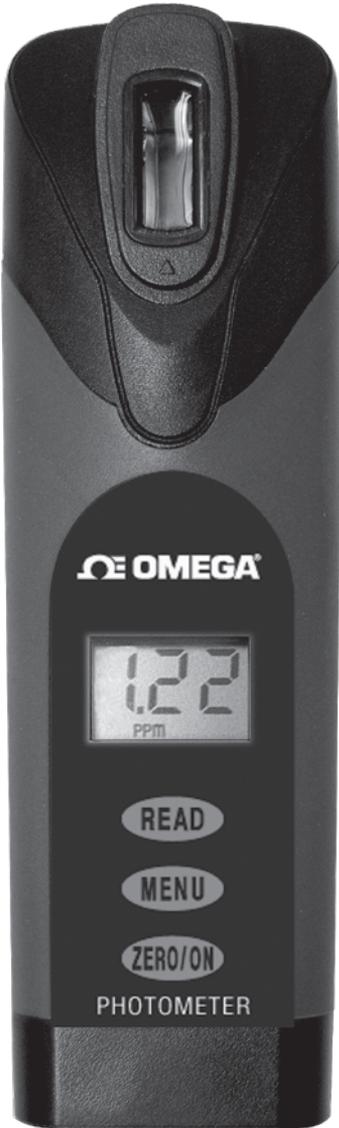


# Ω OMEGA<sup>®</sup> User's Guide



*Shop online at  
**omega.com<sup>®</sup>***

*e-mail: **info@omega.com**  
For latest product manuals:  
**omegamanual.info***

**ISO 9001**  
CERTIFIED  
CORPORATE QUALITY

STAMFORD, CT

**ISO 9001**  
CERTIFIED  
CORPORATE QUALITY

MANCHESTER, UK

# HHWT-12 Handheld Photometer Transmission Test Instructions



**OMEGAnet® Online Service**  
**omega.com**

**Internet e-mail**  
**info@omega.com**

### **Servicing North America:**

**U.S.A.:** Omega Engineering, Inc., One Omega Drive, P.O. Box 4047  
ISO 9001 Certified Stamford, CT 06907-0047 USA  
Toll Free: 1-800-826-6342 TEL: (203) 359-1660  
FAX: (203) 359-7700 e-mail: info@omega.com

**Canada:** 976 Bergar  
Laval (Quebec), H7L 5A1 Canada  
Toll-Free: 1-800-826-6342 TEL: (514) 856-6928  
FAX: (514) 856-6886 e-mail: info@omega.ca

### **For immediate technical or application assistance:**

**U.S.A. and Canada:** Sales Service: 1-800-826-6342 / 1-800-TC-OMEGA®  
Customer Service: 1-800-622-2378 / 1-800-622-BEST®  
Engineering Service: 1-800-872-9436 / 1-800-USA-WHEN®

**Mexico/  
Latin America:** En Español: 001 (203) 359-7803 FAX: 001 (203) 359-7807  
info@omega.com.mx e-mail: espanol@omega.com

### **Servicing Europe:**

**Benelux:** Managed by the United Kingdom Office  
Toll-Free: 0800 099 3344 TEL: +31 20 347 21 21  
FAX: +31 20 643 46 43 e-mail: sales@omegaeng.nl

**Czech Republic:** Frystatska 184  
733 01 Karviná, Czech Republic  
Toll-Free: 0800-1-66342 TEL: +420-59-6311899  
FAX: +420-59-6311114 e-mail: info@omegashop.cz

**France:** Managed by the United Kingdom Office  
Toll-Free: 0800 466 342 TEL: +33 (0) 161 37 29 00  
FAX: +33 (0) 130 57 54 27 e-mail: sales@omega.fr

**Germany/Austria:** Daimlerstrasse 26  
D-75392 Deckenpfronn, Germany  
Toll-Free: 0800 6397678 TEL: +49 (0) 7056 9398-0  
FAX: +49 (0) 7056 9398-29 e-mail: info@omega.de

**United Kingdom:** OMEGA Engineering Ltd.  
ISO 9001 Certified One Omega Drive, River Bend Technology Centre, Northbank  
Irlam, Manchester M44 5BD United Kingdom  
Toll-Free: 0800-488-488 TEL: +44 (0) 161 777-6611  
FAX: +44 (0) 161 777-6622 e-mail: sales@omega.co.uk

It is the policy of OMEGA Engineering, Inc. to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.

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.

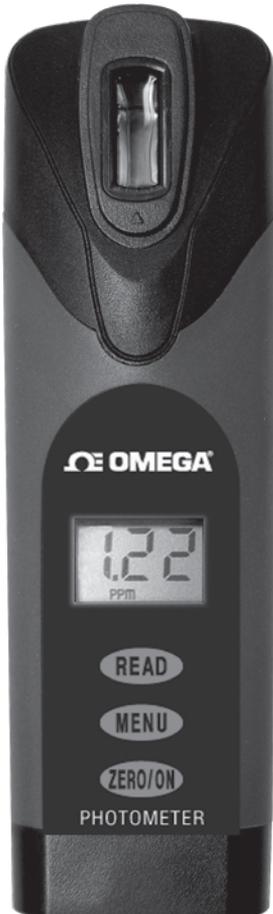
# Ω OMEGA®

# HHWT-12

## Advanced Photometer System Instruction Manual

**IDEAL FOR DRINKING WATER, POOLS AND SPAS,  
ENVIRONMENTAL, & EDUCATIONAL TESTING**

This manual covers transmission tests only. For instructions for HHWT-12 direct read tests, consult manual M-5099 that came with the meter and is also available at [Omega.com/manuals](http://Omega.com/manuals).



**USEPA  
DIN, ISO  
COMPLIANT  
FREE AND TOTAL  
CHLORINE**  
(4500-CL G, DIN STANDARD  
38 408 G4, ISO 7393/2)

### Index:

Parameter	Page
Chloride	4
Chlorine Dioxide	5
Chromium	6
Cyanuric Acid	7
Hydrogen Peroxide (Low Range)	8
Hydrogen Peroxide (Mid Range)	9
Hydrogen Peroxide (High Range)	10
Iodine	11
Manganese	12
Peracetic Acid	13
Phosphate	14
Sulfate	15
Sulfide	16
Total Hardness (Low Range)	17
Total Iron (TPTZ) & Iron (II)	18
Turbidity	19
<hr/>	
Tips for Best Accuracy	20
Error Messages	21
Battery Installation	21
Reorder Information	22





# For Tap Water Chloride (as NaCl) Test Procedure



- 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-481657** 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 Chloride concentration in ppm (parts per million). (Example: a “**TR**” result of 65.3 (use only the 65 for the chart) equals a Chloride value of 70 ppm). Record result. After testing is completed, rinse cell immediately.

