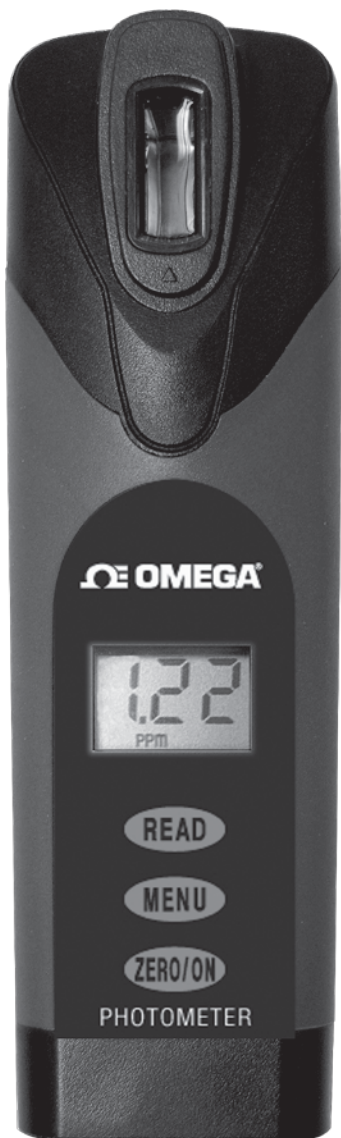


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HHWT-13

Handheld Multi-Chemical Photometer



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The information contained in this document is believed to be correct, but OMEGA accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING: These products are not designed for use in, and should not be used for, human applications.

Ω OMEGA®

HHWT-13

Advanced Photometer System *Instruction Manual*

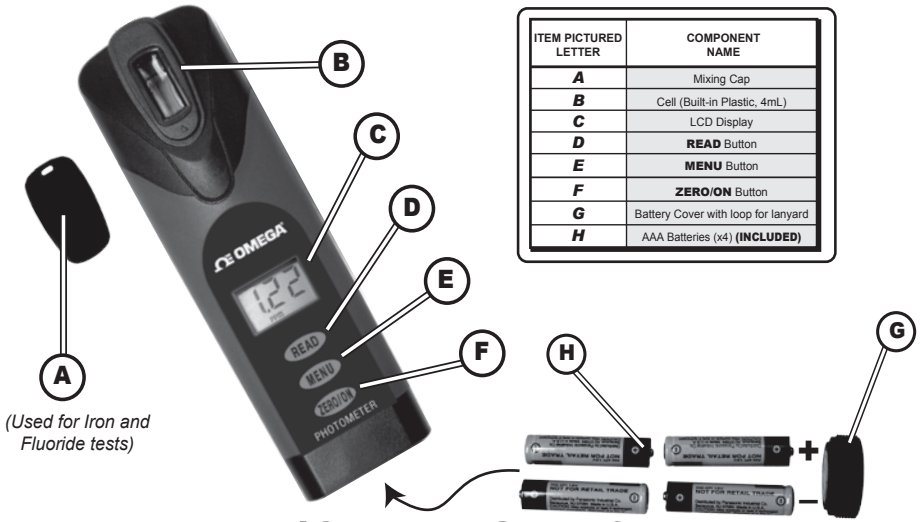
**IDEAL FOR DRINKING WATER, POOL AND SPA,
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HHWT-13 Photometer



ITEM PICTURED LETTER	COMPONENT NAME
A	Mixing Cap
B	Cell (Built-in Plastic, 4mL)
C	LCD Display
D	READ Button
E	MENU Button
F	ZERO/ON Button
G	Battery Cover with loop for lanyard
H	AAA Batteries (x4) (INCLUDED)

HHWT-13 Meter Specifications

Measurement Method:	Photometric
Light Source:	Light Emitting Diode (LED)
Wavelength:	638 nm
Transmission Range:	100 - 0.00 %T
Photometric Precision:	+/- 0.1/0.01 %T
Automatic Range Selection:	See Specifications below
Display:	3-digit customized liquid crystal display with annunciators
CELL Pathlength:	20mm
Sample Volume:	4mL (0.13 oz)

Cell Chamber:	Custom-molded, proprietary, PET plastic fused into chamber, non-removable
Operating Temperature Range:	0 - 50°C (32° - 122°F)
Power Supply:	(4) AAA alkaline batteries (INCLUDED)
Battery Life:	>2000 tests with alkaline batteries
Electromagnetic Compliance:	Emitted Interference - EN 61326 Immunity to Interference - EN 61326
Waterproof Rating:	Exceeds IP67
Weight:	Instrument: 140 g (5 oz)
Dimensions:	Instrument: 5 (W) x 3.5 (D) x 16.5 (H) cm; (2 x 1.4 x 6.375 in)

HHWT-13 Specifications

Menu	Tests for *	Range	Resolution	Typical (±%) Accuracy
CN1	Cyanide	0 - 1.9 ppm	0.01	13
FE2	Iron, Total	0 - 7.5 ppm	0.01 (0-2.49 ppm) 0.1 (2.5-8 ppm)	3 (0-2.00 ppm) 5 (2.01-11 ppm)
NH3	Ammonia	0 - 2 ppm	0.01	5
PO4	Phosphate	0 - 4 ppm	0.01 (0-2.49 ppm) 0.1 (2.5-4 ppm)	4 (0-2.00 ppm) 7.5 (2.01-4 ppm)
PH5	BT-pH	5 - 10 ppm	0.01	0.2 pH (4.5-7.59 pH) 0.6 pH (7.6-9.2 pH)
SS6	Sulfide	0 - 1.1 ppm	0.01	6 (0-1.00 ppm) 9 (1.01-1.7 ppm)
F7	Fluoride			
CH8	Chloride (as NaCl)	3 - 300 ppm	1	20 (1-100 ppm) 24 (101-250 ppm) 21 (251-430 ppm)
QA9	Quaternary Ammonia			
TR0	Transmission ¹ (used for other test parameters)	99.9 - 0.01 %T	0.1 (99.9-10.0 %T) 0.01 (9.99-0.01 %T)	0.01

¹ Measurement requires a conversion chart for value.

