).

The unit is a microprocessor-based instrument designed to measure the fluorescent level in the sample, display the current treatment level dosage, and report the value to the Opti-Pro. The digital display shows the product dosage (.000 - 999 ppm), any alarm notification, and pump status (ON/OFF). Additional information is displayed or changed by pressing various keys on the keypad on the unit. Refer to Figures 3 & 4 on pages 43 & 44 for the location of the following controls on the unit:

LCD Digital Display	Continuously displays HOME screen when values are not being entered or viewed. Except during calibration, the contrast of the LCD can be adjusted on any screen by pressing the UP or DOWN ARROW.
Keypad	Used to enter new unit values and to move between screens. Once the User or Master Identification has been entered, the unit will automatically return to the HOME screen if the keypad is not used for 15 minutes.
Main Power Switch	Main power switch for entire unit -- When ON, the LCD will illuminate.
Pump Circuit Breakers	One 3-amp circuit fuse is located inside the instrument to the left of the AC power connections. A spare fuse is provided in the instrument enclosure.
Inlet Line Shut-off Valve	Directs sample flow to unit. When handle is vertical, the valve is open and sample flows into the unit. When handle is horizontal, sample flow is stopped, permitting calibration solutions to be injected into unit via the Luer-lock injection port.
Luer-lock Injection Port	During instrument calibration, standard and blank solutions are injected into the unit using a syringe at the Luer-lock connection adjacent the valve. The unit is calibrated using a standard dilution of tracer compound and a blank solution (distilled water).
Clean-out Plug	Permits access to flow cell for cleaning with a brush when flushing with acid alone is not effective. Several spare plugs are provided.
Sample In	Where sample intake line is attached to allow sample to flow through unit.
Sample Out	Sample outlet line attaches here. There MUST be a valve at this point if there is back pressure on the line, which is open during normal operation. If there is back pressure on the line, close the valve during calibration. Be aware that some solution will flush to the floor.
Sample Block	Houses flow cell and optical filters. The sample block must be replaced to change the flow cell or filters.
Power Terminal Strip	Located behind enclosure front panel. Power, pump, flow switch, and 4-20 mA chart recorder connections are made on this strip (see Electrical Connections Section and Figure 4 on page 44). Only trained personnel should make electrical connections.

APPENDIX D

[Opti-Pro SOFTWARE FUNCTIONS]

The Opti-Pro has a software interface that simplifies calibration and changes of unit values (see Screens Flow Charts in Appendix E). The following descriptions of the unit's software functions will help provide a better understanding of the unit:

1. Screens:

A series of computerized screens built into the unit are called up using the keypad and shown on the digital display.

1.1 Home Screen: Once the unit has been activated, the HOME screen is continuously displayed, except when accessing other screens.

From the HOME screen, access the calibration data and the calibration sequence by pressing <ENT>. Other screens are accessed from the HOME screen by pressing various keys on the keypad (Appendix E).

Go to the HOME screen by pressing the <HOME> key, except during the calibration procedure. To return to the HOME screen from calibration, first press <ESC> to abort the calibration sequence.

1.2 Warning Screens: There are warning screens throughout the software, which inform of invalid entries (for values or ID).

1.3 Alarms: When an alarm occurs, "ALM" blinks in the upper left-hand corner of the HOME screen. The nature of the alarm can be discovered by pressing <ESC> from the HOME screen (see Alarms and Troubleshooting Sections).

2. Keypad Functions

2.1 Left Arrow: The left arrow can be used to correct typing errors when data is being entered or changed. It acts as a backspace or delete key. During calibration, it can be used to return to previous screens in the sequence if you wish to re-run the calibration. It is also used from the HOME screen to view the alarm history.

2.2 Up & Down Arrows: From HOME screen, these arrows can be used to change screen contrast.

2.3 Escape & Enter: You can escape to the previous screen or abort the calibration sequence by pressing the <ESC> key. While viewing a System Value, press <ENT> to access the screen to change that value. After entering a new System Value, press <ENT> to accept the new value.

3. User Identification

To change System Values or to calibrate the instrument, a four-digit User ID is required. For security, a Master ID, different from the User ID, is required to view or change the User ID. To change the User ID, contact Turner Designs Technical Support at 877-316-8049 for assistance with the Master ID.

Once an ID has been entered, if the keypad is not used for 15 minutes, the unit will automatically return to the HOME screen. The ID will have to be entered again before the unit values can be changed or calibration can be performed.

4. Product Dosage Display

After the unit is powered-up or after calibration, the product dosage displayed will not react immediately, but will respond after a delay of about 10 seconds.

5. LCD Contrast

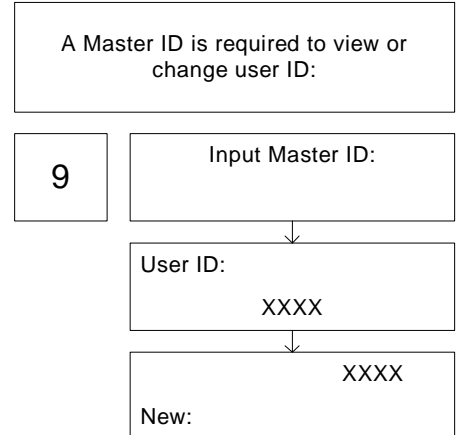
The contrast of the Liquid Crystal Display can be adjusted on any screen (except during calibration) by pressing the up & down arrows.