## Chloride (as NaCl) Table

Sodium Chloride results require the table below. Follow **Chloride (as NaCl) Test Procedure** (above) using **HHWT-481657**. **NOTE:** To convert the NaCl value to Chloride (as Cl<sup>-</sup>), multiply the value from the chart below by 0.6. (Example: 115ppm NaCl = 69ppm Cl<sup>-</sup>)

HHWT-481657 - for 4mL Sample										
%T	9	8	7	6	5	4	3	2	1	0
90	0	0	2	4	6	8	12	14	18	20
80	24	26	28	32	34	36	40	42	46	48
70	50	52	54	58	60	62	64	66	68	70
60	72	74	76	78	80	82	84	86	88	90
50	92	94	96	98	100	102	104	105	106	108
40	110	112	114	116	117	118	120	122	124	126
30	128	130	132	134	136	138	140	142	144	146
20	150	152	154	156	158	162	164	168	170	174
10	176	180	184	188	192	198	204	210	216	226
0	234	246	256	264	272	280	288	290	>290	>290

Rev. 021213-BT

\*NOTE: When testing outdoors (sunlight), for best accuracy, use the Mixing Cap/Cell Cover when Zeroing and Reading the sample.

- 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 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** **DIP STRIP AND PRESS “READ”**  
Dip the **HHWT-484014** 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).
- 5** **ZERO METER\***  
Press the **ZERO/ON** button. The cursor will move across the display, followed by **100 %T**.
- 6** **DIP STRIP AND PRESS “READ”**  
Dip the **HHWT-486633** 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 **TRO**).
- 7** **USE TABLE**  
Find the “**TR**” result in the table below to determine the Chlorine Dioxide concentration in ppm (parts per million). (Example: a “**TR**” result of 65.3 (use only the 65 for the chart) equals a Chlorine Dioxide value of 1.03 ppm). Record result. After testing is completed, rinse cell immediately.

## Chlorine Dioxide Table

Chlorine Dioxide results require the table below. Follow **Chlorine Dioxide Test Procedure** (above) using **HHWT-486633**

**HHWT-486633 - for 4mL Sample**

%T	9	8	7	6	5	4	3	2	1	0
90	0	0	0	0	0.04	0.06	0.08	0.12	0.14	0.16
80	0.21	0.25	0.27	0.29	0.33	0.35	0.37	0.41	0.45	0.47
70	0.49	0.54	0.58	0.62	0.66	0.70	0.74	0.78	0.80	0.82
60	0.86	0.91	0.95	0.99	1.03	1.07	1.11	1.15	1.19	1.24
50	1.28	1.32	1.36	1.40	1.44	1.48	1.56	1.61	1.65	1.69
40	1.73	1.81	1.85	1.94	1.98	2.06	2.10	2.14	2.22	2.28
30	2.35	2.43	2.47	2.55	2.64	2.72	2.80	2.88	2.92	3.01
20	3.09	3.17	3.29	3.38	3.46	3.58	3.66	3.79	3.91	4.03
10	4.16	4.28	4.45	4.57	4.73	4.90	5.11	5.31	5.48	5.72
0	5.97	6.26	6.56	6.88	7.25	7.74	8.28	9.02	10	>10

Rev. 122812-BT

\*NOTE: When testing outdoors (sunlight), for best accuracy, use the Mixing Cap/Cell Cover when Zeroing and Reading the sample.

**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 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 - (read carefully and follow procedure closely)**  
Dip the **HHWT-486614 (8mm 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 **220 seconds** (timer not included). For salt water, wait for **460 seconds**. During this time, meter will shut off. When seconds have elapsed, turn on the meter and wait for the last reading to be displayed and then press **READ**, which will start a final **20 SECOND** countdown. 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 Chromium (IV) concentration in ppm (parts per million). (Example: a "TR" result of 66.3 (use only the 66 for the chart) equals a Chromium (IV) value of 0.14 ppm). Record result. After testing is completed, rinse cell immediately.

## Chromium (VI) Table

Chromium results require the table below. Follow **Chromium (VI) Test Procedure** (above) using **HHWT-486614**. This test can also be used for testing in salt water.

HHWT-486614 - for 4mL Sample

%T	9	8	7	6	5	4	3	2	1	0
90	0	0	0	0.01	0.02	0.02	0.02	0.03	0.03	0.04
80	0.04	0.05	0.05	0.05	0.06	0.06	0.06	0.07	0.07	0.08
70	0.08	0.08	0.09	0.09	0.10	0.10	0.11	0.11	0.11	0.12
60	0.12	0.13	0.13	0.14	0.14	0.14	0.15	0.15	0.16	0.16
50	0.17	0.17	0.18	0.18	0.19	0.19	0.20	0.20	0.21	0.21
40	0.22	0.23	0.23	0.24	0.24	0.24	26.00	0.26	0.27	0.28
30	0.29	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37
20	0.38	0.39	0.41	0.42	0.43	0.44	0.46	0.47	0.49	0.51
10	0.53	0.55	0.57	0.60	0.62	0.65	0.68	0.72	0.75	0.79
0	0.83	0.90	0.96	1.03	1.11	1.22	1.34	1.49	1.70	>1.70

This test is designed to detect Chromium (VI).

Rev. 122812-BT

Note: To convert Chromium(VI) to Dichromate (Cr207) multiply the value with 2.07 factor and as Chromate (CrO4) multiply with 2.23.

\*NOTE: When testing outdoors (sunlight), for best accuracy, use the Mixing Cap/Cell Cover when Zeroing and Reading the sample.



# Cyanuric Acid Test Procedure



**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 CY to the cell and cap meter cell with mixing cap. Press **READ** to start timer, place thumb or finger over cap, and mix the sample by turning the meter upside-down repetitively during the **20 SECOND** countdown. NOTE: Cover the cap completely and hold firmly. **When timer displays 1**, place meter on flat surface. Time the reaction in the **CELL** for **40 seconds** (timer not included). After the 40 seconds, press **READ** again to start another **20 SECOND** countdown\*. At the end of the 20 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 TR0). After testing, rinse cell immediately and use brush to remove any residual from previous test.