About Your HHWT-13 Instrument

To save power, the meter is designed to turn off after 3 minutes (timed from the last button pressed). Should the meter turn off, the last stored zero in the meter will remain valid when the meter is turned on again. The HHWT-13 Photometer is controlled by three buttons:

1. **ZERO/ON:** When first pressed, this button turns the meter on. When the meter is on and this button is pressed, it zeroes the sample in the cell. Once the meter is zeroed, this zero value applies to all menu parameters and is stored and retained even when meter turns off. It is recommended that each new water sample analyzed is zeroed before testing, to maximize accuracy.
2. **MENU:** With each press, when the meter is on, the MENU button advances through the tests in the following sequence: CN1, FE2, NH3, PO4, PH5, SS6, F7, CH8, QA9, TR0. Each test menu can store up to 20 results. To **retrieve the stored results**, go to the desired test using the MENU key. When the desired test is displayed, release button and allow meter to display the last test result in that MENU. Then, **press and hold down the MENU key**. Continue holding down the MENU key to scroll the stored results for that test, starting with the most recent result. The meter will retrieve from stored memory and display the last 20 readings in sequence beginning with -20, which is the latest result, followed by -19, which is the 2nd latest result ... finally -01, which is the oldest result retained. Only the last 20 readings are stored in each menu. This meter is able to store 200 results in memory (20 in each menu).
3. **READ:** When pressed once, this button starts a **20 or 30 SECOND** countdown timer depending on the parameter being tested. If READ is pressed a second time during the countdown, the meter exits the current timing and performs the next function.

If the parameter being measured is below or above the detection range, the display will show "**LO**" (Under Range) or "**HI**" (Over Range), respectively. This feature is menu specific.

About The Accuracy/Calibration Of The HHWT-13 Photometer System

The HHWT-13 Advanced Photometric System has been factory calibrated for your convenience. Customer calibration for your own special application can be performed in the Transmission Menu. You can expect the fixed calibrations or algorithms in the meter to be valid for the life of the meter because of the quality, Long-Life LED, the photo cell, and the software as written into the meter. A blue dye calibration solution is available for verification of meter performance.

HHWT-13 is a "Green" Alternative

HHWT-13 has been designed to offer the user a more "Green" and cost-effective alternative to testing. Instead of using a 10mL water sample, HHWT-13 uses a 4mL water sample, which uses up to 60% less chemical per test. The resolution and accuracy of the meter is maintained by designing the photo cell with a 20mm pathlength.



1

1

REMOVE STRIP

Remove one (1) **HHWT-486812A** from the bottle before beginning the test. Set the strip in a dry, convenient place and recap the bottle immediately. Next, remove one (1) **HHWT-486812B** from the bottle before beginning the test. Set this strip in a dry, convenient place separate from the CN-1 strip. Recap the bottle immediately.



2

2

TURN METER ON

Press the **ZERO/ON** button to power the meter on; the display will show all annunciators, then the current MENU selection, followed by the last reading.



3

3

SELECT TEST: CN1

Press and re-press the **MENU** button until the display shows the parameter **CN1**.



4

4

FILL METER WITH SAMPLE

Rinse the **CELL** at least 3 times with the water sample you will be testing - rinsing minimizes the potential for cross-contamination from a previous test. Finally, fill cell to capacity (4mL) with the water sample. **NOTE:** The calibration of the meter is based on a water temperature between 18°C and 25°C. If temperature is below 18°C, your final Cyanide value may read low.



5

5

ZERO METER

Press the **ZERO/ON** button. The cursor will move across the display followed by **0.00 PPM**. Sample is ready for testing.



6a

6

DIP STRIP AND PRESS "READ"

Dip the **HHWT-486812A** strip into the **CELL** and immediately press **READ**. This starts the **30 SECOND** countdown timer. During this time move the strip in a gentle back and forth motion. Because the strip is 8mm wide, the strip will need to be angled in order to fit in the cell. Be sure test pad is fully submerged. **Remove and discard the strip after "1" on the display disappears.** The cursor will move across the display, informing you to get ready with the CN-2 strip. When the **30 SECOND** countdown starts, dip immediately the **HHWT-486812B** strip into the **CELL**. During this time, with the strip angled slightly, move the strip in a gentle back and forth motion. **Remove and discard the strip after "1" on the display disappears.** The meter will automatically start to count up to 600 seconds. At 600 seconds, the cursor will move across the display while the meter prepares to measure the sample. Record result displayed (this result is automatically stored in CN1 Menu).