APPENDIX E [Screens Flow Charts]

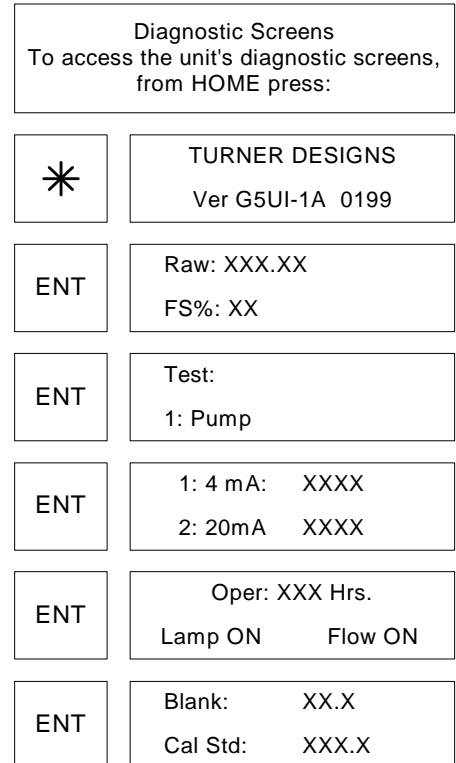
System Value Screens

From the HOME screen, press key to view value. To change value, press <ENT> while viewing, input ID, enter new value, and press <ENT> again. Press HOME screen.		
HOME	XXX PPM Pump: ON	Home Screen shows product dosage & pump status
0	Cal Soln Value: XXX.XXX	Relates value of a Traced Chemical standard to a fluorescent measurement.
1	Product Factor: XXX.XXX	Relates tracer measurement to actual level of product in the system.
2	TRA Value: XXX.XXX	Background fluorescence for system as measured by Solutions Direct lab.
3	Set Point: XXX.XXX	Desired dosage level of product to be maintained in the system.
4	Control Range: +/- XXX.XXX PPM	Amount by which product level is expected to vary from the Set Point.
5	High Prod Alarm: XXX.XXX PPM	Alarm is triggered if product level rises above this and remains there for 10 min.
6	Low Prod Alarm: XXX.XXX PPM	Alarm is triggered if product level falls below this and remains there for 10 min.
7	4 mA Output: XXX.XXX PPM	Output can be set to correspond to a certain level of product
8	20 mA Output: XXX.XXX PPM	Output can be set to correspond to a certain level of product
←	Prod Hi Fluoro	View alarms triggered since last reset.
ESC	No Flow	If alarm is triggered, shows which alarm(s).

User ID Screens



Diagnostic Screens



Operation Manual


Opti-Pro

Screens Flow Charts Continued


From the HOME screen, press <⊕> or <☐> to access the following functions. For example, to change the clock settings or alarm functions, first press <⊕>, then the number of the function to be changed. Key in the new value and press <ENT>, then <ESC> to return to the clock menu.

Time, Date, & Alarm Screens

Download Data Logger Before Changing

	<0> to 02/21/99 <9> 07:58:30 AM
0	Hour: 7 New:
1	AM/PM: PM <ENT> to toggle
2	Min: 0 New:
3	Month: 2 New:
4	Date: 0 New:
5	Year: 99 New:
6	Start Tmr: Off <ENT> to toggle
7	Limit Tmr: 15 min <ENT> to toggle
8	Lo Prod Alm 10% <ENT> to toggle
9	Hi Prod Alm 0% <ENT> to toggle

Datalogger Screens

	Datalogger: <0> - <3>
0	Status: Stop <ENT> to toggle
1	Interval: 1 min <ENT> to toggle
2	Download Data: 5x <8> to start
3	Erase Data: 5x <9> to start

Operation Manual

Opti-Pro

Screens Flow Charts Continued

Calibration Screens

HOME	XXX PPM Pump: ON	1. From the HOME Screen, press <ENT>
ENT	1. Calib 2. Data Cal XX Days Ago	2. Press <2> to view raw data output for blank and standard as set during current calibration, OR, press <1> to begin calibration sequence.
2	Blank: XX.X Cal Std: XXX.X	
1	Please Input ID:	3. If requested, key in ID and press <ENT>. If not requested, go to step number 4.
ENT	CALIBRATE SYSTEM Press <1> to Start	4. Press <1> to begin
1	BLANK SOLUTION	5. Close the valve to stop sample flow by moving lever to the horizontal position. Inject 120 ml of blank solution (flush with 60 ml, then allow portion of second 60 ml to remain in flowcell). Press <ENT>.
ENT	BLANK %: XX	6. If the number shown is less than 25, wait for number to stabilize, then press <0>.
0	BLANK %: XX <i>wait</i>	7. After WAIT command disappears, unit will prompt you to press <ENT> to continue.
	To Continue Press <ENT>	8. Press <ENT>
ENT	CALIBRATION SOLUTION	9. Inject 120 ml of calibration solution (flush with 60 ml, then allow portion of second 60 ml to remain in flowcell). Press <ENT>.
ENT	CAL SOLN %: XX	10. If the number shown is between 1 and 10, wait for reading to stabilize, then press <*>. WAIT command will appear.
*	CAL SOLN %: XX <i>wait</i>	11. When finished, unit will prompt you to press <ENT> to continue.
	To Continue Press <ENT>	12. Press <ENT>
ENT	Press <1> to End Calibration	13. Press <1> to accept the new calibration settings. Unit returns to calibration menu. Open valve to start sample flow by returning lever to the vertical position. Calibration is finished.

APPENDIX F

[SYSTEM, CLOCK, AND ALARM VALUES]

System Values are accessed from the HOME screen (see Appendix E). Default values are listed in Table 5 below. Refer to Appendix B to determine how the unit was configured at the time of installation.

- View the System Values by pressing the appropriate access key while on the HOME screen.
- Change System Values by pressing <ENT> while viewing the value.

The unit will prompt:

Please input ID:

Enter a valid USER ID:

Current: XXXX

New:

Key in the new value on the keypad and press <ENT> again to accept the value.