**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 8.1 ppm). Record result. After testing is completed, rinse cell immediately.

## Cyanuric Acid Table

Cyanuric Acid results require the table below. Follow **Cyanuric Acid Test Procedure** (above) using **HHWT-481652**.  
**NOTE:** For levels above 90ppm Cyanuric Acid, dilute the sample 1/2 or 1/4 with distilled water and retest.

HHWT-481652 - for 4mL Sample

%T	9	8	7	6	5	4	3	2	1	0
90	0	1	1.4	1.8	2.1	2.5	2.8	3	3.2	3.5
80	3.9	4	4.2	4.6	4.9	5.3	5.6	6	6	6.3
70	6.7	7	7.4	7.7	8.1	8.4	8.8	9.1	9.5	9.8
60	10.2	10.5	10.9	11.3	11.6	12	12.3	12.7	13	13.4
50	13.7	14.1	14.8	15.1	15.5	16.2	16.5	16.9	17.2	17.9
40	18.3	19	19.3	19.7	20.4	21.1	21.8	22.1	22.9	23.6
30	24.3	25	25.3	25.7	26.7	27.4	28.1	28.8	29.5	30.6
20	31	32	33	34	35	36	37	38	39	40
10	42	43	44	45	47	48	50	51	54	57
0	60	63	66	70	75	80	85	90	>90	>90

Rev. 011613-BT

\*NOTE: When testing outdoors (sunlight), for best accuracy, use the Mixing Cap/Cell Cover when Zeroing and Reading the sample.



# Hydrogen Peroxide LR Test Procedure



- 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-486616** 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 100 seconds (timer not included). Press **READ** again. This starts another **20 SECOND** countdown timer. After the 20 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 TR0).
- 6 USE TABLE**  
Find the "TR" result in the table below to determine the Peroxide concentration in ppm (parts per million). (Example: a "TR" result of 65.3 (use only the 65 for the chart) equals a Peroxide value of 0.23 ppm). Record result. After testing is completed, rinse cell immediately.

## Hydrogen Peroxide LR Table

Peroxide results require the table below. Follow **Hydrogen Peroxide LR Test Procedure** (above) using **HHWT-486616**.

HHWT-486616 - for 4mL Sample

%T	9	8	7	6	5	4	3	2	1	0
90	0	0	0	0	0.01	0.02	0.03	0.05	0.06	0.07
80	0.07	0.08	0.09	0.1	0.1	0.11	0.12	0.12	0.13	0.14
70	0.14	0.15	0.15	0.16	0.17	0.17	0.18	0.19	0.19	0.2
60	0.2	0.21	0.22	0.22	0.23	0.24	0.24	0.25	0.25	0.26
50	0.27	0.27	0.28	0.29	0.3	0.3	0.31	0.32	0.32	0.33
40	0.34	0.35	0.35	0.36	0.37	0.38	0.39	0.40	0.41	0.41
30	0.42	0.43	0.44	0.45	0.47	0.48	0.49	0.50	0.51	0.53
20	0.54	0.56	0.57	0.59	0.61	0.63	0.65	0.67	0.70	0.73
10	0.75	0.79	0.82	0.86	0.90	0.94	0.99	1.03	1.08	1.12
0	1.16	1.22	1.27	1.33	1.39	1.49	1.57	1.80	2.00	>2.00

Rev. 122812-BT

## About Our Hydrogen Peroxide Tests with HHWT-12

We offer two different Hydrogen Peroxide tests and they all develop a colorimetric red color by a slow oxidation reaction of hydrogen peroxide (H2O2) with iodide to form iodine. The iodine then reacts instantly with the DPD indicator to form a red color. To speed up the reaction a catalyst, Molybdate salt, is added in the Low Range and Mid Range products.

The Low Range product (HHWT-486616) is buffered to about a pH of 5.0 to 5.5, and the chemistry is essentially complete in 2 minutes at this pH if the water sample is at room temperature (between 18°C to 22°C). Cold samples (below 14C) will require 4 minutes or more to complete the reaction. Warm samples (above 23°C) will read about 10% higher. Follow directions as written to get accurate results. For values above 1.8 PPM you should dilute with distilled or Deionized water and retest.

The Mid range product (HHWT-486648) is buffered to about a pH of 2.1 to 2.4. This slows the catalytic reaction and allows the test to measure higher levels of hydrogen peroxide. This test is only accurate if your sample is at room temperature and if you follow directions as written.

The High Range product (HHWT-486676) uses no Molybdate catalyst; and therefore the reaction proceeds slowly. This allows for the detection range to be expanded to 1500 PPM. This test is accurate when directions are followed and sample temperature is at 73°F/23°C. Sample temperature has significant effect on High Range results; at 13°C values are about 40% low, and at 33°C values are about 40% high.

\*NOTE: When testing outdoors (sunlight), for best accuracy, use the Mixing Cap/Cell Cover when Zeroing and Reading the sample.

# MENU Hydrogen Peroxide MR Test Procedure

H<sub>2</sub>O<sub>2</sub> MR

## TR0

- 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-486648** 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 Peroxide concentration in ppm (parts per million). (Example: a "TR" result of 65.3 (use only the 65 for the chart) equals a Peroxide value of 2.1 ppm). Record result. After testing is completed, rinse cell immediately.

## Hydrogen Peroxide MR Table

Peroxide results require the table below. Follow **Hydrogen Peroxide MR Test Procedure** (above) using **HHWT-486648**.

HHWT-486648 - for 4mL Sample

%T	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	0	0	0	0	0	0	0	0	0	1
60	1.2	1.4	1.7	1.9	2.1	2.3	2.5	2.7	2.8	3
50	3.2	3.4	3.6	3.7	3.8	4	4.1	4.3	4.4	4.6
40	4.7	4.8	5	5.1	5.2	5.4	5.5	5.7	5.8	6
30	6.1	6.2	6.4	6.5	6.7	6.8	7	7.2	7.3	7.5
20	7.7	7.9	8	8.2	8.4	8.6	8.8	9	9.2	9.4
10	9.7	10	10.2	10.5	10.9	11.2	11.5	11.8	12.1	12.5
0	13	13.5	14	14.8	15.7	16.8	18	20	>20	>20

Rev. 010213-BT

## About Our Hydrogen Peroxide Tests with HHWT-12

We offer two different Hydrogen Peroxide tests and they all develop a colorimetric red color by a slow oxidation reaction of hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) with iodide to form Iodine. The iodine then reacts instantly with the DPD indicator to form a red color. To speed up the reaction a catalyst, Molybdate salt, is added in the Low Range and Mid Range products.

