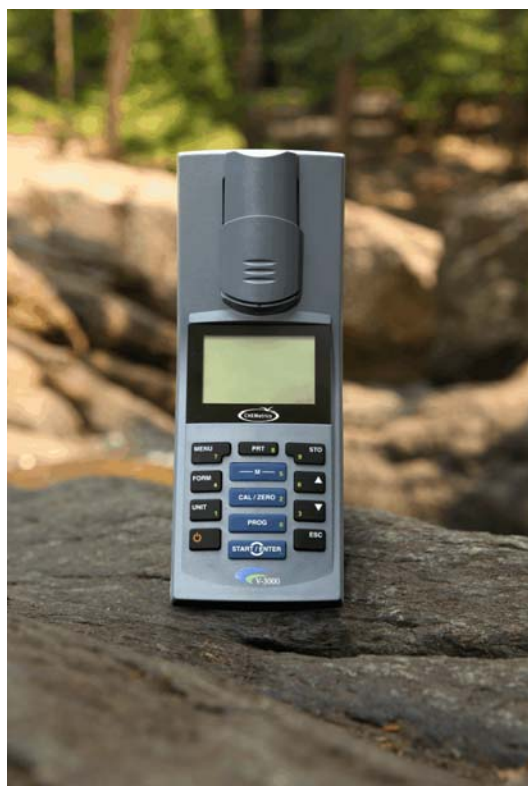


OPERATOR'S MANUAL V-3000 PHOTOMETER



CHEMetrics, Inc.
4295 Catlett Road
Midland, Virginia 22728
Toll Free 1-800-356-3072
Phone: 540-788-9026
Fax: 540-788-4856
Web: www.chemetrics.com

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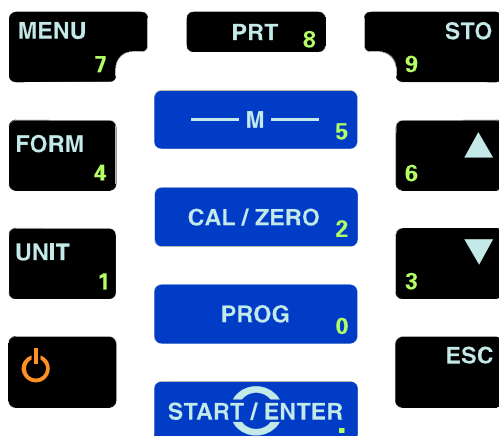
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1 Overview


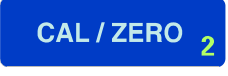








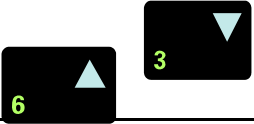

1.1 Features and Specifications

Wavelengths (nm):	436, 517, 557, 594, 610, 690
Cell Sizes:	13 mm, 16 mm, 28 mm - Flat bottom vials only
Wavelength Accuracy:	±2 nm
Light Source:	Light Emitting Diode with interference filters
Detector:	Photodiode
Photometric Range:	-0.200 to 2.000 absorbance units
Operating Temperature:	0°C to 50°C
Humidity:	75% Yearly Mean (up to 30 days at a maximum of 95%)
Waterproof:	IP67
Power Supply:	4 X 1.5 V AA - approximately 5000 measurements
Data Logging:	100 data sets V-3000; 1000 V-3000P and V-3000T
Download Capability:	Data to spreadsheet and printer, RS232 output
Upload Capability:	Web Based Methods Update
pH/ORP Measurement (V-3000P/V-3000T):	pH range: -2.00 - 16.00 ORP range: -1000 - 1000 mV
Turbidity Measurement (V-3000T):	Nephelometric measurement according to DIN EN ISO 7027, employs infrared LED, range: 0.01 - 1100 NTU/FNU
Custom User Programs:	Requires V-3000 Series Data Management Software (sold separately, Catalog Number A-0301)

1.2 Keypad



1.3 Key Functions

	<p>Measuring MODE key</p> <p>Long -M- Keystroke: Toggle between Photometry, Turbidity, pH & ORP (Press and hold)</p> <p>Short -M- Keystroke: In Photometry mode, toggle through concentration absorbance, and % transmittance. In pH & ORP mode, toggle between pH and ORP</p>
	<p>CAL/ZERO key</p> <p>Start pH or Turbidity Calibration (V-3000P or V-3000T only)</p> <p>Reset Zero Adjustment</p> <p>Reset Blank Value Measurement</p>
	<p>PROGRAM key</p> <p>In Photometry mode, select a program for concentration (direct read) measurement.</p>
	<p>START/ENTER key</p> <p>Open Menus</p> <p>Confirm Selections</p> <p>Start Measurements</p>
	<p>MENU key</p> <p>Open the Configuration Menu. All settings are made in the configuration mode.</p>
	<p>FORM key</p> <p>In Photometry / Concentration (direct read) mode, toggle through available chemical forms for a particular analyte (example: NH3, NH3-N, NH4).</p>
	<p>UNIT key</p> <p>In Photometry / Concentration (direct read) mode, toggle through available reporting units (example: ppm, mg/Liter, mmol/Liter)</p>
	<p>ON/OFF key</p> <p>Turn the instrument ON and OFF</p>
	<p>PRINT key</p> <p>Print the display contents via an RS232 interface</p>
	<p>STORE key</p> <p>Press once: open the Store Menu</p> <p>Press twice: quick store a measurement</p>
	<p>▲ UP key</p> <p>▼ DOWN key</p> <p>Move up and down in menu selections</p>
	<p>ESCAPE key</p> <p>Go back to the previous menu level</p>

NOTE: Keys with numbers printed on them can also be used to enter numbers in special menus.

