This is a new revision. The [First Time Use process](#) as defined in [TFC-OPS-OPER-C-13](#) can be used during the initial performance of this revision.

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1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides instructions for a one, two or three (3) point Calibration of YSI Model 60 Handheld pH and Temperature Probe.

1.2 Scope

This procedure pertains to YSI Model 60 Handheld pH and Temperature Probe that provides the following:

- Solution Temperature reading
- Ability to perform a one, two or three point calibration using a 4 pH, 7 pH and 10 pH buffer solution
- Visual display of pH reading and temperature °C.

2.0 INFORMATION

2.1 General Information

2.1.1 The model 60 automatically accounts for pH changes with temperature, and, the pH values displayed during calibration will vary with temperature.

2.1.2 The YSI Model 60 is shipped without the pH sensor installed. The pH sensor must be installed before use (see Figure 2 – Installing the Sensor). The sensor is shipped with a protective bottle filled with a mixture of pH 4 buffer and solution. Do not remove bottle until ready for use. Save the bottle for long term storage of the probe.

2.1.3 Accurate Calibration requires that Sensor and standard solution should be stable and approximately the same temperature. This pH calculation under new temperature conditions is automatically carried out by the YSI 60 software.

2.2 Terms and Definitions

- DI Water - Deionized Water
3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

**WARNING** - Failure to use protective equipment when performing calibration with 4 pH, 7 pH and 10 pH buffer solutions could result in serious eye and or skin injury.

3.1.1 Eye wash station should be located near the testing area.

3.1.2 Chemical Goggles and Chemical Gloves should be worn when handling pH solutions.

3.1.3 Additional job specific protective equipment requirements should be addressed during the pre-job brief and be in accordance with TFC-ESHQ-S_IS-C-02.

3.2 Equipment Safety

**CAUTION** - To prevent permanent damage to the electrode, never use distilled or deionized (DI) water for soaking or storage pH probe. However, it **IS** recommended that DI water be used to rinse the electrode when cleaning and/or transferring to another solution.

**CAUTION** - To prevent pH probe from drying, add 6 to 8 drops of tap water to the sponge in the Probe Transport Chamber and place the probe in the chamber when not in use (up to 1 week) or store in the protective bottle with pH4 buffer solution for long term storage (greater than one week).

3.3 Radiation and Contamination Control

Work in radiological areas will be performed using a Radiological Work Permit following review by Radiological Control per the ALARA Work Planning procedure TFC-ESHQ-RP_RWP-C-03.
4.0 PREREQUISITES

4.1 Special Tools, Equipment and Supplies

The following supplies may be needed to perform this procedure:

- 100 mL graduated cylinder (vendor provided with Model 60)
- Goggles/Safety Glasses
- Chemical Gloves
- Demin water, approximately 1 quart
- Cleanup rags
- GHS-SDS and/or MSDS # 060906 for 4 pH Buffer Solution
- GHS-SDS and/or MSDS # 060907A for 7 pH Buffer Solution
- GHS-SDS and/or MSDS # 060908A for 10 pH Buffer Solution
- Other tools, equipment and supplies as identified by Shift Manager/OE/FWS/User.

4.2 Performance Documents

The following documents may be needed to perform this procedure:

- YSI Model 60 Handheld pH and Temperature Probe Ops Manual A31136A
- YSI 60 pH Meter Calibration and Maintenance protocol; YSI 60 maint-cal.
- TO-100-052 Perform Waste Generation, Segregation, Accumulation and Clean-up

4.3 Field Preparation

4.3.1 **ADD** 6 to 8 drops of tap water to sponge in the “Probe Transport Chamber” (to prevent pH probe from drying) and place the probe in the chamber when not in use (up to 1 week), reference Figure 1.

4.3.2 **ENSURE** eye wash station is located near testing area.

4.3.3 **DON** the appropriate PPE while performing Calibration in the event the Meter, Cable and Probe have been contaminated from previous use.
5.0  PROCEDURE

Special Instructions
For proper care and to prevent damage to YSI Model 60 pH and Temperature system, refer to Attachment 2 – Maintenance of the pH Sensor for the following:

- Sensor Precautions
- Sensor Cleaning
- Sensor Storage.

5.1  Initial or Replacement Sensor Installation

5.1.1  IF the sensor is already attached to the probe and does not need replacement, GO TO Step 5.2.3.

5.1.2  REFER to Figure 2 for Sensor installation.

Special Instructions
Save the storage bottle and solution for long term (over one week) storage of the sensor, and seal the storage bottle with the cap provided.