The Low Range product (HHWT-486616) is buffered to about a pH of 5.0 to 5.5, and the chemistry is essentially complete in 2 minutes at this pH if the water sample is at room temperature (between 18°C to 22°C). Cold samples (below 14C) will require 4 minutes or more to complete the reaction. Warm samples (above 23°C) will read about 10% higher. Follow directions as written to get accurate results. For values above 1.8 PPM you should dilute with distilled or Deionized water and retest.

The Mid range product (HHWT-486648) is buffered to about a pH of 2.1 to 2.4. This slows the catalytic reaction and allows the test to measure higher levels of hydrogen peroxide. This test is only accurate if your sample is at room temperature and if you follow directions as written.

The High Range product (HHWT-486676) uses no Molybdate catalyst; and therefore the reaction proceeds slowly. This allows for the detection range to be expanded to 1500 PPM. This test is accurate when directions are followed and sample temperature is at 73°F/23°C. Sample temperature has significant effect on High Range results; at 13°C values are about 40% low, and at 33°C values are about 40% high.

\*NOTE: When testing outdoors (sunlight), for best accuracy, use the Mixing Cap/Cell Cover when Zeroing and Reading the sample.

# MENU Hydrogen Peroxide HR Test Procedure

H<sub>2</sub>O<sub>2</sub> HR

## TR0

### TURN METER ON

- 1 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.

### SELECT TEST: TR0

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

### FILL METER WITH SAMPLE

- 3 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: Temperature of the water sample should be around 73°F/23°C.

### ZERO METER\*

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

### DIP STRIP AND PRESS "READ"

- 5 Dip the **HHWT-486676** 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).

### USE TABLE

- 6 Find the "TR" result in the table below to determine the Peroxide concentration in ppm (parts per million). (Example: a "TR" result of 65.3 (use only the 65 for the chart) equals a Peroxide value of 140 ppm). Record result. After testing is completed, rinse cell immediately.

## Hydrogen Peroxide HR Table

Peroxide results require the table below. Follow **Hydrogen Peroxide HR Test Procedure** (above) using **HHWT-486676**.

### HHWT-486676 - for 4mL Sample

%T	9	8	7	6	5	4	3	2	1	0
90	0	0	0	0	7	10	14	17	21	23
80	28	34	37	41	45	48	55	59	62	69
70	72	76	83	85	90	97	100	103	110	117
60	120	124	131	138	140	144	152	159	166	172
50	179	186	193	200	205	210	214	221	228	235
40	241	255	262	269	276	283	289	303	310	317
30	331	338	345	359	366	379	393	400	414	428
20	436	448	462	476	490	503	525	539	552	572
10	594	614	635	655	676	704	731	766	794	828
0	876	924	973	1035	1111	1201	1332	1500	>1500	>1500

Rev. 011413-BT

## About Our Hydrogen Peroxide Tests with HHWT-12

We offer two different Hydrogen Peroxide tests and they all develop a colorimetric red color by a slow oxidation reaction of hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) with iodide to form iodine. The iodine then reacts instantly with the DPD indicator to form a red color. To speed up the reaction a catalyst, Molybdate salt, is added in the Low Range and Mid Range products.

The Low Range product (HHWT-486616) is buffered to about a pH of 5.0 to 5.5, and the chemistry is essentially complete in 2 minutes at this pH if the water sample is at room temperature (between 18°C to 22°C). Cold samples (below 14C) will require 4 minutes or more to complete the reaction. Warm samples (above 23°C) will read about 10% higher. Follow directions as written to get accurate results. For values above 1.8 PPM you should dilute with distilled or Deionized water and retest.

The Mid range product (HHWT-486648) is buffered to about a pH of 2.1 to 2.4. This slows the catalytic reaction and allows the test to measure higher levels of hydrogen peroxide. This test is only accurate if your sample is at room temperature and if you follow directions as written.

The High Range product (HHWT-486676) uses no Molybdate catalyst; and therefore the reaction proceeds slowly. This allows for the detection range to be expanded to 1500 PPM. This test is accurate when directions are followed and sample temperature is at 73°F/23°C. Sample temperature has significant effect on High Range results; at 13°C values are about 40% low, and at 33°C values are about 40% high.

\*NOTE: When testing outdoors (sunlight), for best accuracy, use the Mixing Cap/Cell Cover when Zeroing and Reading the sample.

- 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 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-486627** 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 Iodine concentration in ppm (parts per million). (Example: a "TR" result of 65.3 (use only the 65 for the chart) equals an Iodine value of 1.43 ppm). Record result. After testing is completed, rinse cell immediately.

## Iodine Table

Iodine results require the table below. Follow **Iodine Test Procedure** (above) using **HHWT-486627**.

**HHWT-486627 - for 4mL Sample**

%T	9	8	7	6	5	4	3	2	1	0
90	0	0	0.06	0.11	0.15	0.17	0.23	0.28	0.3	0.34
80	0.4	0.42	0.46	0.51	0.54	0.57	0.63	0.69	0.72	0.74
70	0.8	0.85	0.89	0.92	0.97	1.03	1.05	1.09	1.14	1.2
60	1.26	1.32	1.37	1.4	1.43	1.49	1.54	1.6	1.66	1.72
50	1.77	1.83	1.85	1.89	1.95	2	2.06	2.12	2.17	2.23
40	2.29	2.4	2.46	2.52	2.57	2.63	2.69	2.8	2.86	2.92
30	2.97	3.09	3.2	3.26	3.32	3.43	3.55	3.6	3.72	3.78
20	3.89	4	4.12	4.23	4.35	4.46	4.58	4.69	4.86	4.98
10	5.15	5.32	5.49	5.66	5.86	6.06	6.29	6.52	6.75	7.04
0	7.32	7.72	8.05	8.52	9.04	9.73	10.53	11.3	12	>12

Rev. 011513-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: 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 - (read carefully and follow procedure closely)**

Dip the **HHWT-481020-1** 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). Next, Dip the **HHWT-481020-2** into the **CELL** and immediately press **READ**. This starts a **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\*** (CAUTION: discard this strip in regular trash that is inaccessible to children and pets). The cursor will move across the display while the meter prepares to measure the sample (ignore this result again). Press the **ZERO/ON** button. The cursor will move across the display, followed by **100 %T**.