6b



Total Iron, TPTZ (Fe⁺²/Fe⁺³) Test Procedure



(Total Iron Kit HHWT-486650 - Reducer and Strips)

- 1 TURN METER ON**
Press the **ZERO/ON** button to power the meter on; the display will show all annunciators, then the current MENU selection, followed by the last reading.
- 2 SELECT TEST: FE2**
Press and re-press the **MENU** button until the display shows the parameter **FE2**.
- 3 FILL METER WITH SAMPLE - (See Accuracy Tip 16 on Page 9)**
Rinse the **CELL** at least 3 times with the water sample you will be testing - rinsing minimizes the potential for cross-contamination from a previous test. Fill cell to capacity (4mL) with the water sample.
- 4 ADD REAGENT, CAP, AND MIX**
Tilt meter to discard about 0.2mL water in order to leave room for powder reagent. Add the contents of one **HHWT-486601** powder pillow to the **CELL** and cap meter cell with mixing cap. Press **READ** to start the **20 SECOND** countdown timer, place thumb over cap to keep cap securely in place, and mix the sample by turning the meter upside-down repetitively. **When time displays 1**, hold the meter upright and the cursor will flash and the meter will begin to count up to 40 seconds. After the 40 seconds, a result will be displayed (ignore this result).
- 5 ZERO METER**
Press the **ZERO/ON** button. The cursor will move across the display, followed by **0.00 PPM**. Sample is ready for testing.
- 6 DIP STRIP AND PRESS "READ"**
Dip the **HHWT-486631** strip into the **CELL** and immediately press **READ**. This starts the **20 SECOND** countdown timer. During this time, move the strip in a gentle back and forth motion. **Remove and discard the strip after "1" on the display disappears**. The meter will automatically count up for 40 seconds. The cursor will move across the display, informing you that it is about to measure the sample. Record result displayed (this result is automatically stored in FE2).



Ammonia (NH₃) Test Procedure



(Ammonia Kit HHWT-486654 - Reagent and Strips)

- 1 TURN METER ON**
Press the **ZERO/ON** button to power the meter on; the display will show all annunciators, then the current MENU selection, followed by the last reading.
- 2 SELECT TEST: NH3**
Press and re-press the **MENU** button until the display shows the parameter **NH3**.
- 3 FILL METER WITH SAMPLE**
Rinse the **CELL** at least 3 times with the water sample you will be testing - rinsing minimizes the potential for cross-contamination from a previous test. Finally, fill cell to capacity (4mL) with the water sample. Tilt meter to discard about 0.2mL water in order to leave room for liquid reagent. **NOTE:** The calibration of the meter is based on a water temperature between 14°C and 28°C. If temperature is below 14°C, your final Ammonia value may read low.
- 4 ADD REAGENT**
Add 3 drops of **Reagent HHWT-486654B** to the **CELL**.
NOTE: For Salt Water Analysis, add 10 drops.
- 5 ZERO METER**
Press the **ZERO/ON** button. The cursor will move across the display, followed by **0.00 PPM**. Sample is ready for testing.
- 6 DIP STRIP - (read carefully and follow procedure closely)**
Dip the **HHWT-486654A** strip into the **CELL** and immediately press **READ**. This starts the **20 SECOND** countdown timer. During this time move the strip in a gentle back and forth motion. **Remove and discard the strip after "1" on the display disappears**. The meter will automatically start to count up for 500 seconds. After the 500 seconds, the cursor will move across the display while the meter prepares to measure the sample. Record result displayed (this result is automatically stored in NH3).

MENU

Phosphate (PO₄) Test Procedure

PO₄**PO4**

(Phosphate Kit HHWT-486814 - Strips only)

1 TURN METER ON

Press the **ZERO/ON** button to power the meter on; the display will show all annunciators, then the current MENU selection, followed by the last reading.

2 SELECT TEST: PO4

Press and re-press the **MENU** button until the display shows the parameter PO4.

3 FILL METER WITH SAMPLE

Rinse the **CELL** at least 3 times with the water sample you will be testing - rinsing minimizes the potential for cross-contamination from a previous test. Finally, fill cell to capacity (4mL) with the water sample. Clean the cell with Diluted Vinegar or 0.1 N HCl or Muriatic acid.

NOTE: The calibration of the meter is based on a water temperature between 15°C and 31°C. If temperature is below 15°C, your final Phosphate value may read low. This test can also be used for Salt Water Testing.

4 ZERO METER

Press the **ZERO/ON** button. The cursor will move across the display, followed by **0.00 PPM**. Sample is ready for testing.

5 DIP STRIP - (read carefully and follow procedure closely)

Dip the **HHWT-486814** strip into the **CELL** and immediately press **READ**. This starts the **20 SECOND** countdown timer. During this time move the strip in a gentle back and forth motion.

Remove and discard the strip after "1" on the display disappears. The meter will automatically start to count down for 120 seconds. After the 120 seconds, the cursor will move across the display while the meter prepares to measure the sample. Record result displayed (this result is automatically stored in PO4).

MENU

BT-pH Test Procedure

bt**PH5**

(BT-pH Kit HHWT-486652 - Strips only)

This test procedure is for use with fresh water samples
(Salt/Chloride level, as NaCl, is less than 4,000 ppm)

1 TURN METER ON

Press the **ZERO/ON** button to power the meter on; the display will show all annunciators, then the current MENU selection, followed by the last reading.

2 SELECT TEST: PH5

Press and re-press the **MENU** button until the display shows the parameter PH5.

3 FILL METER WITH SAMPLE

Rinse the **CELL** at least 3 times with the water sample you will be testing - rinsing minimizes the potential for cross-contamination from a previous test. Finally, fill cell to capacity (4mL) with the water sample.

4 ZERO METER

Press the **ZERO/ON** button. The cursor will move across the display followed by **0.00**. Sample is ready for testing.