**WARNING**
Failure to use protective equipment when performing calibration with 4 pH, 7 pH and 10 pH buffer solutions could result in serious eye and or skin injury.

5.1.1  DON PPE; Chemical gloves, and Chemical goggles.

5.1.2  REMOVE the sensor from the protective storage bottle (containing pH 4 buffer solution).

5.1.3  INSERT the pH sensor into the probe body (align the tabs on the sensor with the slots in the probe body) AND TWIST ¼ turn to lock in place.

5.1.4  AFTER locking in place, leave the pH sensor attached to the probe assembly until replacement is needed.

5.1.5  INSTALL the sensor in the storage bottle and solution for long term (over one week) storage of the sensor, AND SEAL the storage bottle with the cap provided, see Attachment 1.
5.2 Instrument Calibration

**Special Instructions**

The YSI Model 60 must be calibrated prior to making pH measurements.

For best results:

- Calibrate as close as possible to sample temperature
- After pH sensor storage in pH 4 buffer solution, place the pH sensor in pH 7 buffer and allow to acclimate before calibrating (5 to 10 minutes)
- Always give the pH and temperature sensors enough time (≥ 60 seconds) to equilibrate with the temperature of the buffer.

5.2.1 **IF** the probe is in the long-term storage bottle, **REMOVE** it from bottle and cap, (Attachment 1).

5.2.2 **IF** the probe is in the Transport Chamber, **REMOVE** probe, **AND**

**RINSE** the probe with deionized water.

5.2.3 **PRESS** the on/off key on the YSI Model 60.

5.2.4 **IF** instrument does not display pH and °C, **PRESS** the MODE key until pH and °C is displayed.

5.2.5 **DRY** the probe or rinse it with some of the pH buffer solution to be used for calibration.

---

**WARNING**

Failure to use protective equipment when performing calibration with 4 pH, 7 pH and 10 pH buffer solutions could result in serious eye and skin injury.

5.2.6 **DON** PPE; Chemical gloves, and Chemical goggles.

5.2.7 **PLACE** 30 to 35 mL of the 7.00 pH buffer to calibrate system with in the 100 mL graduated cylinder.

5.2.8 **IMMERSE** the probe making sure that both the pH and temperature sensors are covered by the solution **AND**

**JIGGLE** lightly to remove any trapped air bubbles on probe.

5.2.9 **ALLOW** the probe to sit in this solution for 20 minutes or until stable.
Calibrate YSI pH Meter With Sensor

5.2 Instrument Calibration (Cont.)

NOTE - When entering the calibration menu the main display will show the neutral solution of 7.00 pH (the buffer to be used to adjust the offset).

5.2.10 ENTER the calibration menu by pressing the up ▲ and down ▼ arrow keys simultaneously (Figure 1).

5.2.11 CHECK display shows CAL at the bottom; STAND will be flashing and the main display will show 7.00 (buffer to be used to adjust the offset) as given below.

![First buffer value](image)

Setting the Midpoint

5.2.12 PRESS the Enter key, CHECK the unit displays CAL at the bottom; STAND will stop flashing and the pH calibration value is shown with the middle decimal point flashing AND JIGGLE lightly to remove any trapped air bubbles on probe.

![Flashing until reading is stable](image)

5.2.13 ALLOW reading to stabilize (does not change by 0.01 pH in 10 seconds) and the decimal point stops flashing.

5.2.13.1 PRESS AND HOLD the enter key to save calibration Point.

5.2.13.2 CHECK the unit flashes SAVE on the display along with OFS to indicate the offset value has been saved.

![Save OFS](image)

5.2.14 RECORD pH 7 buffer Calibration complete on Data Sheet.
5.2 Instrument Calibration (Cont.)

5.2.15 CHECK SLOPE appears on the display and is flashing indicating that the slope is ready to be set using a second pH buffer.

5.2.16 POUR the 7.00pH buffer solution into a clean plastic container with label and date for later use.

Setting the Lower Point

5.2.17 RINSE the probe with purified water, AND DRY the probe using care

WARNING
Failure to use protective equipment when performing calibration with 4 pH, 7 pH and 10 pH buffer solutions could result in serious eye and or skin injury.

5.2.18 FILL a clean cylinder with ≈ 25mL the second pH buffer (pH 4) AND IMMERSE the probe into the solution while ensuring that the temperature sensor (Figure 2) is also immersed.

5.2.19 PRESS the Enter key, CHECK the unit displays CAL at the bottom; SLOPE will stop flashing and the pH buffer value is shown with one of the decimal point flashing AND JIGGLE lightly to remove any trapped air bubbles on probe.