Table 5. System Default Values and Ranges

System Value	Access Key	Default Value	Range
Cal Sol'n Value	<0>	0.000	0.000 to 998.000
Product Factor	<1>	0.000 (ppm)	0.000 to 999.000
TRA Test Value	<2>	2.0%	0.0 to 100.0
Product Set Point	<3>	0.000 (ppm)	0.002 to 998.000
Control Range	<4>	± 0.000 (ppm)	± 0.001 to 100.000
High Product Alarm Level	<5>	999.000 (ppm)	0.004 to 999.000
Low Product Alarm Level	<6>	0.000 (ppm)	0.000 to 997.000
4 mA Output	<7>	0.000	0.000 to 998.000
20 mA Output	<8>	100.00	0.002 to 999.000
Software Version	<*>	N/A	Fixed
User ID	<9>	8520	0 TO 9999
Low Product Alarm %	<clock>, <8>	10%	0 to 100%
High Product Alarm %	<clock>, <9>	0%	0 to 100%
Start Up Timer	<clock>, <6>	OFF	1 to 168 hours
Limit Timer	<clock>, <7>	OFF	1 to 1,440 min.

System Value Definitions

<0> CALIBRATION SOLUTION VALUE

Relates value of the tracer standard to a fluorescence measurement.

<1> PRODUCT FACTOR

Relates tracer measurement to actual level of Traced Chemical in the sample. It is very important to enter the Product correctly. Refer to the TRA Lab Report for the correct product factor for the site.

<2> TRA TEST VALUE

Background fluorescence (%) for recirculating water system as measured by the Laboratory. This value varies from site to site.

<3> PRODUCT SET POINT

Desired dosage level of product to be maintained in the unit. The unit will warn "RESET LoProd ALM" if a new set point value minus the control range is lower than or equal to the current low product alarm level.

Operation Manual

Opti-Pro

Similarly, the unit will warn "RESET HiProd ALM" if the new value plus the control range is higher than or equal to the current high product alarm level.

If the new set point plus the control range is greater than or equal to the High Product Alarm maximum value (999.0), the unit will warn "INVALID INPUT." Similarly, if the new set point minus the control range is less than or equal to the Low Product Alarm minimum value (0), the unit will warn "INVALID INPUT."

<4> CONTROL RANGE

Amount (ppm) by which the product level is expected to vary from the product set point. Usually, the control range span depends on the magnitude and rate of load changes. The Opti-Pro uses the control range to determine when to turn the pump off and on.

If the product level is less than the set point minus the control range, the pump will be turned on. The pump will stay on until the product level is higher than the sum of the set point plus the control range. For example, if the set point equals 100 ppm and the control range is equal to 2 ppm, then the pump will be turned on when the level reaches 98 ppm ($100 - 2 = 98$). The pump will stay on until the product level in the sample stream reaches 102 ppm ($100 + 2 = 102$).

The unit will reject (INVALID INPUT) a new control range value if the product set point minus the new value is not higher than the low product alarm level. It will also reject a new control range value if the product set point plus the new value is not lower than the high product alarm value.

<5> HIGH PRODUCT ALARM LEVEL

If the product level rises above this level (and remains there for the 10-minute delay period), a high product alarm will be triggered.

The unit will reject (INVALID INPUT) a new high product alarm level value if it is not higher than the product set point plus the control range.

<6> LOW PRODUCT ALARM LEVEL

If the product level falls below this level (and remains there for the 10 minute delay period), a low product alarm will be triggered.

The unit will reject (INVALID INPUT) a new low product alarm level value if it is not lower than the product set point minus the control range.

<7> 4 MA OUTPUT

The 4 mA output and the 20 mA output can be sent to a chart recorder or other device. Outputs can be set to correspond to a certain level of product (i.e., 100 ppm & 900 ppm, respectively). The narrower the range, the greater the resolution. However, for example, if 4 mA was set to 40, and 20 mA to 60 ppm, then any data below 40 ppm will correspond to 4 mA and any data above 60 ppm will correspond to 20 mA.

The unit will reject (INVALID INPUT) the new 4 mA value if it is not lower than the 20 mA output value.

During an alarm condition, the 4-20 mA output will still send out the dosage level. During calibration the 4-20 mA output will send out a 4 mA signal.

<8> 20 MA OUTPUT

See <7>. The unit will reject (INVALID INPUT) the new 20 mA value if it is not higher than the 4 mA output value.

<9> USER ID

For security, to change the System Values or to calibrate, a User ID is required. See Table 5 for System Default Value.

The Master ID (different from the User ID) is required to view or change the User ID. The Master ID cannot be changed.

To view or change the User ID, contact Turner Designs Technical Support for assistance with the Master ID. Then with the HOME screen displayed, press <9>. The unit will require entry of the Master ID, which, if valid, will allow access to a screen showing the current User ID. Press <ENT> and use the keypad to enter

Operation Manual

Opti-Pro

the new User ID. Press <ENT> again and the new User ID is valid.

The date, time, and alarm output values are accessed under the <⊕> menu.

Pressing the <⊕> key will display the current date and time being used for data logging and access to the date, time and alarm values (0-9) if changes are necessary.

Example <⊕> screen:

<0> to	02/21/99
<9>	xx:xx:xxam

To change the hour of day press <0> to see:

Hour:	XX
New:	

Key in the new value on the keypad and press <ENT> again to accept the value.

From the HOME screen, press <⊕> to access the date, time and alarm output values. Press the appropriate number (0-9) to access the values described below.

<0> HOUR

For the data logger to reference the correct time, the hour of day must be entered. The numeric value (1-12) must be entered and the <ENT> key pressed to accept the new value. Press <ESC> to return to the previous screen.