**6**

**ADD REAGENT, CAP, MIX, AND WAIT 2 MINUTES**

Shake the bottle of **HHWT-486606-R** and add three (3) drops (*Precaution: make sure that the bottle is straight*) and cover the meter **CELL** with the mixing cap. Press **READ** to start timer, place thumb over the cap and mix the sample by turning the meter upside-down repetitively during the **20 SECOND** countdown. **When the time displays 1**, hold the meter upright. Time the reaction in the cell for **100 seconds** (timer not included). After the 100 seconds, press **READ**. 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**).

**7**

**USE TABLE**

Find the "TR" result in the table below to determine the Manganese concentration in ppm (parts per million). (Example: a "TR" result of 45.3 (use only the 45 for the chart) equals a Manganese value of 0.05 ppm). Record result. After testing is completed, rinse cell immediately.

## Manganese (as Mn<sup>2+</sup>) Table

Manganese results require the table below. Follow **Manganese Test Procedure** (above) using **HHWT-481020-1, HHWT-481020-2, HHWT-486606-R**.

**HHWT-481020-1, HHWT-481020-2, & HHWT-486606-R - for 4mL Sample\*\***

%T	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	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0
40	0.02	0.03	0.04	0.05	0.05	0.06	0.07	0.08	0.09	0.09
30	0.10	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.20
20	0.21	0.22	0.23	0.24	0.26	0.27	0.29	0.31	0.32	0.34
10	0.36	0.37	0.39	0.41	0.43	0.46	0.49	0.52	0.54	0.57
0	0.61	0.66	0.70	0.75	0.82	0.89	0.99	1.13	1.30	>1.30

This table was calibrated using Mn<sup>2+</sup> Manganese Standards

Rev. 122812 MN

\*NOTE: When testing outdoors (sunlight), for best accuracy, use the Mixing Cap/Cell Cover when Zeroing and Reading the sample.

\*\*Kit contents not sold separately



# Peracetic Acid Test Procedure



- 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-486674** 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 the result displayed (this result is automatically stored in TR0).
- 6 USE TABLE**  
Find the "TR" result in the table below to determine the Peracetic Acid concentration in ppm (parts per million). (Example: a "TR" result of 65.3 (use only the 65 for the chart) equals a Peracetic Acid value of 0.52). Record result. After testing is completed, rinse cell immediately.

## Peracetic Acid Table

Peracetic Acid results require the table below. Follow **Peracetic Acid Test Procedure** (above) using **HHWT-486674**.

HHWT-486674 - for 4mL Sample										
%T	9	8	7	6	5	4	3	2	1	0
90	0	0.02	0.04	0.06	0.08	0.1	0.12	0.13	0.15	0.16
80	0.18	0.19	0.21	0.22	0.23	0.25	0.26	0.27	0.29	0.3
70	0.31	0.33	0.34	0.35	0.37	0.38	0.4	0.41	0.42	0.44
60	0.45	0.47	0.48	0.5	0.52	0.53	0.55	0.56	0.58	0.6
50	0.61	0.63	0.65	0.67	0.69	0.71	0.73	0.75	0.77	0.79
40	0.81	0.84	0.86	0.89	0.91	0.94	0.97	0.99	1.03	1.06
30	1.08	1.11	1.15	1.18	1.22	1.25	1.29	1.32	1.36	1.40
20	1.44	1.48	1.52	1.56	1.61	1.65	1.70	1.74	1.79	1.84
10	1.89	1.95	2.00	2.06	2.13	2.19	2.27	2.35	2.44	2.54
0	2.65	2.79	2.94	3.12	3.30	3.50	3.74	4.30	5.00	>5.0

Rev. 122812-BT

**NOTE:** Various oxidizing agents such as halogens, ferric ions, and cupric ions will produce high test results. The detection of peracetic acid is very selective in the presence of peroxide and tests can tolerate up to 35 times excess of Peroxide to Peracetic Acid ratio. If your Hydrogen Peroxide to Peracetic Acid ratio is in excess of 35, it is recommended that Hydrogen Peroxide interference be removed by adding a small amount of catalase enzyme to the test solution before testing.

\*NOTE: When testing outdoors (sunlight), for best accuracy, use the Mixing Cap/Cell Cover when Zeroing and Reading the sample.

**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 SAMPLE - (See Accuracy Tips 19 & 20 on Page 20)**  
Clean the cell with Distilled vinegar (5%), 0.1 N HCl or Muriatic Acid before starting this test. 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-486814** 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 **100 seconds** (timer not included). Press **READ** again. This starts another **20 SECOND** countdown timer. The cursor will move across the display while the meter prepares 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 Phosphate concentration in ppm (parts per million). (Example: a "TR" result of 85.3 (use only the 85 for the chart) equals a Phosphate value of 0.36 ppm). Record result. After testing is completed, rinse cell immediately.

## Phosphate Table

Iron results require the table below. Follow **Phosphate Test Procedure** (above) using **HHWT-486814**. This Test can also be used for Salt Water Testing.

HHWT-486814 - for 4mL Sample

%T	9	8	7	6	5	4	3	2	1	0
90	<0.03	<0.03	<0.03	<0.03	0.03	0.05	0.08	0.11	0.14	0.17
80	0.20	0.25	0.30	0.33	0.36	0.40	0.43	0.46	0.49	0.52
70	0.56	0.59	0.63	0.66	0.70	0.74	0.78	0.82	0.86	0.89
60	0.94	0.97	1.02	1.07	1.10	1.15	1.19	1.24	1.28	1.33
50	1.38	1.42	1.47	1.52	1.56	1.62	1.68	1.73	1.78	1.83
40	1.89	1.94	2.01	2.06	2.13	2.19	2.26	2.32	2.40	2.46
30	2.52	2.60	2.67	2.75	2.83	2.90	2.98	3.08	3.16	3.26
20	3.35	3.44	3.54	3.66	3.76	3.87	4.00	4.12	4.20	>4.2
10	>4.2	>4.2	>4.2	>4.2	>4.2	>4.2	>4.2	>4.2	>4.2	>4.2
0	>4.2	>4.2	>4.2	>4.2	>4.2	>4.2	>4.2	>4.2	>4.2	>4.2

Rev. 011613-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 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 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 TRO).
- 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 22 ppm). Record result. After testing is completed, rinse cell immediately.