5.2.20 CHECK the reading stabilizes, and the decimal point stops flashing,

PRESS AND HOLD “ENTER” key (to save the first slope) until “SAVE” is displayed along with “SLP”.

5.2.21 RECORD pH 4 buffer Calibration complete on Data Sheet.
5.2 Instrument Calibration (Cont.)

5.2.22 CHECK “SLOPE” starts to flash; (indicating that the slope is ready to be set using a third pH buffer).

Setting the Upper Point:

5.2.23 RINSE the probe with purified water, AND DRY the probe using care

WARNING
Failure to use protective equipment when performing calibration with 4 pH, 7 pH and 10 pH buffer solutions could result in serious eye and or skin injury.

5.2.24 FILL a clean cylinder with $\equiv 25\text{mL}$ of pH 10 buffer solution AND IMMERSE the probe into the solution while ensuring that the temperature sensor (Figure 2) is also immersed.

5.2.25 PRESS the Enter key, CHECK the unit displays CAL at the bottom; SLOPE will stop flashing and the pH buffer value is shown with the right decimal point flashing AND JIGGLE lightly to remove any trapped air bubbles on probe.

5.2.26 CHECK the reading stabilizes, and the decimal point stops flashing,

PRESS AND HOLD “ENTER” key until “SAVE” flashes on the display along with “SLP” (to indicate the second slope value has been saved).
## 5.2 Instrument Calibration (Cont.)

5.2.27 **RECORD** pH 10 buffer Calibration complete on Data Sheet.

**NOTE** - System is now calibrated at three points and will return to normal operation.

5.2.28 **IF**, at any time you want to return to the main operating screen, **PRESS** “MODE”.

**CAUTION**

To prevent pH probe from drying, add 6 to 8 drops of tap water to the sponge in the Probe Transport Chamber and place the probe in the chamber when not in use (up to 1 week) or store in the protective bottle with pH4 buffer solution for long term storage (greater than 1 week).

5.2.29 **RINSE** the probe with purified water **AND**

**INSERT** into Probe Transport Chamber to prevent sensor from drying out.

**CAUTION**

To prevent damage to the electrode, never use distilled or deionized (DI) water for soaking or storage of pH probe. However, it **IS** recommended that DI water be used to rinse the electrode when cleaning and/or transferring to another solution.

5.2.30 **IF** storage is for long term, (longer than 1 week), **PLACE** probe into the protective bottle with pH4 buffer solution storage (Attachment 1).

5.2.31 **DISPOSE** of used pH buffer solutions in accordance with TO-100-052 Perform Waste Generation, Segregation, Accumulation and Clean-up.
5.3 Restoration

5.3.1 IF not already removed, **DISCONNECT AND REMOVE** all Test Equipment.

5.3.2 **RECORD** the Test Equipment information and calibration status on Data Sheet.

5.3.3 **CHECK** equipment restoration by observing indications are consistent with expected conditions.

5.3.4 IF any problems were encountered with calibration, **INFORM** FWS.

5.4 Acceptance Criteria

Acceptance Criteria has been met when Steps in this procedure have been satisfactorily performed and As-Left values meet the specifications and tolerance(s) per the Data Sheet.

5.5 Review

5.5.1 **INFORM** FWS test is complete.

5.5.2 FWS **REVIEW AND ENSURE** the following:

- Completed Data Sheets meet the acceptance criteria.
- Comments sections are filled out appropriately.
- Work requests needed as a result of this procedure are identified and generated.
- Work request number(s) of any work documents generated as a result of this procedure, are recorded in the Comments/Remarks section of the Data Sheet.

5.6 Records

The performance of this procedure generates no records. However PMID’s associated with the procedure, identified for the activity are record material and are maintained in the work package as record material.

The record custodian identified in the company-level Records Inventory and Disposition Schedule (RIDS) is responsible for record retention in accordance with TFC-BSM-IRM_DC-C-02.
Calibrate YSI pH Meter With Sensor

Figure 1 – Layout of YSI Model 60 Handheld pH & Temperature Probe
The YSI Model 60 is shipped without the pH sensor installed. The pH sensor must be installed before use. The sensor is shipped with a protective bottle filled with a mixture of pH 4 buffer and solution. Do not remove bottle until ready for use. Save the bottle for long term storage of the probe.

Align tabs with slots in probe body

Insert pH sensor into probe body

Turn sensor 1/4 turn to lock in place
Attachment 1 – pH Probe Long term Storage and Removal from Storage

Long Term Storage of pH Probe

1.) Store the pH probe in pH4 buffer solution if it’s not to be used for more than a few days.