<1> AM/PM

For the data logger to reference the correct time (morning or evening), AM/PM must be entered. The <ENT> key toggles between AM/PM. Press <ESC> to return to the previous screen.

<2> MINUTES

For the data logger to reference the correct time, the number of minutes after the hour must be entered. The numeric value (0-59) must be entered and the <ENT> key pressed to accept the new

value. Press <ESC> to return to the previous screen.

<3> MONTH

For the data logger to reference the correct date, the month of the year must be entered. The numeric value (1-12) must be entered and the <ENT> key pressed to accept the new value. Press <ESC> to return to the previous screen.

<4> DATE

For the data logger to reference the correct date, the day of the month must be entered. The numeric value (1-31) must be entered and the <ENT> key pressed to accept the new value. Press <ESC> to return to the previous screen.

<5> YEAR

For the data logger to reference the correct date, the year must be entered. The numeric value (00-99) must be entered and the <ENT> key depressed to accept the new value. Press the <ESC> to return to the previous screen.

<6> START-UP TIMER

When the unit is first activated, the START-UP TIMER ALARM will monitor the amount of time it takes the product dosage to fall within the set point, ± control range -- and remain there for at least 10 minutes. If the time exceeds the pre-defined value, then it will trigger the START-UP TIMER ALARM. Press <ENT> to toggle between a 1 to 168 hour START-UP TIMER interval. Press <ESC> to return to the previous screen.

Operation Manual

Opti-Pro

If the time exceeds this predefined value (1-168 hours), the START-UP TIMER ALARM will be triggered - indicating a chemical-feed problem. A setting of OFF disables the alarm. If triggered, the Start-Up Timer defaults to the Low Product Alarm pump output setting.

<7> LIMIT TIMER

This alarm monitors the amount of time the solenoid pump is on. If the time exceeds this period (from 1-1,440 minutes), the alarm will be triggered, indicating a possible solenoid pump or chemical-feed problem. A setting of OFF disables this alarm. Press <ENT> to toggle between a 0-24 hour limit timer interval. Press <ESC> to return to the previous screen. If triggered, the Limit Timer defaults to the Low Product Alarm pump output setting.

The LIMIT TIMER ALARM will not begin to monitor until the start-up timer is finished.

<8> LOW PRODUCT ALARM %

The unit can be set to feed a pre-defined level of product during various alarm conditions. The user can define whether to feed 0-100% product during a low product alarm, a no flow alarm, a fluorometer alarm, a limit timer alarm, a start up timer alarm or a high temperature alarm. Press <ENT> to toggle between 0 - 100% feed rates during certain system and fluorometer alarms. Press <ESC> to return to the previous screen.

If both a High or Low Product Alarm and a System Alarm occur at the same time, the feed setting chosen for Low Product Alarm will take precedence.

<9> HIGH PRODUCT ALARM %

The unit can be set to feed a pre-defined level of product during a high product

alarm ONLY. The user can define whether to feed 0-100%. Press <ENT> to toggle between 0 - 100% feed rates during High Product Alarm conditions. Press <ESC> to return to the previous screen.

If both a High or Low Product Alarm and a System Alarm occur at the same time, the feed setting chosen for Low Product Alarm will take precedence.

Operation Manual

Industrial Controller

APPENDIX G

[Turner Designs Opti-Pro TROUBLESHOOTING WORKSHEET]

The Troubleshooting Worksheet is designed to facilitate diagnostic data collection. After collecting all data on the worksheet, most problems can be solved over the telephone. Refer to the Service Assistance Section for the appropriate numbers.

Please fill out worksheet completely -- All entries are important

GENERAL INFORMATION:

Unit Serial No.: _____
(Tag is located beneath sample block.)

Field Contact Name: _____

Field Contact Phone: _____

Description of Symptoms: _____

Date/Time Symptoms Started: _____

Describe Any Physical Damage To Unit: _____

Date Of Last Calibration: _____
(Press <ENT> from HOME screen to read last calibration date.)

THE HOME SCREEN READS: _____ ppm

- Check One:
- The pump goes off and on
 - The pump stays on
 - The pump stays off

If "ALM" is blinking, press _____
<ESC> and record alarms _____

PHYSICAL INSPECTION:

1. Is main power switch on?	<input type="checkbox"/> YES	<input type="checkbox"/> NO
2. Can LCD contrast be adjusted using the UP/DOWN arrows?	<input type="checkbox"/> YES	<input type="checkbox"/> NO
3. Date flow cell was last cleaned:	With Acid:	
	With Brush:	
4. Turn main power to the instrument off and remove enclosure face being careful to remove keypad ribbon cable from the circuit board. Tug each wire to the terminal strip to see if it is firmly connected.		

APPENDIX G

[Opti-Pro TROUBLESHOOTING WORKSHEET]

RECORD Opti-Pro SYSTEM VALUES

Access Keys	System Value	Value
<HOME> <0>	Cal Sol'n. Value	
<HOME> <1>	Product Factor	
<HOME> <2>	TRA Value	
<HOME> <3>	Set Point	
<HOME> <4>	Control Range	
<HOME> <5>	High Product Alarm %	
<HOME> <6>	Low Product Alarm %	
<HOME> <←>	Alarm History [List Alarms]	
<HOME> <⊕> <6>	Startup Timer	
<HOME> <⊕> <7>	Limit Timer	
<HOME> <⊕> <8>	Low Product Alarm	
<HOME> <⊕> <9>	High Product Alarm	
<HOME> <*>	Software Version	
<HOME> <*> <ENT>	Raw	
	FS %	
<HOME> <*> <ENT> <ENT> <1>	Does Pump Go Off/On When <ENT> Toggled?	
<HOME> <*> <ENT> <ENT> <ENT>	Oper. Hrs	
	Lamp	
	Flow	
<HOME> <*><ENT><ENT><ENT><ENT> <ENT>	Blank	
	Cal Std	