## Sulfate (SO<sub>4</sub><sup>-2</sup>) Table

Sulfate results require the table below. Follow **Sulfate (SO<sub>4</sub><sup>-2</sup>) Test Procedure** (above) using **HHWT-486608**.

HHWT-486608 - for 4mL Sample										
%T	9	8	7	6	5	4	3	2	1	0
90	0	0	1	1	2	2	3	3	4	5
80	5	6	6	7	8	8	9	9	10	10
70	11	12	13	13	14	15	15	16	17	18
60	18	19	20	21	22	23	23	24	24	25
50	26	27	28	29	30	31	32	33	34	35
40	36	37	38	39	40	41	42	43	45	46
30	48	49	50	52	53	55	56	58	59	61
20	63	65	67	68	70	73	75	77	80	82
10	84	88	90	94	97	100	105	108	112	117
0	123	129	137	145	155	165	185	200	220	>220

Rev. 011613-BT

\*NOTE: When testing outdoors (sunlight), for best accuracy, use the Mixing Cap/Cell Cover when Zeroing and Reading the sample.

- 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 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-486646** 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 Sulfide concentration in ppm (parts per million). (Example: a "TR" result of 65.3 (use only the 65 for the chart) equals a Sulfide value of 1.02 ppm). Record result. After testing is completed, rinse cell immediately.

## Sulfide (as H<sub>2</sub>S) Table

Sulfide results require the table below. Follow **Sulfide Test Procedure** (above) using **HHWT-486646**.

HHWT-486646 - for 4mL Sample

%T	9	8	7	6	5	4	3	2	1	0
90	0	0	0	0	0	0.04	0.08	0.11	0.15	0.19
80	0.23	0.27	0.3	0.34	0.38	0.42	0.45	0.49	0.53	0.55
70	0.57	0.61	0.64	0.68	0.7	0.72	0.76	0.8	0.83	0.85
60	0.86	0.91	0.95	0.99	1.02	1.06	1.1	1.14	1.17	1.21
50	1.25	1.27	1.29	1.33	1.36	1.4	1.48	1.52	1.55	1.59
40	1.63	1.67	1.71	1.78	1.82	1.86	1.93	1.97	2.05	2.08
30	2.16	2.2	2.27	2.35	2.39	2.46	2.54	2.61	2.69	2.77
20	2.84	2.96	3.03	3.11	3.22	3.33	3.45	3.56	3.68	3.83
10	3.98	4.09	4.28	4.43	4.62	4.85	5.08	5.3	5.57	5.87
0	6.21	6.56	6.97	7.43	7.96	8.5	9	>9	>9	>9

Rev. 011613-BT

\*NOTE: When testing outdoors (sunlight), for best accuracy, use the Mixing Cap/Cell Cover when Zeroing and Reading the sample.

**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 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-486630** 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 TRO).

**6**

**USE TABLE**

Find the “TR” result in the table below to determine the Total Hardness concentration in ppm (parts per million). (Example: a “TR” result of 65.3 (use only the 65 for the chart) equals a Total Hardness value of 9.5 ppm). Record result. After testing is completed, rinse cell immediately.

## Total Hardness Low Range Table

Low Range Total Hardness results require the table below. Follow **Total Hardness Low Range Test Procedure** (above) using **HHWT-486630**.

**HHWT-486630 - for 4mL Sample**

%T	9	8	7	6	5	4	3	2	1	0
90	0	0	0	0	0	0	0	0	0	0
80	0	1	1.3	1.5	1.7	2.1	2.5	2.8	3	3.5
70	3.9	4.3	4.7	5.1	5.6	6	6.5	6.9	7.3	7.5
60	7.7	8.2	8.6	9	9.5	10	10	11	11	12
50	12	13	13	14	14	15	15	16	16	17
40	18	18	19	19	20	21	21	22	23	24
30	24	25	26	27	28	28	29	30	31	32
20	33	34	35	36	37	38	39	40	42	43
10	45	46	48	50	51	53	55	58	60	62.7
0	66	70	73	78	83	89	95	100	>100	>100

This table was calibrated using CaCO<sub>3</sub> Standards

Rev. 011513-BT

\*NOTE: When testing outdoors (sunlight), for best accuracy, use the Mixing Cap/Cell Cover when Zeroing and Reading the sample.



# Total Iron, TPTZ (Fe<sup>2+</sup>/Fe<sup>3+</sup>) & Iron (II) Test Procedure



(Total Iron, TPTZ Kit HHWT-486650 - Powder Pillows 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: TRO

Press and re-press the **MENU** button until the display shows the parameter **TR0**.

**3**

## FILL METER WITH SAMPLE - (See Accuracy Tips 19 & 20 on Page 20)

Clean the cell with Distilled vinegar (5%), 0.1 N HCl or Muriatic Acid before starting this test. 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 - Skip this step if testing only Iron (II)

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 **100 %T**. Sample is ready for testing.

**6**

## DIP STRIP AND PRESS "READ"

Dip the **HHWT-486631** 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). Wait 20 seconds (timer not included) and press **READ** to start an additional **20 SECOND** countdown. **When time displays 1**, 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**).

**7**

## USE TABLE

Find the "TR" result in the table below to determine the Iron concentration in ppm (parts per million). (Example: a "TR" result of 85.3 (use only the 85 for the chart) equals an Iron value of 0.11 ppm). Record result. After testing is completed, rinse cell immediately and clean with brush.

## Total Iron, TPTZ (Fe<sup>2+</sup>/Fe<sup>3+</sup>) Table

Iron results require the table below. Follow **Total Iron, TPTZ (Fe<sup>2+</sup>/Fe<sup>3+</sup>) & Iron (II) Test Procedure** (above) using **HHWT-486650**.