1.4 Display

Photometry\Concentration	
1.29 mg/l	
15: K1503	NH3-N
13 mm	0.00 - 7.00 mg/l
11.30.13 15:12	

Measuring mode

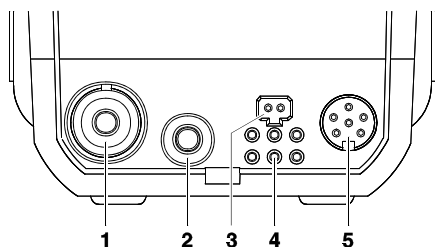
Measured value (with unit)

Program no.: Catalog no. and Chemical form

Diameter of the cell and measuring range

Status line with date and time

1.5 Socket Field



1. pH/ORP electrode (V-3000P & V-3000T only)
2. pH temperature sensor (V-3000P & V-3000T only)
3. Power pack (V-3000P & V-3000T only)
4. Contacts for Lab Station
5. RS232 serial interface

1.6 List of Direct Read Programs (factory calibrations)

Analyte	Prog. #	Kit Cat. #	Cell Size, mm	Blank Y/N	Wavelength, nm	Range, ppm	Method
Aluminum	9	K-0603	13	Y	517	0 - 0.25	Eriochrome Cyanine R
Ammonia	12	K-1413	13	N	610	0 - 3.00 (as N)	Hydroxybenzyl Alcohol
Ammonia	13	K-1413	13	N	610	0 - 60.0 (as N)	Hydroxybenzyl Alcohol
Ammonia	15	K-1503	13	N	436	0 - 7.00 (as N)	Direct Nesslerization
Ammonia	16	K-1523	13	N	436	0 - 14.0 (as N)	Direct Nesslerization
Chloride	26	K-2103	13	Y	436	0 - 40.0	Ferric Thiocyanate
Chlorine	32	K-2513	13	N	517	0 - 5.00	DPD
Chlorine	33	K-2523	13	N	517	0 - 5.00	DPD
Chlorine Dioxide	37	K-2703	13	N	517	0 - 11.00	DPD
Chromate	42	K-2803	13	N	557	0 - 3.50 (as CrO ₄)	Diphenylcarbazide
Copper	55	K-3503	13	N	436	0 - 12.00	Bathocuproine
Cyanide	60	K-3803	13	Y	594	0 - 0.400	Isonicotinic/Barbituric Acid
DEHA	64	K-3903	13	N	557	0 - 2.00	PDTS
Fluoride	73	K-4009	28	Y	594	0 - 3.00	SPADNS (Arsenic-free)
Formaldehyde	78	K-4203	13	N	557	0 - 8.00	Purpald
Glycol	83	K-4403	13	N	557	0 - 10.00 (as EG)	Purpald/Periodate
Glycol	84	K-4423	13	N	557	0 - 200 (as PG)	Purpald/Periodate
Hydrazine	89	K-5003	13	N	436	0 - 1.20	PDMAB
Peroxide	93	K-5513	13	N	517	0 - 3.00	DPD

Analyte	Prog. #	Kit Cat. #	Cell Size, mm	Blank Y/N	Wavelength, nm	Range, ppm	Method
Peroxide	95	K-5543	13	N	436	0 - 6.00	Ferric Thiocyanate
Iron	100	K-6003	13	N	517	0 - 6.00	Phenanthroline
Iron	101	K-6013	13	N	436	0 - 25.0	Phenanthroline
Iron	102	K-6023	13	N	557	0 - 2.50	PDTS
Iron	103	K-6203	13	N	517	0 - 6.00	Phenanthroline
Manganese	110	K-6503	13	N	517	0 - 30.0	Periodate
Molybdate	115	K-6703	13	N	436	0 - 25.0 (as Mo)	Catechol
Nitrate	119	K-6903	13	N	517	0 - 1.50 (as N)	Cadmium Reduction
Nitrate	122	K-6913	13	N	517	0 - 1.50 (as N)	Zinc Reduction
Nitrate	120	K-6923	13	N	517	0 - 7.50 (as N)	Cadmium Reduction
Nitrate	121	K-6933	13	N	517	0 - 50.0 (as NO ₃)	Cadmium Reduction
Nitrite	125	K-7003	13	N	517	0 - 1.00 (as N)	Azo Dye Formation
Ozone	133	K-7423	13	N	517	0 - 5.00	DPD
Ozone	134	K-7433	13	Y	610	0 - 0.75	Indigo
Oxygen	140	K-7503	13	N	610	0 - 2.00	Indigo Carmine
Oxygen	141	K-7513	13	N	517	0 - 15.0	Indigo Carmine
Oxygen	142	K-7553	13	N	517	0 - 1.000	Rhodazine D™
Peracetic Acid	148	K-7913	13	N	517	0 - 5.00	DPD
Phenols	152	K-8003	13	N	517	0 - 8.00	4-Aminoantipyrine
Phenols	153	K-8023	13	N	517	0 - 20.0	4-Aminoantipyrine

Analyte	Prog. #	Kit Cat. #	Cell Size, mm	Blank Y/N	Wavelength, nm	Range, ppm	Method
Phosphate	158	K-8503	13	N	436	0 - 80.0 (as PO ₄)	Vanadomolybdo-phosphoric Acid
Phosphate	160	K-8513	13	N	690	0 - 5.00 (as PO ₄)	Stannous Chloride
Silica	168	K-9003	13	N	690	0 - 10.00 (as SiO ₂)	Heteropoly Blue
Sulfate	174	K-9203	13	N	436	0 - 100.0	Turbidimetric
Sulfide	179	K-9503	13	N	690	0 - 3.00	Methylene Blue
Sulfide	180	K-9523	13	N	610	0 - 6.00	Methylene Blue
Zinc	187	K-9903	13	Y	610	0 - 3.00	Zincon
Zinc	188	K-9923	13	Y	610	0 - 15.0	Zincon

1.7 Power LabStation (sold separately, Catalog Number A-0302)

The Power LabStation includes: LabStation, Universal Power Cable with four plugs (US, Euro, UK, AUS), Rechargeable Battery Pack, PC Interface Cable (9 pin to 9 pin).

The Power LabStation provides the following features:

- When the photometer is placed in the Power LabStation (which is plugged into an electrical outlet), the photometer will always be fully charged and ready for use.
- For photometric measurements, when the photometer is in the Power LabStation, the zero measurement is retained even after turning the instrument off.
- Batteries are not needed when using the Power LabStation.
- The Power LabStation (when plugged into an electrical outlet) charges the re-chargeable battery pack, even when the instrument is turned off.