Operation Manual

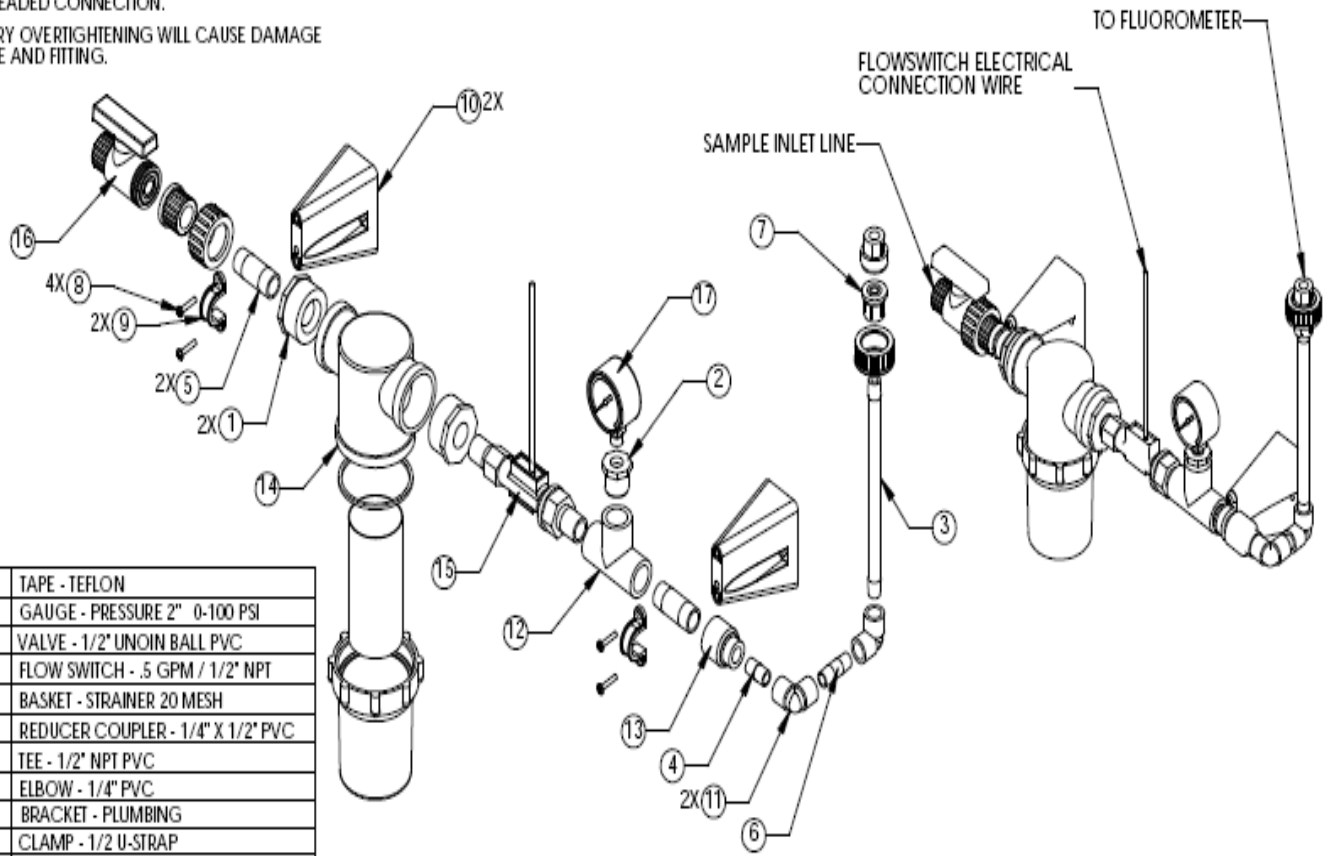
Opti-Pro

Figure 1. Opti-Pro Inlet Plumbing

ASSEMBLY INSTRUCTIONS FOR TURNER P/N#6000-956

1. WRAP TEFLON TAPE, REF 18, AROUND ALL MALE THREADED FITTINGS USING 2 TO 3 WRAPS.
2. ASSEMBLE PLUMBING FROM VALVE, REF 16, THROUGH TO UNION, REF 7. THEN ATTACH PLUMBING ASSEMBLY TO HOLDERS, REF 9 AND REF 10, USING SCREWS, REF 8.
3. ASSEMBLE ALL PLUMBING PARTS 2 TO 2.5 TURNS BEYOND FINGER TIGHT IS ALL THAT IS REQUIRED TO MAKE A SOUND PLASTIC THREADED CONNECTION.
4. UNNECESSARY OVERTIGHTENING WILL CAUSE DAMAGE TO BOTH PIPE AND FITTING.