5 DIP STRIP AND PRESS "READ"

Dip the **HHWT-486652** strip into the **CELL** and immediately press **READ**. This starts the **20 SECOND** countdown timer. During this time move the strip in a gentle back and forth motion. **Remove and discard the strip after "1" on the display disappears.** The cursor will move across the display while the meter prepares to measure the sample. Record result displayed (this result is automatically stored in PH5).

S²⁻

Sulfide (as S²⁻) Test Procedure

MENU**SS6**

(Sulfide Kit HHWT-486818 - Reagent and Strips)

1**TURN METER ON**

Press the **ZERO/ON** button to power the meter on; the display will show all annunciators, then the current **MENU** selection, followed by the last reading.

2**SELECT TEST: SS6**

Press and re-press the **MENU** button until the display shows the parameter **SS6**.

3**FILL METER WITH SAMPLE**

Rinse the **CELL** at least 3 times with the water sample you will be testing - rinsing minimizes the potential for cross-contamination from a previous test. Finally, fill cell to capacity (4mL) with the water sample. Tilt meter to discard about 0.2mL water in order to leave room for liquid reagent.

NOTE: The calibration of the meter is based on a typical well water temperature of greater than 20°C (68°F) and uses a 20-second dip (see step 5).

4**ZERO METER**

Add 4 drops of **Reagent HHWT-486818A**. Press the **ZERO/ON** button. The cursor will move across the display, followed by **0.00 PPM**. Sample is ready for testing.

5**DIP STRIP AND PRESS “READ”**

Dip the **HHWT-486818B** strip into the **CELL** and immediately press **READ**. This starts the **30 SECOND** countdown timer. During this time move the strip in a gentle back and forth motion. If water temperature is below 20°C, **remove and discard the strip after “1” on the display disappears**. If water temperature is above 20°C, **remove and discard the strip after “10” on the display appears**. The meter will automatically, at time “0”, start to count up for 180 seconds. After the 180 seconds, the cursor will move across the display while the meter prepares to measure the sample. Record result displayed (this result is automatically stored in **SS6**).

NOTE: Maximum detection is 1.1 ppm, however best accuracy at less than 20°C is for levels less than 0.70 ppm.

F

Fluoride Test Procedure

MENU**F7**

(Fluoride Kit HHWT-486643 - Reagent Only)

1**TURN METER ON**

Press the **ZERO/ON** button to power the meter on; the display will show all annunciators, then the current **MENU** selection, followed by the last reading.

2**SELECT TEST: F7**

Press and re-press the **MENU** button until the display shows the parameter **F7**.

3**FILL METER WITH SAMPLE**

Rinse the **CELL** at least 3 times with the water sample you will be testing - rinsing minimizes the potential for cross-contamination from a previous test. Finally, fill cell to capacity (4mL) with the water sample. Tilt meter to discard about 0.2mL water in order to leave room for liquid reagent.

4**ZERO METER**

Press the **ZERO/ON** button. The cursor will move across the display, followed by **0.00 PPM**. The sample is ready for testing.

5**ADD DROPS**

Add 10 drops of **Reagent HHWT-486643** to the **CELL** and cover the meter **CELL** with the mixing cap. **NOTE:** Be sure that the bottle is straight up and down while adding drops.

6**PRESS “READ”**

Press **READ** to start the **20 SECOND** countdown timer, place thumb or finger over the cap and mix the sample by turning the meter upside-down repetitively during the countdown. After “1” on the display disappears, hold the meter level. The cursor will move across the display while the meter prepares to measure the sample. Record result displayed (this result is automatically stored in **F7**). After testing is completed, rinse cell immediately.

CAUTION: Do not allow reagent sample to contact skin or eyes.



Chloride (as NaCl) Test Procedure



(Chloride Kit HHWT-481657 - Strips Only)

1

TURN METER ON

Press the **ZERO/ON** button to power the meter on; the display will show all annunciators, then the current MENU selection, followed by the last reading.

2

SELECT TEST: CH8

Press and re-press the **MENU** button until the display shows the parameter CH8.

3

FILL METER WITH SAMPLE

Rinse the **CELL** at least 3 times with the water sample you will be testing - rinsing minimizes the potential for cross-contamination from a previous test. Finally, fill cell to capacity (4mL) with the water sample.

4

ZERO METER

Press the **ZERO/ON** button. The cursor will move across the display, followed by **0.00 PPM**. Sample is ready for testing.

5

DIP STRIP AND PRESS "READ"

Dip the **HHWT-481657** strip into the **CELL** and immediately press **READ**. This starts the **20 SECOND** countdown timer. During this time move the strip in a gentle back and forth motion (approx. 2 strokes/Sec). Remove and discard the strip after "1" on the display disappears. The cursor will move across the display while the meter prepares to measure the sample. Record result displayed (this result is automatically stored in CH8). After testing, rinse the **CELL** immediately with brush.



Quaternary Ammonia Test Procedure



(Quaternary Ammonia Kit HHWT-486823 - Strips Only)

1

TURN METER ON

Press the **ZERO/ON** button to power the meter on; the display will show all annunciators, then the current MENU selection, followed by the last reading.

2

SELECT TEST: QA9

Press and re-press the **MENU** button until the display shows the parameter QA9.

3

FILL METER WITH SAMPLE

Rinse the **CELL** at least 3 times with the water sample you will be testing - rinsing minimizes the potential for cross-contamination from a previous test. Finally, fill cell to capacity (4mL) with the water sample.

4

ZERO METER

Press the **ZERO/ON** button. The cursor will move across the display, followed by **0.00 PPM**. Sample is ready for testing.