2 Getting Started

2.1 Scope of Delivery

- Handheld photometer
- four alkaline AA batteries, 1.5 V
- 13 mm cell adapter and light shield
- two empty 28 mm cells for MDL+ testing
- V-3000T only: two extra empty 28 mm cells with labels for turbidity measurements (four cells total)
- V-3000T only: AMCO®-Clear turbidity standards
- PC interface cable (6 pin to 9 pin)
- Operator's Manual

2.2 Power Supply

The V-3000 series photometers can be operated with regular AA batteries, a rechargeable battery pack or a power cable. The rechargeable battery pack and the power cable are part of the Power LabStation package, which is sold separately. There is a LoBat display indicator that appears when the batteries are nearly discharged.

2.3 Battery Installation

The V-3000 series photometers require four AA alkaline or lithium batteries. Remove the batteries when the photometer is not in use.

To install batteries, carefully loosen the two screws on the battery compartment on the back of the instrument. Remove the battery compartment cover and insert the four batteries with correct orientation as illustrated in the battery compartment. Replace the battery compartment cover and secure it in place with the two screws.

2.4 Automatic Switch-off

The meter has a user chosen, automatic switch-off function (10 minutes to 24 hours) that is designed to save battery life. The automatic switch-off time is chosen in the Configuration/System/Continue menu.

2.5 Display Illumination

During operation with batteries, the display illumination automatically turns off if no key is pressed for 30 seconds. Display illumination is switched on with the next keystroke. Display illumination features can be adjusted Configuration/System/Display menu.

3 Setup

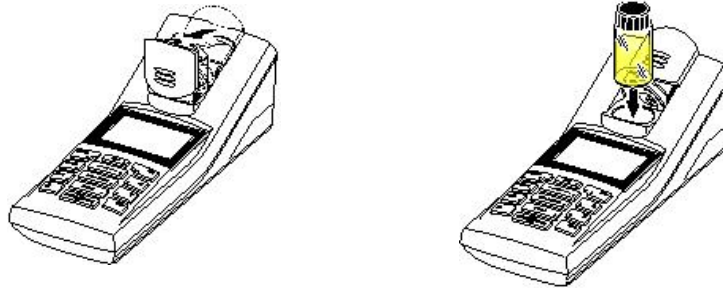
3.1 Turning the Instrument On

Press the **ON/OFF** key. For 30 seconds, the Start menu appears listing the measuring modes. The measuring mode last selected is highlighted. The status line indicates the meter name and the version number of the software. After about 30 seconds, the meter automatically switches to the measuring mode and measured parameter used last.

3.2 Inserting a Cell

Inserting a 28 mm cell

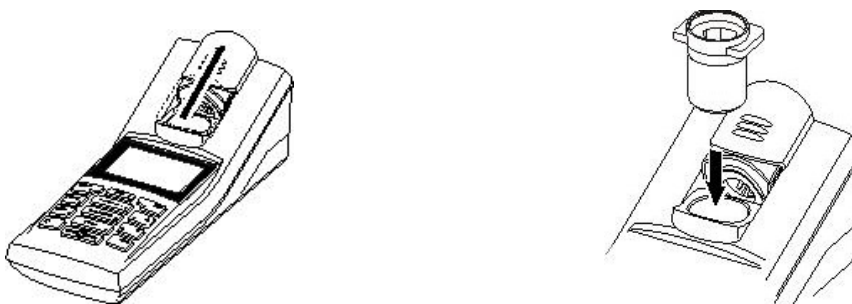
Remove the black 13 mm adapter if it is in the sample compartment. Make sure that the dust cover is pushed upward. Insert a 28 mm cell into the sample compartment using downward pressure to ensure that it is fully seated.



Inserting a Vacu-vials® Ampoule (13 mm) - Requires installation of an adapter

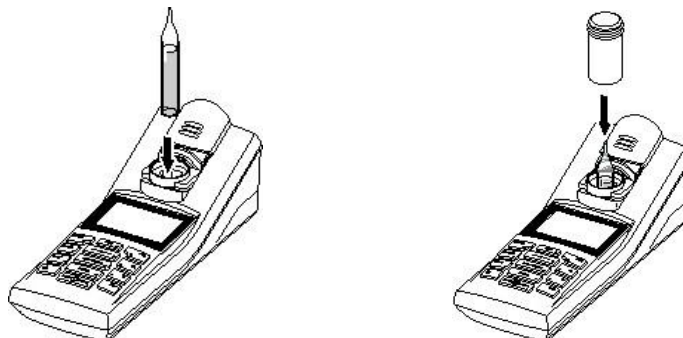
■ Installing the 13 mm Adapter

Make sure that the dust cover is pushed upward. Insert the black 13 mm adapter into the sample compartment with the proper orientation (silver ball plunger in the cell shaft goes to the right). Use downward pressure to ensure that the adapter is fully seated.



■ Inserting the 13 mm Vacu-vials® Ampoule

Insert the Vacu-vials ampoule into the sample compartment using downward pressure to ensure that it is fully seated. Place the light shield over the ampoule.



3.3 Operating modes

The instrument has the following operating modes:

- **Measurement** - The display indicates measurement data in the measured value display.
- **Calibration** - The display indicates a calibration process with calibration information, or a process to carry out a zero adjustment.
- **Data transmission** - The meter transmits data or calibration records to the serial interface.
- **Configuration** - The display indicates a menu with further menus, settings and functions.

3.4 Navigation - Menus, Settings and Messages


• Menus

Menus are opened by pressing the **START/ENTER** key. The name of the menu is displayed in the upper left corner of the screen.

• Settings

Settings represent choices that the user may make and are displayed as follows: Language: English.

• Messages

Information or instructions are marked by the  symbol. Messages can not be selected or altered. They do not initiate a process.

Navigation Example: Setting the date and time

The V-3000 series photometers have a clock with a date function. The date and time are indicated in the status line of the display. There are choices for date format presentation: day, month, year (dd.mm.yy) or month, day, year (mm.dd.yy). When storing measured values and calibrating, the current date and time are automatically stored as well. The correct setting of the date and time and date format is important for the following functions and displays: current date and time, calibration date, and identification of stored measured values. Therefore, check the time at regular intervals. If power is interrupted (example: batteries die), the date and time will need to be reset.

Press the **MENU** key. The Configuration menu is opened.

Use the **▲** or **▼** key to highlight System. Press the **START/ENTER** key. System menu is opened.

Use the **▲** or **▼** key to highlight Continue. Press the **START/ENTER** key.