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
D	CHANGE BRACKETS; ECO# 1242	07-09-02	WW
E	ECO# 1633	04-28-04	WW



REF	QTY	PART NUMBER	PART DESCRIPTION
18	1	800-0500	TAPE - TEFLON
17	1	185-0150	GAUGE - PRESSURE 2" 0-100 PSI
16	1	183-0205	VALVE - 1/2" UNION BALL PVC
15	1	120-0110	FLOW SWITCH - .5 GPM / 1/2" NPT
14	1	119-0102	BASKET - STRAINER 20 MESH
13	1	118-0200	REDUCER COUPLER - 1/4" X 1/2" PVC
12	1	118-0130	TEE - 1/2" NPT PVC
11	2	118-0115	ELBOW - 1/4" PVC
10	2	130-6000	BRACKET - PLUMBING
9	2	028-6900	CLAMP - 1/2 U-STRAP
8	4	075-0380	SCREW - 8-32 X 7/8" SST PHILLIP PAN HD
7	1	052-1100	UNION - 1/4" PVC
6	1	052-0400	NIPPLE - 1/4" X SHORT, PVC
5	2	052-0300	NIPPLE - 1/2" X 2" PVC
4	1	052-0285	NIPPLE - 1/4" X CLOSE, PVC
3	1	052-0261	NIPPLE - 1/4" X 8" PVC
2	1	020-0800	BUSHING - 1/2" X 1/4" PVC
1	2	020-0600	BUSHING - 1/2" X 1 1/4" PVC

<small>UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:</small> FRACTIONS: ± 1/32 DECIMALS: .XX ± .01 ANGLES: ± 5° <small>CO. & STD.</small>		CONTRACT NO.: APPROVALS: DATE:		SUNNYVALE, CA 94085, USA	
MATERIAL: FINISH: DO NOT SCALE DRAWING		DRAWN: MS CHECKED: DT ISSUED:	DATE: 02-25-99 DATE: 03-01-99	INLET PLUMBING - PC PVC PLUMBING KIT	
		SEE: B SCALE: 1/4	FSCM NO.: DWG. NO.: 998-0956 CASEFILENAME: 998-0956.DRW	REV: E	SHEET: 1 OF 1

Operation Manual

Opti-Pro

Figure 2. Opti-Pro Outlet Plumbing

ASSEMBLY INSTRUCTIONS FOR TURNER P/N#6000-957

1. WRAP TEFLON TAPE, REF 7, AROUND ALL MALE THREADED FITTINGS USING 2 TO 3 WRAPS.
2. ASSEMBLE PLUMBING FROM CLOSED NIPPLE, REF 2, THROUGH TO NIPPLE, REF 1.
3. CUT NIPPLE, REF 1, TO LENGTH AS NEEDED FOR WALL MOUNTING PLUMBING. GLUE ON ELBOW, REF 5, FOR PLUMBING TO RUN ALONG WALL.
4. ASSEMBLE ALL PLUMBING PARTS 2 TO 2.5 TURNS BEYOND FINGER TIGHT IS ALL THAT IS REQUIRED TO MAKE A SOUND PLASTIC THREADED CONNECTION.
5. UNNECESSARY OVERTIGHTENING WILL CAUSE DAMAGE TO BOTH PIPE AND FITTING.

REVISIONS

REV.	DESCRIPTION	DATE	APPROVED
B	ECO #0723	05-24-00	MS
C	ECO#1633	04-28-04	WW

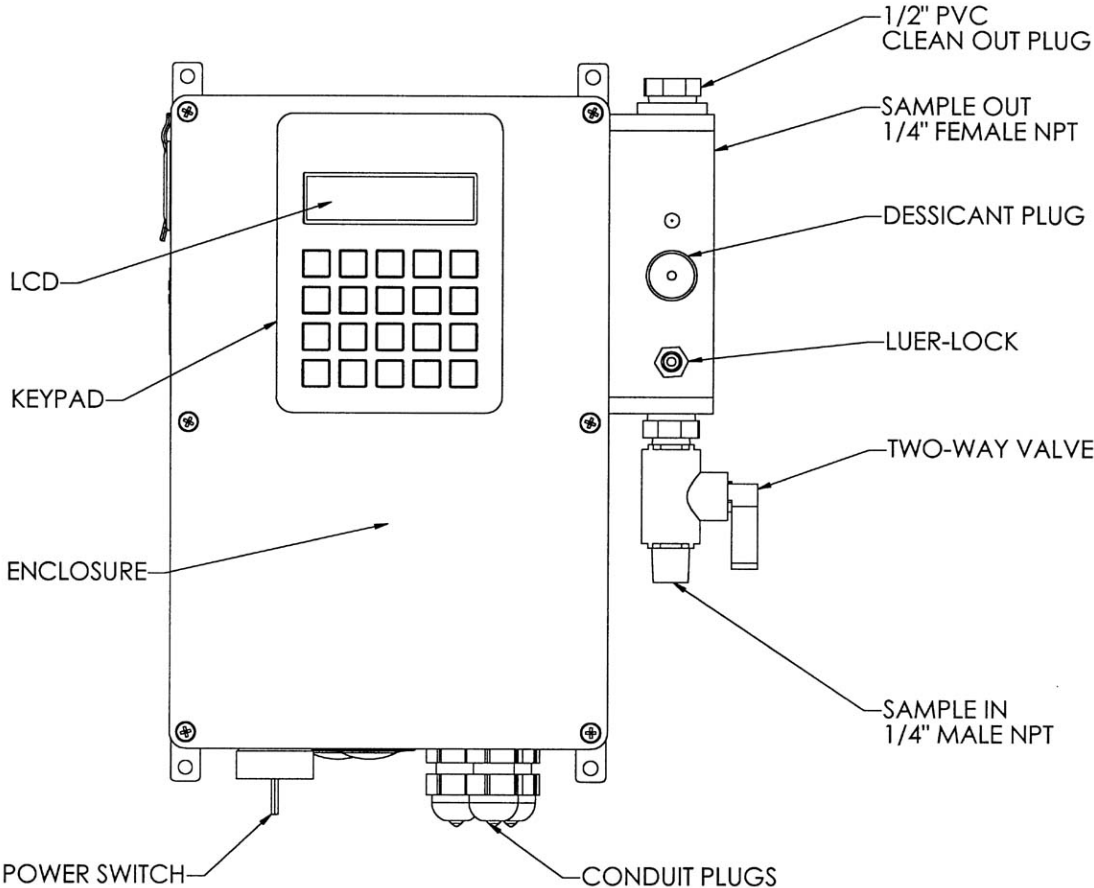
REF	QTY	PART NUMBER	PART DESCRIPTION
7	1	800-0500	TAPE - TEFLON
6	1	183-0550	VALVE - 1/4" 3 - WAY PVC
5	1	118-0128	ELBOW - 1/4" X 45° PVC
4	1	118-0115	ELBOW - 1/4" X 90° PVC
3	1	052-1100	UNION - 1/4" PVC
2	3	052-0285	CLOSE NIPPLE - 1/4" PVC
1	1	052-0261	NIPPLE - 1/4" X 8" PVC