5

DIP STRIP AND PRESS "READ"

Dip the **HHWT-486823** into the **CELL** and immediately press **READ**. This starts the **20 SECOND** countdown timer. During this time move the strip in a gentle back and forth motion (approx. 2 strokes/Sec). Remove and discard the strip after "1" on the display disappears. The cursor will move across the display while the meter prepares to measure the sample. Record result displayed (this result is automatically stored in QA9). After testing, rinse the **CELL** immediately with brush.

(Aluminum Kit HHWT-486821 - Reagent and Strips)

1 TURN METER ON
Press the **ZERO/ON** button to power the meter on; the display will show all annunciators, then the current MENU selection, followed by the last reading.

2 SELECT TEST: TR0
Press and re-press the **MENU** button until the display shows the parameter TR0.

3 FILL METER WITH SAMPLE
Rinse the **CELL** at least 3 times with the water sample you will be testing - rinsing minimizes the potential for cross-contamination from a previous test. Finally, fill cell to capacity (4ml) with the water sample.

4 ADD BUFFER
Add 6 drops of *Buffer, HHWT-486821A* to the cell.

4 ZERO METER
Press the **ZERO/ON** button. The cursor will move across the display, followed by **100 %T**. Sample is ready for testing.

5 DIP STRIP AND PRESS "READ"
Dip the *HHWT-486821B* strip into the **CELL** and immediately press **READ**. This starts the **20 SECOND** countdown timer. During this time move the strip in a gentle back and forth motion. **Remove and discard the strip after "1" on the display disappears.** The cursor will move across the display while the meter prepares to measure the sample (ignore this result). Time the reaction in the **CELL** for 60 seconds (no timer included). After 60 seconds, press **READ** again to start another **20 SECOND** countdown timer. After the **20 SECOND** countdown, the cursor will move across the display while the meter prepares to measure the sample. Record result displayed (this result is automatically stored in TR0).

6 USE TABLE
Find the "TR" result in the table below to determine the Aluminum concentration in ppb (parts per billion). (Example: a "TR" result of 65.3 (use only the 65 for the chart) equals a Aluminum value of 35 ppb). Record result. After testing is completed, rinse cell immediately.

Aluminum Table

Aluminum results require the table below. Follow **HHWT-13 Aluminum Test Procedure** (above) using *HHWT-486821A* and *HHWT-486821B*.

HHWT-486821B - for 4mL Samples

tr	9	8	7	6	5	4	3	2	1	0
90	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0
70	2	5	7	9	12	14	16	19	21	23
60	26	28	30	33	35	37	40	44	47	49
50	52	56	59	63	66	70	75	77	80	84
40	87	91	96	100	105	110	115	120	124	131
30	134	141	148	155	159	166	176	183	192	201
20	211	222	232	244	258	277	295	316	337	370
10	398	480	550	600	>600	>600	>600	>600	>600	>600
0	>600	>600	>600	>600	>600	>600	>600	>600	>600	>600

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1 TURN METER ON
Press the **ZERO/ON** button to power the meter on; the display will show all annunciators, then the current **MENU** selection, followed by the last reading.

2 SELECT TEST: TR0
Press and re-press the **MENU** button until the display shows the parameter TR0.

3 FILL METER WITH SAMPLE
Rinse the **CELL** at least 3 times with the water sample you will be testing - rinsing minimizes the potential for cross-contamination from a previous test. Finally, fill cell to capacity (4mL) with the water sample.

4 ZERO METER
Press the **ZERO/ON** button. The cursor will move across the display, followed by **100 %T**. Sample is ready for testing.

5 DIP STRIP AND PRESS "READ"
Dip the **HHWT-486810** strip into the **CELL** and immediately press **READ**. This starts the **20 SECOND** countdown timer. During this time move the strip in a gentle back and forth motion. **Remove and discard the strip after "1" on the display disappears.** The cursor will move across the display while the meter prepares to measure the sample. Record result displayed (this result is automatically stored in TR0).

6 USE TABLE
Find the "TR" result in the table below to determine the Biguanide concentration in ppm (parts per million). (Example: a "TR" result of 65.3 (use only the 65 for the chart) equals a Biguanide value of 19 ppm). Record result. After testing is completed, rinse cell immediately.

Biguanide Table

Sulfate results require the table below. Follow **HHWT-13 Biguanide Test Procedure** (above) using **HHWT-486810**.

HHWT-486810 - for 4mL Samples										
tr	9	8	7	6	5	4	3	2	1	0
90	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
80	1	1	2	3	4	5	6	7	7	8
70	9	10	10	11	12	12	13	14	15	15
60	16	17	17	18	19	20	20	21	22	23
50	23	24	25	26	26	27	28	26	29	30
40	31	32	33	34	35	35	36	37	38	39
30	40	41	42	43	45	46	47	48	50	51
20	52	54	55	57	58	60	62	64	66	68
10	70	72	75	77	80	84	88	93	100	>100
0	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100



Cyanuric Acid Test Procedure

(Cyanuric Acid Kit HHWT-481652 - Reagent only)