Use the **▲** or **▼** key to highlight Date/Time. Press the **START/ENTER** key. Date/Time menu is opened.

Use the **▲** or **▼** key to highlight Time or Date. Press the **START/ENTER** key.

Use the **START/ENTER** key to move cursor to the right. The digit to be changed is underlined on the display.

Use the number keys to enter the correct Time or Date.

Press the **START/ENTER** key when the correct information is displayed.

Press the **ESC** key to go back to the previous menu.

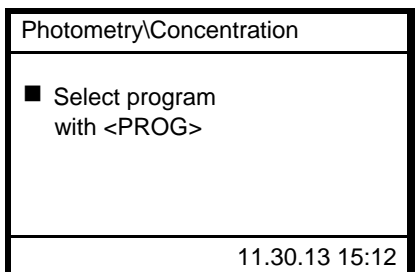
3.5 Menu Overview

Photometry	Measured Parameter	Concentration, % Transmittance, Absorbance	
	Programs		
	Dilution		
	Analysis Timer	On, Off	
	Reset		
Turbidity	Calibr. Record		
	Calibr. Interval		
	Reset		
pH & ORP	Measured Parameter	pH, ORP	
	Calibration	Calibration Record	
		Calibration Type	TEC, NIST/DIN
		Calibration Interval	1...999 days
		Unit For Slope	mV/pH, %
	Man. Temperature	-20...+130 °C	
	Temperature Unit	°C, °F	
Reset			
Timer			
System	Language	German, English, French, Spanish	
	Measured Value Memory (Store)	Display	
		RS232 Download	
		Data Filter	Filter, ID, Program, Date
		Delete	
		<input type="checkbox"/> # of 100 occupied (V-3000) <input type="checkbox"/> # of 1000 occupied (V-3000P and V-3000T)	
		<input type="checkbox"/> Filter, No filter	
	Display	Illumination	Auto off, On, Off
		Contrast	0...100%
		Brightness	0...100%
	Reset (Restore basic settings)		
	Interface	Baud Rate	1200, 2400, 4800, 9600, 19200
		Output Format	ASCII, CSV
	Continue.../ Date/Time	Time	hh:mm:ss
Date			
Date Format		dd.mm.yy (default setting), mm.dd.yy, mm/dd/yy	
Continue.../ Switchoff	10, 20, 30, 40, 50 min		
Continue.../ Beep	On, Off		
Info			

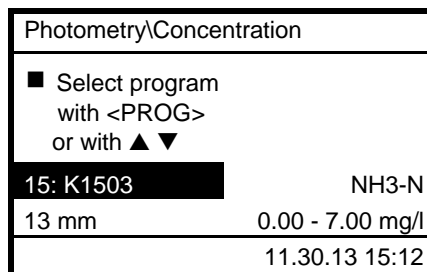
4 Photometry

4.1 Measuring the Concentration

1. Prepare the meter to receive the cell size of choice (See Section 3.2)
2. Turn the meter on by pressing the **ON/OFF** key.
3. Press the **-M-** key (short pressure) until Photometry\Concentration is displayed on the top line of the display. After the first concentration measurement, the last program used is automatically displayed.



First concentration measurement (#1)



All subsequent concentration Measurements (#2)

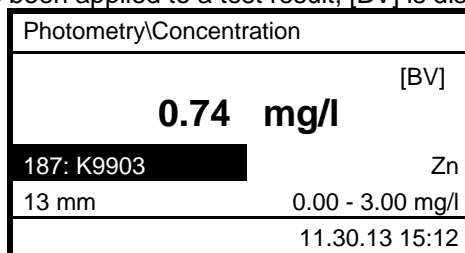
NOTE: From display #2 above, use the **FORM** key to change the chemical form being reported for the program displayed and use the **UNITS** key to change the reporting unit. (See Section 1.3).

4. Use the ▲ or ▼ keys to toggle through the last ten programs used or press the **PROGRAM** key and enter the desired program number, then press **START/ENTER**.
5. Zero adjustment (zeroing the photometer at all wavelengths) is required each time the meter is turned on, unless the photometer is docked in a Power LabStation (See Section 1.7). Zero adjustment must employ the cell size for the test that is being run (See Section 1.6). If zeroing is necessary, the required cell size and the following message are displayed: “**i** No valid zero adjustment is available”. The user is prompted to perform the zero adjustment. The prompts are highlighted across the bottom of the display. To proceed to each next prompt, press **START/ENTER**.

NOTE: To perform the zero adjustment for Vacu-vials® Test Kits, use the factory sealed ZERO ampoule supplied with each kit. For MDL+ Test Kits, fill a sample cell with distilled water to perform the zero adjustment.

6. In addition to zero adjustment, some programs also require a reagent blank (indicated in the individual kit instructions):
 - If a blank measurement **has NOT** previously been made (stored) for a program, the menu prompts the user to measure a blank value. The prompts are highlighted across the bottom of the display. To proceed to each next prompt, press **START/ENTER**.
 - If a blank measurement **has** previously been made (stored) for a program, the previously stored blank value will automatically be applied to the new sample measurement unless the user deletes or changes the blank value. To delete the old blank value or generate a new blank value, press the **CAL/ZERO** key and follow the choices/prompts.

NOTE: When a blank value has been applied to a test result, [BV] is displayed on the screen with the test result.



7. Insert the clean, dry sample vial or ampoule as prompted and press **START/ENTER**. The test result is displayed.

NOTE: If the measured test result is above the upper limit of the test range, the display will show > XX ppm. However, immediately above that in a smaller font, the actual test result will be displayed.

4.2 Analysis Timer

The analysis timer is programmed with program specific color development times for all factory calibrated programs. When the analysis timer is turned on (Configuration/Photometry/Analysis timer menu), it is active for all factory calibrated programs and can not be bypassed. When the analysis timer is turned on and a program is selected to run, the meter will show a prompt for starting the analysis timer. When **START/ENTER** is pushed, the analysis timer displays and counts down the required color development time and then beeps. When the meter beeps, **START/ENTER must be pressed twice** to obtain a the concentration measurement.