<p style="font-size: small;">UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:</p> <p style="font-size: x-small;">FRACTIONS ± 1/32 DECIMALS .XX ± .01 ANGLES ± .5°</p> <p style="font-size: x-small;">XXX ± .005</p>	<p>CONTRACT NO.</p> <hr/> <p>APPROVALS DATE</p> <p>DRAWN MS 01-15-99</p> <p>CHECKED DT 03-01-99</p> <p>DESIGNED</p>	<p>TURNER DESIGNS SUNNYVALE, CA 94085, USA</p>
<p>THIRD ANGLE PROJECTION</p>	<p>DO NOT SCALE DRAWING</p>	<p>DRAIN PLUMBING KIT OUTLET KIT - P/C</p>
		<p>SCALE 1/4" CAD FILE NAME 998-0957.DRW SHEET 1 OF 1</p>

Operation Manual

Opti-Pro

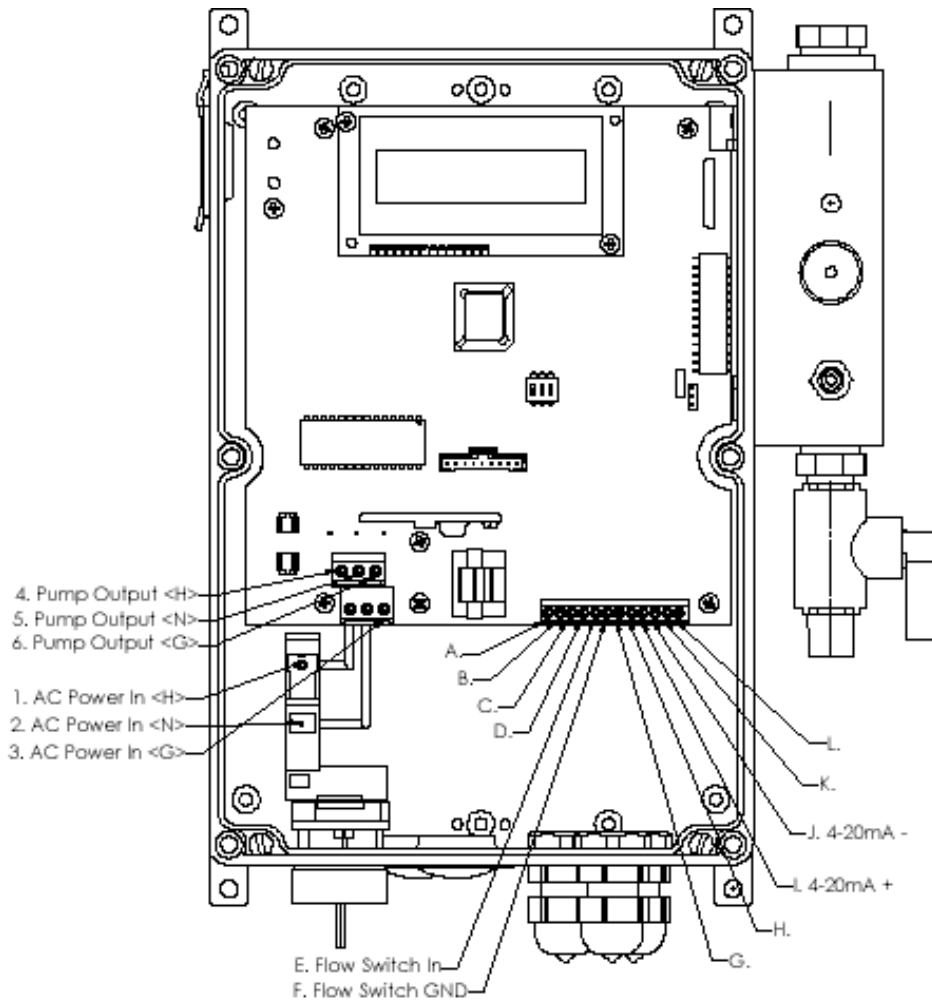
Figure 3. Turner Designs Opti-Pro Front View