HHWT-486650 - for 4mL Sample\*\*

%T	9	8	7	6	5	4	3	2	1	0
90	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	0.03	0.05
80	0.06	0.07	0.08	0.09	0.11	0.13	0.14	0.16	0.17	0.18
70	0.21	0.23	0.23	0.25	0.26	0.28	0.30	0.32	0.32	0.34
60	0.37	0.39	0.39	0.41	0.44	0.46	0.48	0.48	0.51	0.53
50	0.55	0.58	0.59	0.62	0.62	0.64	0.66	0.69	0.71	0.74
40	0.76	0.78	0.83	0.85	0.87	0.90	0.92	0.94	0.97	1.01
30	1.03	1.08	1.10	1.13	1.17	1.20	1.24	1.26	1.31	1.33
20	1.38	1.43	1.47	1.52	1.56	1.61	1.66	1.70	1.75	1.82
10	1.86	1.93	2.00	2.07	2.14	2.21	2.30	2.40	2.48	2.58
0	2.69	2.83	2.98	3.11	3.30	3.52	3.77	4.09	4.50	>4.5

This table was calibrated using Fe<sup>2+</sup> Iron Standards

Rev. 011613-BT

\*NOTE: When testing outdoors (sunlight), for best accuracy, use the Mixing Cap/Cell Cover when Zeroing and Reading the sample.

\*\*Kit contents not sold separately

- 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 TR0.
  
- 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.
  
- 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 TR0).
  
- 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 **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	<4	7	10	11	14	16	18	20	22	25
80	28	30	32	34	36	39	42	44	46	50
70	53	55	57	60	64	68	70	72	74	78
60	81	85	88	90	92	96	99	103	106	109
50	113	117	120	124	127	131	138	142	145	149
40	152	158	162	166	170	174	180	184	191	198
30	202	209	212	223	227	234	237	245	251	259
20	269	276	283	290	301	308	319	325	336	350
10	361	372	386	400	416	435	450	468	490	514
0	540	574	609	650	706	758	800	>800	>800	>800

*This table was calibrated using stabilized Formazin Turbidity Standards.*

**Rev. 121012-BT**

\*NOTE: When testing outdoors (sunlight), for best accuracy, use the Mixing Cap/Cell Cover when Zeroing and Reading the sample.

## HHWT-12 Tips For Best Accuracy

---

1. Become familiar with the meter and the different tests by reading the instructions carefully.
2. The Free Chlorine, Combined Chlorine, and Total Chlorine reagents are compliant for meeting USEPA (4500-Cl G); ISO 7393/2; and German DIN 38408 G4-2 requirements.
3. Observe the dip time (*as required for the test*) for accurate results.
4. Test immediately after filling the **CELL** with water sample when testing for oxidizers such as Chlorine and Bromine (Ozone can be measured in CL3 MENU).
5. Be sure the **CELL** is filled to capacity (4mL), especially for pH and Total Alkalinity.
6. Rinse the **CELL** with clean water immediately after completing each test. Some reagents may stain the CELL if not rinsed shortly after use. Other reagents including Cyanuric Acid, Chloride, and Calcium Hardness may coat the CELL wall. It is recommended, after these tests, to use the Cell Cleaning Brush with water to clean the CELL.
7. 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 amount of sample*).
8. Store the meter and all test materials out of direct sunlight and away from chemical storage areas.
9. Minimize exposure of meter and test reagents to heat above 32°C (90°F).
10. Dry the outside of the meter when testing is complete or before storage of the meter.
11. When running a DPD-1 Free Chlorine test **AFTER** a Total Chlorine DPD-3, a Total Chlorine DPD-4, or a HR Chlorine test, rinsing is very important to remove residual KI, which may interfere.
12. Each Strip Micro is valid for **ONLY** one test. Discard strip after single use in regular refuse that is inaccessible to children and pets.
13. Each bottle of Strip Micro contains the quantity of strips notated on the bottle. Due to the strip slitting process, you may find one or two strips that are noticeably smaller or larger in width than the normal strips in the bottle. These should be discarded. Using these strips may give unreliable results.
14. Every lookup table has a unique revision number located in the bottom right corner. We recommended you visit [www.omega.com](http://www.omega.com) every 6 months for updated revisions.
15. The HHWT-12 Meter is not compatible for use with DPD-1, DPD-3, and DPD-4 powder pillows, tablets, and liquids available from other manufacturers. Accurate results can only be guaranteed by using genuine Micro strips or reagents (*reorder information on page 22*).
16. Our lab testing with the HHWT-12 meter has shown that zeroing and measuring of the sample normally does not require any cell cover for accurate results, except in sunlight. To obtain optimal accuracy when testing with the meter outdoors (sunlight), use the Mixing Cap/Cell Cover when zeroing and reading the sample.
17. Remove batteries when meter is not used for more than a month (Warranty Requirement).
18. It is recommended that Pool and Spa samples for oxidizers (such as Chlorine) be taken 18 inches below the surface as follows: submerge meter with open cell facing down 18 inches, and then turn meter upright at that depth to fill the cell. Remove meter from water with the sample for testing.
19. Clean cell with 0.1N HCl, Distilled Vinegar (5%), or Muriatic Acid before filling the meter with the sample to be tested for Iron and Phosphate. 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.
20. If running multiple tests in a row, using the same water sample, for Iron or Phosphate, the CELL does not have to be rinsed or cleaned with acid between each test. It is recommended that the CELL be rinsed three times with the sample water.

## HHWT-12 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 Omega technical support in the USA at (800) 872-9436.

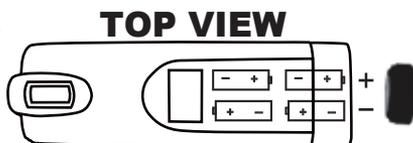
LCD Message	Description	Corrective Action
HI	In READ mode: test sample concentration is above the measurement range (test specific).	Dilute and retest.
LO	In READ mode: test sample concentration is below the measurement range (test specific).	Sample value is below measurement range.
LO	In ZERO mode: 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. One of these options should remedy the problem.
ER	Excessive stray light detected. Normally this does not occur, even when testing in sunlight.	Place the LIGHT BLOCKING CAP over the CELL for zeroing and for reading result. Moving to a shaded area can also fix this problem.
	Low battery indication.	Replace the batteries.

## About The Built-In 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. Clean as follows: 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 Hardness and Cyanuric Acid).

## 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. Batteries are not included.
2. Remove the used batteries and install 4 new AAA batteries following the diagram for correct polarity (see diagram). We recommend high quality AAA alkaline batteries be used.
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.