4.3 Timer

There may be waiting periods in between the individual steps of a test method. The Timer function can be used to manually set these time intervals. The timer is set and started in the Configuration/Timer menu by entering a time interval. The timer is displayed in the lower left corner (status line) of the display. When the selected time expires, the meter beeps. Press **START/ENTER** to stop the beeping.

4.4 Measuring Diluted Samples

If the concentration of a sample exceeds the measuring range of a test method, it may be reasonable to dilute the sample with distilled water prior to analysis. The corresponding dilution factor (1....99) can be manually set on the photometer so that test results are automatically adjusted for the dilution factor. After selecting the program for which a sample dilution is to be employed, go to the Configuration/ Photometry/Dilution menu to specify the appropriate dilution factor. Once the dilution factor is set, the meter applies the dilution factor and **displays the concentration of the undiluted sample**. The entered dilution factor is only valid for the selected program. If a dilution factor is active, it is indicated on the display during measurement as follows:

[x + 1].....with x = parts water and 1 = parts sample.

The dilution factor is erased if:

- the photometer is turned off
- a different program number is selected
- the factor 0 is entered in the Dilution menu.

NOTE: Sample dilution is not appropriate for all analytes.

5 pH / ORP

5.1 Measuring the pH value

1. Connect a pH electrode to the meter.
2. Turn the meter on by pressing the **ON/OFF** key.
3. Use the **▲** or **▼** key to highlight pH & ORP
4. Press the **START/ENTER** key. The pH & ORP menu is opened.
5. Press the **-M-** key (short pressure) until pH & ORP/pH is displayed on the top line of the display.
6. If the selected pH electrode does not have a built in temperature sensor, then measure the sample temperature manually and enter this temperature using the **▲** or **▼** key.
7. Immerse the pH electrode in the sample.
8. The display will flash until the measured pH value is stable.

5.2 Measuring the ORP voltage

1. Connect an ORP electrode to the meter.
2. Turn the meter on by pressing the **ON/OFF** key.
3. Use the **▲** or **▼** key to highlight pH & ORP
4. Press the **START/ENTER** key. The pH & ORP menu is opened.
5. Press the **-M-** key (short pressure) until pH & ORP/ORP is displayed on the top line of the display.
6. If the selected ORP electrode does not have a built in temperature sensor, then measure the sample temperature manually and enter this temperature using the **▲** or **▼** key.

7. Immerse the ORP electrode in the sample.
8. The display will flash until the measured ORP value is stable.

NOTE: ORP electrodes do not need to be calibrated, however a test solution can be used to check ORP electrode performance. Refer to the ORP electrode manual for instructions on use.

5.3 pH Calibration - General Information

pH electrodes must be calibrated at regular intervals. With age, the asymmetry (zero point) and slope of the pH electrode change. As a result, an inexact measured value can be obtained. Calibration determines the current values of the asymmetry and slope of the electrode and stores them in the meter.

Calibration is recommended as follows:

- When connecting a new pH electrode
- When the electrode sensor symbol flashes
- When the user chosen calibration interval has expired
- When there has been a voltage interruption (e.g. batteries died)

Use the buffer sets quoted in the table below for an automatic calibration.

Buffer Sets	pH values at 25°C
TEC (technical)	2.00
	4.01
	7.00
	10.01
NIST/DIN	1.679
	4.006
	6.865
	9.180
	12.454

5.4 pH Calibration Procedure

Make sure the Calibr. type is correctly set in the pH & ORP/Calibration menu.





For this procedure, use any one, two or three buffer solutions in ascending or descending order.

1. Press the **-M-** key (short pressure) repeatedly until the measured parameter, pH or ORP is selected.
2. Start the calibration by pressing the **CAL/ZERO** key. The calibration display appears.
3. Immerse the electrode in buffer solution 1.
4. If the Set temperature menu item appears, measure and enter the temperature of the buffer manually.
5. Using the **▲** or **▼** keys, select Continue and press **START/ENTER**. The buffer is measured and the measured value is checked for stability (AutoRead).
6. Wait for the end of the AutoRead measurement or accept the calibration value by pressing **START/ENTER**. The calibration display for the next buffer appears.
7. For a one-point calibration, use the **▲** or **▼** keys to highlight Exit with one point and confirm by pressing **START/ENTER**. The calibration is complete as a one-point calibration. The new calibration values are displayed. Proceed as follows:
 - Accept the new calibration values by pressing **START/ENTER**, or
 - Switch to the measured value display without accepting the new calibration values by pressing **-M-** (short pressure) or **ESC**.

8. To continue for two-point calibration, thoroughly rinse the electrode with distilled water.
9. Immerse the electrode in buffer solution 2.
10. If the Set temperature menu item appears, measure and enter the temperature of the buffer manually.
11. Using the ▲ or ▼ keys, select Continue and press **START/ENTER**. The buffer is measured and the measured value is checked for stability (AutoRead).
12. Wait for the end of the AutoRead measurement or accept the calibration value by pressing **START/ENTER**. The calibration display for the next buffer appears.
13. For a two-point calibration, use the ▲ or ▼ keys to highlight Exit with two-point and confirm by pressing **START/ENTER**. The calibration is completed as a two-point calibration. The new calibration values are displayed. Proceed as follows:
 - Accept the new calibration values by pressing **START/ENTER**, or
 - Switch to the measured value display without accepting the new calibration values by pressing **-M-** (short pressure) or **ESC**.
14. To continue for three-point calibration, thoroughly rinse the electrode with distilled water.
15. Immerse the electrode in buffer solution 3.
16. If the Set temperature menu item appears, measure and enter the temperature of the buffer manually.
17. Using the ▲ or ▼ keys, select Continue and press **START/ENTER**. The buffer is measured and the measured value is checked for stability (AutoRead).
18. Wait for the end of the AutoRead measurement or accept the calibration value by pressing **START/ENTER**. The calibration display for the next buffer appears.
19. For a three-point calibration, use the ▲ or ▼ keys to highlight Exit with three-point and confirm by pressing **START/ENTER**. The calibration is completed as a three-point calibration. The new calibration values are displayed. Proceed as follows:
 - Accept the new calibration values by pressing **START/ENTER**, or
 - Switch to the measured value display without accepting the new calibration values by pressing **-M-** (short pressure) or **ESC**.