Operation Manual

Opti-Pro

Figure 4. Turner Designs Opti-Pro Wiring Diagram



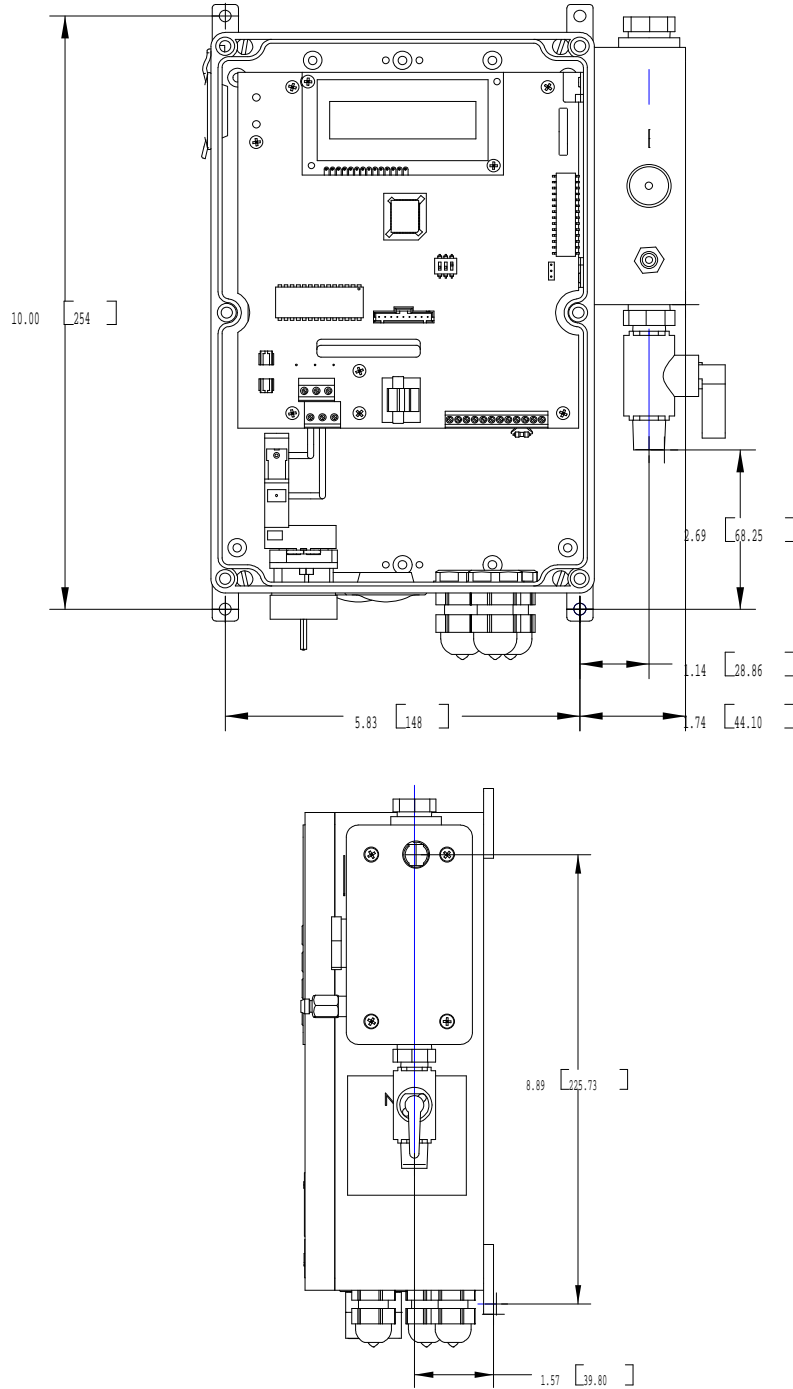
Currently not used: A, B, C, D, G, H, K, L.

A.C. CONNECTIONS	I/O CONNECTIONS	
1. AC Power In <H>	A. Reserved	G. Reserved
2. AC Power In <N>	B. Reserved	H. Reserved
3. AC Power In <G>	C. Reserved	I. 4-20mA+
4. Pump Output <H>	D. Reserved	J. 4-20mA
5. Pump Output <N>	E. Flow Sw In	K. Reserved
6. Pump Output <G>	F. Flow Sw GND	L. Reserved

Operation Manual

Opti-Pro

Figure 5. Turner Designs Opti-Pro Dimensions



Dimensions are in [inches] & [mm]

Opti-Pro



Equipment Specified as Electrical and Electronic Waste

Operation Manual

Opti-Pro

Warranty

Terms

Turner Designs warrants the Opti-Pro and accessories to be free from defects in materials and workmanship under normal use and service for a period of 12 months from the date of shipment from Turner Designs with the following restrictions:

- Turner Designs is not responsible for replacing parts damaged by accident or neglect. Your instrument must be installed according to instructions in the User's Manual. Damage from corrosion is not covered. Damage caused by customer modification of the instrument is not covered.
- This warranty covers only Turner Designs products and is not extended to equipment used with our products. We are not responsible for accidental or consequential damages, except in those states where this limitation is not allowed. This warranty gives you specific legal rights and you may have other rights which vary from state to state.
- Damage incurred in shipping is not covered.

Warranty Service

To obtain service during the warranty period, the owner shall take the following steps:

1. Write, email or call the Turner Designs Technical Support department and describe as precisely as possible the nature of the problem.

Phone: 1 (877) 316-8049

Email: support@turnerdesigns.com

2. Carry out any adjustments or tests as suggested by the Technical Support Department.

3. If proper performance is not obtained you will be issued a Return Materials Authorization number (RMA) to reference. Package the unit, write the RMA number on the outside of the shipping carton, and ship the instrument, prepaid, to Turner Designs. If the failure is covered under the warranty terms, the instrument will be repaired and returned free of charge, for all customers in the contiguous continental United States.

For customers outside of the contiguous continental United States who purchased equipment from one of our authorized distributors, contact the distributor. If you purchased directly, contact us. We will repair the instrument at no charge. Customer pays for shipping duties and documentation to Turner Designs. Turner Designs pays for return shipment (custom duties, taxes and fees are the responsibility of the customer).

Operation Manual

Opti-Pro

Out of Warranty Service

Follow steps for Warranty Service as listed above. If our Technical Support department can assist you by phone or correspondence, we will be glad to, at no charge. Repair service will be billed on a fixed price basis, plus any applicable duties and/or taxes. Shipment to Turner Designs should be prepaid. Your bill will include return shipment freight charges.

Address for Shipment:

Turner Designs, Inc.
845 W. Maude Ave.
Sunnyvale, CA 94085