- 1** **TURN METER ON**
Press the **ZERO/ON** button to power the meter on; the display will show all annunciators, then the current MENU selection, followed by the last reading.
- 2** **SELECT TEST: TR0**
Press and re-press the **MENU** button until the display shows the parameter TR0.
- 3** **FILL METER WITH SAMPLE**
Rinse the **CELL** at least 3 times with the water sample you will be testing - rinsing minimizes the potential for cross-contamination from a previous test. Finally, fill cell to capacity (4ml) with the water sample.
- 4** **ZERO METER**
Press the **ZERO/ON** button. The cursor will move across the display, followed by **100 %T**. Sample is ready for testing.
- 5** **ADD REAGENT, CAP, PRESS "READ", AND MIX**
Shake the bottle of **HHWT-481652** to mix the chemical in the bottle. Then, add five (5) drops of reagent HHWT-481652 to the cell and cap meter cell with mixing cap. Press **READ** to start timer, mix sample by pressing one finger over the cap to keep it in place. Then, turn the meter over from side to side to mix during the **20 SECOND** countdown. After "1" on the display disappears, hold meter upright and the cursor will move across the display while the meter prepares to measure the sample (ignore this result). Press **READ** again to start another 20 SECOND countdown. After "1" on the display disappears, the cursor will move across the display while the meter prepares the measure the sample. Record result displayed (this result is automatically stored in TR0).
- 6** **USE TABLE**
Find the "TR" result in the table below to determine the Cyanuric Acid concentration in ppm (parts per million). (Example: a "TR" result of 75.3 (use only the 75 for the chart) equals a Cyanuric Acid value of 9.1 ppm). Record result. After testing is completed, rinse cell immediately.

Cyanuric Acid Table

Cyanuric Acid results require the table below. Follow **HHWT-13 Cyanuric Acid Test Procedure** (above) using **HHWT-481652**

NOTE: For levels above 80ppm Cyanuric Acid, dilute the sample 1/2 or 1/4 with distilled water and retest.

HHWT-481652 - for 4mL Samples

%T	9	8	7	6	5	4	3	2	1	0
90	0	0	1	1.6	1.8	2.2	2.5	2.8	3.1	3.4
80	3.75	4.1	4.9	5	5.3	5.6	5.9	6.3	6.8	7.2
70	7.8	8.1	8.4	8.8	9.1	9.7	10.3	10.6	10.9	11.6
60	12.2	12.5	13.1	13.4	14	14.7	15	15.6	16	16.6
50	17.2	17.8	18.1	18.7	19.4	20	20.6	21.3	22	22.5
40	23	23.8	24.7	25.3	26	26.9	27.5	28.1	29	30
30	31	31.6	32.5	33	34	35	36	37	38	39
20	40	41	42	44	45	47	48	50	51	52
10	54	56	58	60	62	64	67	69	72	76
0	80	>80	>80	>80	>80	>80	>80	>80	>80	>80

Rev. 121410 CY

SO₄

Sulfate (SO₄) Test Procedure

MENU
TR0

(Sulfate Kit HHWT-486608 - Strips only)

- 1 TURN METER ON**
Press the **ZERO/ON** button to power the meter on; the display will show all annunciators, then the current MENU selection, followed by the last reading.
- 2 SELECT TEST: TR0**
Press and re-press the **MENU** button until the display shows the parameter TR0.
- 3 FILL METER WITH SAMPLE**
Rinse the **CELL** at least 3 times with the water sample you will be testing - rinsing minimizes the potential for cross-contamination from a previous test. Finally, fill cell to capacity (4ml) with the water sample.
- 4 ZERO METER**
Press the **ZERO/ON** button. The cursor will move across the display, followed by **100 %T**. Sample is ready for testing.
- 5 DIP STRIP AND PRESS "READ"**
Dip the **HHWT-486608** into the **CELL** and immediately press **READ**. This starts the **20 SECOND** countdown timer. During this time move the strip in a gentle back and forth motion. **Remove and discard the strip when the time displays 1.** The cursor will move across the display, informing you that it is about to measure the sample. Record result displayed (this result is automatically stored in TR0).
- 6 USE TABLE**
Find the "TR" result in the table below to determine the Sulfate concentration in ppm (parts per million). (Example: a "TR" result of 65.3 (use only the 65 for the chart) equals a Sulfate value of 28 ppm). Record result. After testing is completed, rinse cell immediately.

Sulfate (SO₄) Table

Sulfate results require the table below. Follow **HHWT-13 Sulfate (SO₄) Test Procedure** (above) using **HHWT-486608**.

HHWT-486608 - for 4mL Samples

tr	9	8	7	6	5	4	3	2	1	0
90	0	0	0	2	3	5	7	8	9	10
80	10	11	12	13	14	15	16	16	17	17
70	18	19	20	21	21	21	22	23	23	24
60	25	26	27	27	28	29	30	31	32	32
50	33	34	35	35	36	37	38	39	40	41
40	42	43	44	45	46	47	48	49	50	52
30	53	55	56	57	58	60	62	63	64	66
20	68	71	72	74	76	77	79	82	84	87
10	89	92	95	98	101	105	109	113	117	122
0	128	134	142	150	160	170	190	200	>200	>200

Rev. 112110 BT

- 1** **TURN METER ON**
Press the **ZERO/ON** button to power the meter on; the display will show all annunciators, then the current MENU selection, followed by the last reading.
- 2** **SELECT TEST: TRO**
Press and re-press the **MENU** button until the display shows the parameter TRO.
- 3** **FILL METER WITH DISTILLED OR DEIONIZED WATER**
Rinse the **CELL** at least 3 times with distilled or deionized water. Finally, fill cell to capacity (4ml) with the distilled or deionized water water.
- 4** **ZERO METER**
Press the **ZERO/ON** button. The cursor will move across the display, followed by **100 %T**. Discard the distilled or deionized water. Rinse the meter cell at least 3 times and finally fill cell to capacity (4ml) with water to be tested for Turbidity.
- 5** **PRESS "READ"**
Press **READ**; this starts the **20 SECOND** countdown timer. Press **READ** again and the cursor will move across the display, informing you that it is about to measure the sample. Record result displayed (This result is automatically stored in TRO).
- 6** **USE TABLE**
Find the "TR" result in the table below to determine the Turbidity concentration in NTU (Nephelometric Turbidity Units). (Example: a "TR" result of 85.3 (use only the 85 for the chart) equals a Turbidity value of 36 NTU). Record Turbidity result.