5.5 Calibration Evaluation

After calibrating, the meter automatically evaluates the calibration. The asymmetry and slope are evaluated separately. The evaluation appears on the display and in the calibration record.

Sample display	Calibration Record	Assymmetry [mV]	Slope [mV/pH]
	+++	-15 ... +15	-60.5 ... -58
	++	-20 ... +20	-58 ... -57
	+	-25 ... +25	-61 ... -60.5 or -57 ... -56
	-	-30 ... +30	-62 ... -61 or -56 ... -50
----	----	< -30 or > 30	< -62 or > -50

6 Turbidity

6.1 General information

Air bubbles in the sample will affect the turbidity measurement. Large air bubbles cause sudden changes in the measured value. Smaller air bubbles are recorded by the instrument as turbidity. During turbidity testing, ensure all movement of the sample cell is kept to a minimum to reduce the likelihood of air bubbles.

6.2 Cleaning the Cells

For accurate turbidity measurements, cells have to be clean, dry and free of fingerprints and scratches. Clean cells inside and out regularly with hydrochloric acid or laboratory soap. Rinse with distilled water and air dry. Handle the cell by the lid so that the optical path is not impaired.

6.3 Aligning and Marking Cells

Even completely clean cells may exhibit tiny directional differences in their light transmittance. Therefore, it is necessary to align the sample cells and cells for calibration standards.

1. Prepare the meter to receive the 28 mm cell (See Section 3.2)
2. Turn the meter on by pressing the **ON/OFF** key.
3. Use the **▲** or **▼** key to highlight Turbidity.
4. Press the **START/ENTER** key. The Turbidity menu is opened.
5. Insert the empty cell.
6. Press and **hold** the **START/ENTER** key.
7. Slowly and with small steps, turn the cell one complete 360° rotation. After each small step, wait until the displayed measured value is stable.
8. Turn the cell back to the position with the lowest measured value.

NOTE: To keep the drift as low as possible, the time for aligning the cell while pressing and holding the **START/ENTER** key is limited to 30 seconds.

9. Release the **START/ENTER** key. Measurement starts and the measured value is displayed.
10. The optimal alignment position of the cell can be marked once it is determined. The marking can be done on a label on the cap of the cell.

6.4 Measuring Turbidity

1. Prepare the meter to receive the 28 mm cell (See Section 3.2)
2. Turn the meter on by pressing the **ON/OFF** key.
3. Use the **▲** or **▼** key to highlight Turbidity.
4. Press the **START/ENTER** key. The Turbidity menu is opened.
5. Rinse a clean dry cell and cap with the sample to be tested. Repeat 2 more times.
6. Fill the cell with the sample to be tested (approximately 15 mL). Close the cell with the black cap.
7. Insert the cell with optimal cell alignment (See Section 6.3).
8. Press and briefly hold the **START/ENTER** key. Slowly rotate the cell to confirm optimal cell alignment (lowest measured value).
9. Release the **START/ENTER** key to begin measurement.

6.5 Turbidity Calibration - General Information

Calibration is recommended every 90 days or when the ambient temperature has changed significantly. The calibration interval is factory set to 90 days but can be changed to any number of days in the Configuration/Turbidity/Calibration Interval menu. The menu guided calibration requires the following calibration standards in the following order:

Standard Number	NTU/FNU
1	1000 ± 1%
2	10.0 ± 1%
3	0.02 ± 0.02

- Turbidity standards must not freeze. If they freeze, they are no longer viable for use.
- Turbidity standards in glass cells are for one-time use only. Never pour the standard back into the plastic bottle. The turbidity value of a standard in the glass cell will decrease within 24 hours. Never store the turbidity standard in the glass cell.

6.6 Turbidity Calibration Procedure

1. Prepare the meter to receive the 28 mm cell (See Section 3.2)
2. Prepare the cells containing the calibration standards.
3. Turn the meter on by pressing the **ON/OFF** key.
4. Use the ▲ or ▼ key to highlight Turbidity.
5. Press the **START/ENTER** key. The Turbidity menu is opened.
6. Start the menu-guided calibration by pressing the **CAL/ZERO** key.
7. Insert the cell that contains the displayed calibration standard.
8. Press and briefly hold the **START/ENTER** key to ensure optimum cell alignment.
9. Release the **START/ENTER** key to begin measurement.
10. Repeat steps 7 through 9 for the other 2 standards.
11. After measuring the 0.02 NTU/FNU calibration standard, the calibration result (Calibration successful! or Calibration error!) is displayed and stored and the calibration is completed.
12. Confirm the calibration result with the **START/ENTER** key.

NOTE: If Calibration error! was displayed as the calibration result, a note appears on the display to re-calibrate before measuring. Should a valid calibration not be possible, the meter also offers to continue measuring with the last valid calibration data.

7 Storing Data

The V-3000 photometer can store up to 100 measurements. The V-3000P and V-3000T can store up to 1000 measurements. A measurement is stored by pressing the **STO** key. This opens the Store menu. Each stored measurement includes the date, time and measurement ID number as well as the following:

Measuring Mode	Measurement Data
Photometry	Program Number
	Measured Value
	Chemical Form Chosen for the Analyte Tested
	Use of a Blank Value (BV), if applicable
	Dilution (x +1), if applicable
Turbidity	Measured Value
pH & ORP	Measured Value (pH/mV)
	Measured Temperature Value (°C/°F)
	Autoread (AR) appears if the Auto-Read criterion was met while storing (stable measured value)

7.1 Assigning Measurement ID Number

Use the ▲ or ▼ keys, the **START/ENTER** key and the number keys to assign an ID number from 0 to 999. The same ID number can be used multiple times to indicate a particular sampling location or a particular operator.

7.2 Managing Stored Measurements

The number of storage locations that are still free is displayed in parenthesis at the top of the Store menu display. The number of storage locations that are occupied is displayed in the Configuration/System/Measured value memory menu.

If the measured value memory capacity is full, the meter will offer the option to overwrite the oldest stored measurement with the new storing command. Another option is that all stored values can be deleted using the Configuration/System/Measured Value Memory menu. A security prompt appears before a dataset is overwritten or all of the measured values are deleted. It is not possible to selectively delete a single stored measurement.