# Strip Reagent Reorder Information

**Strip Micro (4mL) Reagent Specifications - For use with HHWT-12**

No.	PARAMETER	PART NO.	# OF TESTS	DETECTION RANGE	CHEMISTRY
	Reference Standard	HHWT-486602	15	N/A	N/A
1	Alkalinity, Total	HHWT-486641	100	1 - 320 ppm	Alizarin Red S + Citrate
2	Bromine (DPD-1)	HHWT-486636	100	0.1- 12 ppm	DPD
3	Chlorine, Free (DPD-1)	HHWT-486637	100	0 - 5 ppm	DPD
4	Chlorine, High Range	HHWT-486672	50	0.3 - 300 ppm	KI + Buffer
5	Chlorine, Total (DPD-3)**	HHWT-486638	100	0 - 5 ppm	KI
6	Chlorine, Total (DPD-4)	HHWT-486670	100	0 - 5 ppm	DPD + KI
7	Copper (Cu <sup>2+</sup> )	HHWT-486632	50	0 - 11 ppm	Biquinoline
8	Hardness, Total (as CaCO <sub>3</sub> )	HHWT-486673	50	4 - 300 ppm	Phthalein Purple
9	Ozone (DPD-4)	HHWT-486634	100	0 - 5 ppm	DPD + KI
10	Permanganate (DPD-1)	HHWT-486626	100	0 - 5 ppm	DPD
11	pH	HHWT-486639	100	5.5 - 8.8 pH	Phenol Red
12	Nitrate (as NO <sub>3</sub> )	HHWT-486655	50	0.12 - 30 ppm	Zinc Reduction
13	Nitrite (as NO <sub>2</sub> <sup>-2</sup> )	HHWT-486623	50	0 - 1.8 ppm	Chromotropic Acid
14	Chloride (as NaCl) II*	HHWT-481657	25	0 - 290 ppm	Silver (ppt)
15	Chlorine Dioxide (DPD-1)*	HHWT-486633	100	0 - 10 ppm	DPD
16	Chromium (VI)*	HHWT-486614	50	0 - 1.7 ppm	Diphenylcarbazide
17	Cyanuric Acid II*	HHWT-481652	60	0 - 90 ppm	Melamine (ppt)
18	Glycine (used for Chlorine Dioxide)	HHWT-484014	50	N/A	Glycine
19	Hydrogen Peroxide LR*	HHWT-486616	50	0 - 2 ppm	DPD + PO4 + MoO4 + KI
20	Hydrogen Peroxide MR*	HHWT-486648	50	0 - 20 ppm	DPD + MoO4 + KI + acid
21	Hydrogen Peroxide HR*	HHWT-486676	100	0 - 1500 ppm	DPD + KI
22	Iodine (DPD-1)*	HHWT-486627	100	0 - 12 ppm	DPD
23	Total Iron, TPTZ (Fe <sup>2+</sup> /Fe <sup>3+</sup> )*	HHWT-486650	50	0.02 - 4.5 ppm	TPTZ + PP
24	LR Total Hardness (as CaCO <sub>3</sub> )*	HHWT-486630	100	0 - 100 ppm	Phthalein Purple
25	Manganese*	HHWT-486606	24	0 - 1.3 ppm	PAN + Cyanide
26	Peracetic Acid (DPD-4)*	HHWT-486674	100	0 - 5 ppm	DPD + KI
27	Phosphate*	HHWT-486814	50	0.03 - 4.2 ppm	Molybdate Method
28	Sulfate*	HHWT-486608	50	0 - 220 ppm	Barium (ppt)
29	Sulfide (as H <sub>2</sub> S)*	HHWT-486646	50	0 - 9 ppm	Nitroprusside
30	Turbidity*	None	N/A	7 - 800 NTU	Turbidity

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

\*\* Total Chlorine DPD-3 Test requires Free Chlorine DPD-1 (HHWT-486637) to be run first.

R041613

**Consult manual M-5099 for complete instructions on Direct Read Test procedures.**

NOTE: Because most of our products are test strips or use reagents that have little or no hazard in the quantity sold, MSDS sheets are not supplied with the test.

**If your required procedure is not listed in this manual, please see the back page for our contact information.**

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



## 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.

OMEGA is a registered trademark of OMEGA ENGINEERING, INC.

© Copyright 2012 OMEGA ENGINEERING, INC. All rights reserved. This document may not be copied, photocopied, reproduced, translated, or reduced to any electronic medium or machine-readable form, in whole or in part, without the prior written consent of OMEGA ENGINEERING, INC.

# Where Do I Find Everything I Need for Process Measurement and Control? **OMEGA...Of Course!** *Shop online at [omega.com](http://omega.com)<sup>SM</sup>*

## **TEMPERATURE**

- Thermocouple, RTD & Thermistor Probes, Connectors, Panels & Assemblies
- Wire: Thermocouple, RTD & Thermistor
- Calibrators & Ice Point References
- Recorders, Controllers & Process Monitors
- Infrared Pyrometers

## **PRESSURE, STRAIN AND FORCE**

- Transducers & Strain Gages
- Load Cells & Pressure Gages
- Displacement Transducers
- Instrumentation & Accessories

## **FLOW/LEVEL**

- Rotameters, Gas Mass Flowmeters & Flow Computers
- Air Velocity Indicators
- Turbine/Paddlewheel Systems
- Totalizers & Batch Controllers

## **pH/CONDUCTIVITY**

- pH Electrodes, Testers & Accessories
- Benchtop/Laboratory Meters
- Controllers, Calibrators, Simulators & Pumps
- Industrial pH & Conductivity Equipment

## **DATA ACQUISITION**

- Data Acquisition & Engineering Software
- Communications-Based Acquisition Systems
- Plug-in Cards for Apple, IBM & Compatibles
- Data Logging Systems
- Recorders, Printers & Plotters

## **HEATERS**

- Heating Cable
- Cartridge & Strip Heaters
- Immersion & Band Heaters
- Flexible Heaters
- Laboratory Heaters

## **ENVIRONMENTAL MONITORING AND CONTROL**

- Metering & Control Instrumentation
- Refractometers
- Pumps & Tubing
- Air, Soil & Water Monitors
- Industrial Water & Wastewater Treatment
- pH, Conductivity & Dissolved Oxygen Instruments