Turbidity Table

Turbidity results require the table below. Follow **HHWT-13 Turbidity Test Procedure** (above). Values below are not for Compliance Testing.

(NOTE: These Turbidity values are not for Potable water Compliance Testing)

%T	9	8	7	6	5	4	3	2	1	0
90	<5	5	8	11	12	14	17	20	22	24
80	27	30	31	33	36	39	42	44	46	48
70	52	55	58	61	64	67	69	70	73	76
60	80	83	86	89	92	95	98	101	104	107
50	114	117	120	123	126	132	135	138	142	148
40	152	157	160	166	170	176	179	185	189	194
30	201	206	210	216	222	229	235	241	250	257
20	263	269	278	288	294	303	312	325	334	347
10	355	368	381	393	408	424	442	458	480	504
0	523	555	589	632	682	750	800	>800	>800	>800

This table was calibrated using stabilized Formazin Turbidity Standards.

Rev. 051611 NTU

HHWT-13 Tips For Best Accuracy


1. Become familiar with the meter and the different tests by reading the instructions carefully.
2. Observe the dip time (*as required for the test*) for accurate results.
3. Be sure the **CELL** is filled to capacity (4mL).
4. Rinse the **CELL** with clean water immediately after completing the test. (*Some test reagents will stain or coat the **CELL***)
5. Just before testing, rinse the sample **CELL** with the sample water several times to get a representative sample. (*Use deionized or distilled water for rinsing if you have a limited sample*).
6. Store the meter and all test materials out of direct sunlight and away from chemical storage areas.
7. Minimize exposure of meter and test reagents to heat above 100°F (38°C).
8. Dry the outside of the meter when testing is complete or before storage of the meter.
9. Each strip is valid for **ONLY** one test. Discard strip after single use in regular trash that is inaccessible to children and pets.
10. Each bottle of strips contains the quantity of strips notated on the bottle. Due to the manufacturing process, you may find one or two strips that are noticeably smaller or larger in width than the normal strips in the bottle for the test. These should be discarded. Using these strips may give unreliable results.
11. Each conversion table supplied has a unique revision number located in the bottom right corner of the chart. It is recommended that you visit www.sensafe.com at least every 6 months to check for any updated revisions for conversion chart or methodology.
12. Tests are calibrated at 75°F +/- 2°F (24°C +/- 1°C). If water sample is 60°F (15°C) or cooler, most tests may require additional time for full chemical development. At the end of the normal test procedure, press **READ** again and compare value after this countdown. If the new value is higher, then use the new value for your result. When possible, it is recommended that the water sample be warmed to room temperature before testing.
13. Normally the mixing cap is used for tests like Iron and Fluoride. A stirrer (such as a clean, plastic coffee stirrer) may also be used in place of the mixing cap. Use the stirrer with gentle, back and forth motion, during the 20-second countdown timing.
14. Our lab testing with the HHWT-13 meter has shown that zeroing and measuring of the sample does not require any cell cover for accurate results, even in full sunlight.
15. Remove batteries when meter is not used for more than a month.
16. Clean cell with 0.1N HCl before filling the meter with the sample to be tested for Iron. This is especially important when testing low levels of Iron after running a Sulfide test, which uses an Iron reagent. It is recommended that Iron testing be done before Sulfide testing if possible.
17. Rinse the **CELL** with clean water immediately after completing the test. *A stained cell will need to be cleaned according to procedure as described in About the Built-In Cell/Cleaning Cell (page 10).*
18. Do not drop meter. This may cause meter to stop functioning or result in broken CELL or display. These kinds of meter failures are not covered by the warranty.
19. CELL cleaning procedure: Fill cell with clean water and move the Cell cleaning brush up-and-down and back-and-forth along the walls of the cell. Afterwards, rinse the cell and the meter is ready for use again. Cleaning the cell regularly is especially recommended after you run a test that is using turbidity or precipitation chemistry for analysis (Calcium, Potassium, Cyanuric Acid, etc.).

About The Built-In Cell/Cleaning Cell

The built-in **CELL** is transparent plastic and, when filled to the top, contains 4ml. The sturdy **CELL** design will last for over 20,000 readings. Scratches on the **CELL** will not interfere or compromise the accuracy of the readings because of its fixed position. For best accuracy, rinse cell with clean water immediately after a test is completed. Do not use solvents, such as acetone, to clean the cell. When the **CELL** becomes stained or cloudy from repeated testing, or when the meter does not blank when you press the **ZERO/ON** button, the cell needs to be cleaned.

HHWT-13 Meter Messages

The following are some common messages that may be displayed, including error messages. If an error message other than those listed below is displayed, please contact technical support in the USA at (800) 872-9436.