7.3 Filtering Stored Measurements

The functions to display and download stored measurements refer to all stored measurements that correspond to the adjusted filter criteria. The filter criteria choices (listed below) are found in the Configuration/System/Measured value memory/Data filter menu.

Filter Criteria	Description
No filter	There is no filter set
ID	Select according to ID Number
PROG	Select according to Program Number
Date	Select according to a period of days
ID + PROG	Select according to ID Number and Program Number
ID + Date	Select according to ID Number and period of days
PROG + Date	Select according to Program Number and period of days
ID + PROG + Date	Select according to ID Number and Program Number and period of days

8 Use with Printers and Computers

The V-3000 photometer allows communication directly to a printer or bidirectional communication with a computer. Connecting to a printer or a computer requires the use of the supplied PC interface cable with RS-232 connector. This cable has a special 6-pin connector on one end for the V-3000. The 6-pin RS-232 port is on the back of the photometer. If your printer or computer does not have a 9 pin RS232 port, you will need to purchase the following USB adapter that will allow you to connect the V-3000 PC Interface cable to the USB port on your printer or computer: Catalog Number: A-0305, Description: RS232 (9 pin) to USB Cable Adapter.

8.1 Saved Data Output Format

When data is being downloaded from the V-3000 to a computer or printer, output format can be selected. ASCII output format downloads data sets with formatting. CSV output format downloads the data set information separated by semi-colons(;). CSV format is used for importing data into spreadsheets. The output format setting is set or changed in the Configuration/System/Interface/Output format menu.

Example of ASCII format:

```
V-3000 Pro Ser. No. 12390625
3: 12/31/15 11:55:09
ID 0 / PROG 15
4.50 mg/l NH3-N
```

Example of CSV format:

2;12/31/15;11:55:06;0;15:NH3-N; ;4.50;mg/l;VALID; ; ;

Description of data separated by semi-colons in CSV format

Data storage number

Date of storing

Time of storing

User assigned ID

Program number, only for the concentration measurements

Citation form, only for the measured parameter

Blank value (BV) for concentration readings or Autoread (AR) for pH and ORP readings

Dilution factor, only for concentration measurements

Measured value

Unit of measured value (e.g. ppm, mg/L)

Measured value status-VALID, INVALID, UFL (below measuring range), OFL (above measuring range)

Secondary measured value- pH & ORP = Temperature, Absorbance/%Transmittance = wavelength

Unit of secondary measured value - pH & ORP = °C / °F, Absorbance/% Transmission = nm

Secondary measured value status (VALID, INVALID, UFL, OFL)

8.2 Printing Data Directly to a Printer

1. With the V-3000 power off, connect the V-3000 to a printer using the supplied PC interface cable.
2. Turn the meter on by pressing the **ON/OFF** key.
3. Press the **MENU** key. The Configuration menu is opened.
4. Use the **▲** or **▼** keys to highlight System. Press **START/ENTER**. The System menu is opened.
5. Use the **▲** or **▼** keys to highlight Measured value memory. Press **START/ENTER**.
6. **To print individual readings:** Use the **▲** or **▼** keys to highlight Display. Press **START/ENTER**. Readings will display one at a time. Use **▲** or **▼** keys to scroll. Press **PRT** key to print individual readings in selected output format. (See Section 8.1)
To print entire dataset: Use the **▲** or **▼** keys to highlight RS232 download. Press **START/ENTER**. This will print entire dataset according to the filters criteria that has been set (See Section 7.3).
To print pH or turbidity calibration records: Access record as follows: MENU/pH & ORP or Turbidity/Calibration/Calibr. Press the **PRT** key and the record will print in ASCII format.

8.3 Downloading Data to a Computer

V-3000 Series Data Management Software for Data Exchange (Catalog Number A-0301) is available for easy data downloading and manipulation. However, without the additional software, data can also be sent to a terminal emulator program and then exported to a spreadsheet or database software application.

To download data without the V-3000 Series PC Software:

NOTE: These instructions are specific to the terminal emulator program HyperTerminal.

1. Create and save a text file (*.txt) to receive the V-3000 logged data. Close this file.
2. With the V-3000 power off, connect the V-3000 to a computer using the supplied PC interface cable.
3. Turn the meter on by pressing the **ON/OFF** key.
4. Press the **MENU** key. The Configuration menu is opened.
5. Use the **▲** or **▼** keys to highlight System. Press **START/ENTER**. The System menu is opened.
6. Use the **▲** or **▼** keys to highlight Measured value memory. Press **START/ENTER**.
7. Open HyperTerminal by going to the Start button on your computer, then clicking on Programs/ Accessories/Communications/HyperTerminal.
8. A "New Connection" window will open. Enter a name for the terminal program, for example "V3000". Select an icon to represent the terminal program.
9. A "Connect To" window will open. Select the Com (serial) port to which V-3000 is connected.
10. Enter the port transmission settings:
 Baud Rate: 1200, 2400, 4800, or 9600
 Data Bits: 8
 Parity: None

Stop Bit: 1
Start Bit: 1
Flow Control: Hardware

NOTE: The baud rate selected in Hyper Terminal must match the V-3000 baud rate. V-3000 baud rate is set in the Configuration/System/Interface/Baud rate menu.

11. From the HyperTerminal menu, select Transfer. Click on Capture Text. Enter the path and name of the file created in Step 1. Click on Start.
12. Make sure that the desired V-3000 output format has been chosen (See Section 8.1).
13. **To download individual readings:** Use the ▲ or ▼ keys to highlight Display. Press **START/ENTER**. Readings will display one at a time. Use ▲ or ▼ keys to scroll. Press **PRT** key to download individual readings in selected output format.
To download entire datasets: Use the ▲ or ▼ keys to highlight RS232 download. Press **START/ENTER**. This will download entire data sets in the selected output format according to the filter criteria that has been set (See Section 7.3).
To download pH or turbidity calibration records: Access record as follows: MENU/pH&ORP or Turbidity/Calibration/Calibr. Press the **PRT** key and the record will download in ASCII format.
14. Downloaded readings should appear in the Hyper Terminal window. Once transmission is complete, click on Transfer/Capture Text and select Stop. Exit the HyperTerminal program and disconnect the V-3000 from the computer.
15. The text file, which captured the V-3000 data, can now be opened in the appropriate software application. Data may be reformatted as needed for spreadsheet or database manipulation.

8.4 Uploading Program Revisions

The V-3000 program version can be updated by visiting the CHEMetrics website, www.chemetrics.com and clicking on V-3000 Method Update under the Support tab. The CHEMetrics website will inform customers when new programs are available or existing programs have been updated. Also, product specific test kit labels will alert the user about program updates as they occur. To ensure that the most current calibrations are being used, it is recommended that every V-3000 user check the CHEMetrics website frequently.

To determine what firmware version is currently on your V-3000 instrument, turn the photometer on. Press the Menu key and select "Info". The info screen displays Software version and Program version (as well as Serial number and main PC board identification).

Equipment Needed to Upgrade your V-3000:

- PC with Windows XP, Windows Vista, Windows 7, or Windows 10.

NOTE: Administrator rights will be required.

- PC Serial interface cable (6 pin to 9 pin, supplied with instrument) and if necessary, USB Cable Adapter (sold separately, Cat. No. A-0307).
OR
Power LabStation (sold separately, Cat. No. A-0302) with its serial interface cable and if necessary, USB Cable Adapter (Cat No. A-0307).

Procedure for Firmware Revision Update:

Important Message! Before beginning the update:

- Ensure that the V-3000 has a stable uninterrupted power supply (i.e. fresh batteries or Power LabStation with power cord).
- Close all other applications on your PC.

NOTE: Updates do not delete user generated custom methods.

1. Click on the link provided on the CHEMetrics website to open the update program.
2. Files have been compressed into a zip archive (*.zip). Admin rights will be required to unzip the archive and install the program on your PC. Unzip the files and save them to your PC. Open the folder on your PC called "V3000_update", then double click on the executable (*.exe) file. When the installation has occurred successfully, the executable icon (shortcut to the V-3000 upload program) will be saved to your desktop.

NOTE: The step-by-step procedure for installing the program and unzipping the files varies among different operating systems and individual PCs. Consult with an IT Specialist for detailed instructions.

3. With the V-3000 power off, connect the V-3000 to the computer using the supplied PC interface serial cable. If only USB ports are available, connect the V-3000 using the supplied serial cable and USB Cable Adapter (sold separately, Cat. No. A-0307).
4. Turn the V-3000 on by pressing the ON/OFF key.

NOTE: It does not matter which screen the instrument displays at the start of this update.

5. Double click on the V-3000 executable icon on your desktop. Click "OK" to initiate the V-3000 Firmware Update. The entire process will take approximately 10 minutes. The V-3000 screen will go through a series of programming tasks.

NOTE: Do NOT click Cancel, remove PC cable, interrupt power supply, or attempt to stop the update. This can result in meter malfunction requiring repair by the manufacturer.

6. When the update is complete, the PC screen will display "Firmware update successfully completed!" as well as meter and revision information including the new Software and Program Version numbers. If the update fails, follow the prompts on the PC screen to re-initiate the upload. When prompted, carefully enter the V-3000 serial number.

NOTE: If the update repeatedly fails, disconnect the V-3000 from the COM port and contact technical@chemetrics.com.

7. When the update is completed successfully, disconnect the V-3000 from the COM port.
8. Click File\Exit to close the program. Do NOT click "OK".

9 Troubleshooting

V-3000, V-3000P, V-3000T		
Issue/Error Message	Cause	Remedy
Zero Adjustment Error	<p>Failure to perform zero at all six wavelengths.</p> <ul style="list-style-type: none"> Debris in sample well Debris on zeroing ampoule Invalid zeroing ampoule 	<p>Only zero with valid 13 or 28 mm water blank.</p> <p>Clean zeroing ampoule.</p> <p>Clean sample well. Make sure it is free of debris and liquid.</p>
LoBat	Battery power is insufficient.	<p>Replace AA batteries immediately.</p> <p>Recharge “accumulator pack”.</p> <p>Plug into 9V power supply cable.</p>
Instrument does not react to keystroke or RS232 interface.	Meter software needs to system reboot.	Perform processor reset by pressing <START/ENTER> and <PRT> key simultaneously.
Bootloader waiting	Error uploading method update.	Never press cancel during a method update. Contact CHEMetrics for assistance.
Program number invalid!	Program number not recognized.	<p>Only use program appropriate program numbers.</p> <p>Make sure method software is up to date.</p>
Obviously incorrect measured values	Measurement disturbed by light.	Use light shield.
	Cell not correctly inserted.	Insert cell positioned in the bottom of the sample compartment.
	Cell contaminated.	Clean the cell.
	Sample compartment contaminated.	Clean the sample compartment.
	Dilution set incorrectly.	Set the correct dilution factor.
	Selected program unsuitable.	Select appropriate program number.
	Zero measurement incorrect.	Perform zero adjustment.
Blank value incorrect.	Re-measure the blank value for program in use.	
Error message, Error 0, 8, 16, 16384	Instrument error.	<p>Repeat measurement.</p> <p>Restart instrument.</p>

V-3000P, V-3000T		
Issue/Error Message	Cause	Remedy
pH calibration error	<p>Failure to standardize buffers.</p> <p>Invalid buffer set setting (NIST Vs. Tec)</p> <p>Unsuitable electrode (- - -)</p>	<p>Make sure buffer is correct for pH recognition.</p> <p>Check electrode asymmetry and slope (must be < $\pm 30\text{mV}$ and slope -62 to -50 mV/PH).</p>
Obviously incorrect measured values or reading not stable	pH electrode not working properly.	<p>Make sure BNC connect attached securely.</p> <p>Re-standardize with NIST/TEC buffers and verify asymmetry/slope values.</p> <p>Make sure diaphragm and membrane aren't contaminated.</p>

V-3000T		
Issue/Error Message	Cause	Remedy
Turbidity calibration error	<p>Turb unit unable to perform turbidity calibration.</p> <p>Invalid order of NTU standards</p> <p>Invalid sample cell</p>	<p>Make sure to read turbidity standards in correct order (1000 then 10.0 then 0.02 NTU).</p> <p>Only measure turbidity using 28 mm sample cell.</p>
Measured value obviously incorrect.	Cell not correctly inserted.	Lock cell into place.
	Cell contaminated.	Clean the cell.
	Calibration too old.	Carry out calibration every 90 days.