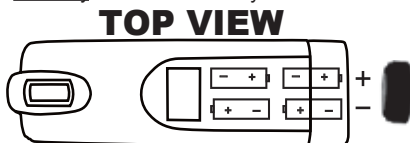
LCD Message	Description	Corrective Action
HI	In READ mode: test sample concentration is above the measurement range (test specific).	Dilute and retest. Dilution Kit available (HHWT-487200) (Not valid for pH)
LO	In READ mode: test sample concentration is below the measurement range (test specific).	Sample value is below detection capability of meter.
LO	In ZERO mode: sample absorbance (due to a cloudy or colored sample or a dirty cell) is too high to zero, the meter will read "LO".	Dilute sample, filter sample, or clean cell. Meter will not function until valid ZERO is recorded
	Low battery indication.	Replace the batteries.

About the HHWT-13 TR0 MENU

TR0: Different ions react with a specific indicator to form a color or a precipitate that proportionally indicates the concentration of the ion present by the transmission value found. A conversion chart is then used to determine the ion concentration using the transmission value. The advantage of using transmission measurement is that many different ions can be determined in one MENU, which expands the flexibility of this meter. Once you have determined the %T result for the test you ran, find this %T result in the conversion chart and read the concentration corresponding for this %T. The HHWT-13 gives the %T values as 3 digits (example 99.2) but only the first two digits are used in the charts (round off your %T value to two digits). Tests that can be used with the HHWT-13 in TR0 MENU are listed on page 18. Typically, common tests are supplied with the conversion chart in this booklet. You can also use the TR0 MENU to develop your own custom conversion chart for unusual samples or uncommon tests.

To Install/Replace "AAA" Batteries:

1. Unscrew the O-ring sealed battery cover counter-clockwise. Use proper sized pliers if necessary. Do not disturb the sealing O-ring.
2. Remove the used batteries.
3. Install 4 new AAA batteries following the diagram for correct polarity (see below).
4. Replace the battery cover. Be sure to tighten the cover securely. This is necessary for meter to be waterproof.
5. Dispose of the used batteries in accordance with your local regulations.
6. Press ZERO/ON button to confirm the meter turns on. The meter is now ready for operation.
7. Meter will not work if battery orientation is incorrect.
8. Meter will not work if battery contacts are bent due to a dropped meter. Confirmed by rattling in meter.



HHWT-13 Reagent Reorder Information

(4mL) Reagent Specifications - For use with HHWT-13

No.	PARAMETER	PART NO.	# OF TESTS	DETECTION RANGE	CHEMISTRY
1	Chloride	HHWT-481657	25	3 - 300 ppm	Silver (ppt)
2	Cyanide	HHWT-486812	50	0 - 1.9 ppm	Isonicotinic/Barbituric Acid
3	Fluoride	HHWT-486643	25		SPADNS
4	Total Iron, TPTZ (Fe+2/Fe+3)	HHWT-486650	50	0 - 7.5 ppm	TPTZ + Reducer
5	Ammonia	HHWT-486654	25	0 - 2 ppm	Salicylate method
6	Phosphate	HHWT-486814	50	0 - 4 ppm	Molybdate Method
7	BT-pH	HHWT-486652	100	5 - 10 pH	Bromothymol blue + Thymol blue
8	Quaternary Ammonia	HHWT-486823	50		Bromophenol Blue + Buffer
9	Sulfide	HHWT-486818	50	0 - 1.1 ppm	DPD Reagent / FeCl3
10	Aluminum*	HHWT-486821	50	0 - 600 ppm	PV
11	Biguanide*	HHWT-486810	50	1 - 100 ppm	Bromophenol Blue
12	Cyanuric Acid*	HHWT-481652	60	0 - 80 ppm	Melamine (ppt)
13	Sulfate*	HHWT-486608	50	0 - 200 ppm	Barium (ppt)
14	Turbidity*	None	No Reagent	5 - 800 NTU	Turbidity

* Results utilize the TR0 (Transmission) meter function and require the use of a conversion table. See respective test procedures for more information and tables.

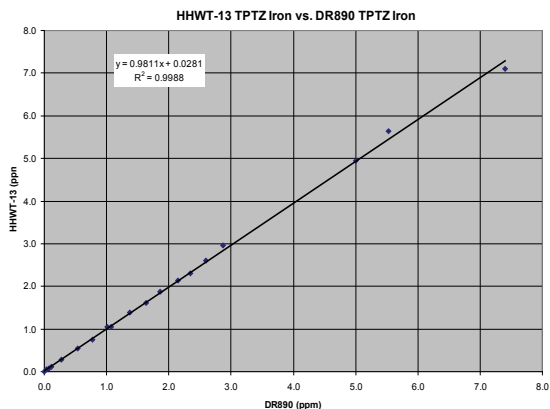
To ensure optimal performance, store your kit in a cool, dry place away from excess heat (below 100°F / 38°C), moisture, and oxidizers such as Chlorine and Bromine.

FE TPTZ Accuracy

Total Iron results are compared using the **FE TPTZ** with the **Reagent REDUCER** in the HHWT-13 Photometer using Menu FE2 versus Hach® DR890 Colorimeter in Program 39 using Hach® TPTZ Iron powder pillows (cat 26087-99).

DR890	Micro 8
0.00	0.00
0.04	0.05
0.07	0.08
0.12	0.12
0.28	0.29
0.54	0.55
0.77	0.75
1.01	1.04
1.07	1.05
1.37	1.39
1.63	1.61
1.86*	1.88
2.15*	2.13
2.35*	2.30
2.60*	2.61
2.88*	2.96
5.00*	4.95
5.53*	5.63
7.40*	7.10

*Sample diluted appropriately to read within the limits of the Hach® DR890, which is 1.80 ppm.





WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by the company will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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