2.) Storage set-up as follows:
   a. Slide the cap with the hole (the “open cap”) up the probe, to just below the O-ring that is on the probe.
   b. Roll the loose)-ring that comes with the storage bottle up the probe until it’s under the open cap.
   c. Fill the storage bottle too slightly below the shoulder with pH4 buffer solution.
   d. Insert the probe into this bottle, and then screw the bottle up into the cap (you may have to slide the cap down a bit to get the threads to engage.) With the O-ring inside, this seal should be water tight – test to make sure.
   e. Attach the “closed cap” to the bottom of the bottle, using the Velcro to make it grip.
   f. Store the unit out of the way, preferably with the probe facing straight down.

Removing the Probe from storage

1.) To take the probe back out of the storage bottle and prepare it for further sampling, perform the following:
   a. Remove the “closed cap” from the Velcro at the bottom of the bottle.
   b. Holding the bottle upright, unscrew it from the cap with the hole (“open cap”) and screw the closed cap onto it.
   c. Rinse the probe and open cap with distilled water.
   d. Slide the open cap towards the cord to expose the O-ring beneath the cap. Roll off the O-ring, then slide the open cap off the end of the probe.
   e. Smush the O-ring into the Velcro at the bottom as you press the open cap into it. Thus, the bottle, both caps, and the O-ring are all stored together in a single “Package”.
   f. Remove the tape that’s covering the probe changer on the side of the meter, being careful not to lose the little sponge that’s inside.
   g. With the little sponge inside the chamber, add a few drops of tap water.
   h. Put the probe all the way into this chamber.
   i. (If possible, before sending the meter back out in the field, soak probe in tap water for 30 min. before placing probe in meter’s storage chamber).
Attachment 1 – pH Probe Long term Storage and Removal from Storage (Cont.)

Probes and Storage Bottle Layout
**Attachment 2 – Maintenance of the pH Sensor**

**pH Sensor Precautions**

1. When making measurements or performing the calibration procedure, make certain that the level of sample or pH buffer is high enough to cover both the pH and temperature sensors.

2. Rinse the probe with deionized water between changes of calibration buffer solutions.

3. During pH calibration, allow the sensors time to stabilize with regard to temperature (approximately 60 seconds) before proceeding with the calibration protocol. The pH readings after calibration are only as good as the calibration itself.

4. Clean and store the probe according to the instructions found below.

**pH Sensor Cleaning**

Cleaning is required whenever deposits or contaminants appear on the glass pH sensor. Unscrew and remove the small guard that protects the pH sensor. Use tap water and a clean cloth or lens cleaning tissue to remove all foreign material from the glass sensor.

If good pH response is not restored by the above procedure, perform the following additional procedure:

1. Soak the probe for 10 to 15 minutes in clean water containing a few drops of commercial dishwashing liquid.

2. GENTLY clean the glass bulb by rubbing with a cotton swab soaked in the cleaning solution.

3. Rinse the probe in clean water, wipe with a cotton swab saturated with clean water, and then rinse again with clean water.

   If good pH response is still not restored by the above procedure, perform the following additional procedure:

   1. Soak the probe for 15 to 30 seconds in one molar (1 M) hydrochloric acid (HCl).

   2. GENTLY clean the glass bulb by rubbing with a cotton swab soaked in the acid.

   3. Rinse the probe in clean water, wipe with a cotton swab saturated with clean water, and then rinse again with clean water.

   4. Reinstall the small guard that protects the pH sensor.

   If biological contamination of the reference junction is suspected or if good response is not restored by the above procedures, perform the following additional cleaning step:

   1. Soak the probe for approximately 1 hour in a 1 to 1 dilution of commercially-available chlorine bleach.

   2. Rinse probe with clean water, then soak for 1 hour in clean water to remove residual bleach from junction.
Attachment 2 – Maintenance of the pH Sensor (Cont.)

**pH Sensor Storage**

For short term storage between measurements in the field (up to one week), place the probe in the transport chamber in the side of the instrument case. Make sure that the sponge inside the chamber is wet (tap water).

For long term storage (over one week), place the probe in the storage bottle (provided) containing a mixture of 50% pH 4 buffer and 50% 1.5M. This will assure the fastest possible pH response. If this mixture is not available, storage in tap water is the next best choice. **Do NOT store the probe dry or in distilled or deionized water.**

NOTE: After storage in the pH 4 solution described above, place the probe in the transport chamber in the side of the instrument case or soak the probe in pH 7 buffer for 5 to 10 minutes allowing it to acclimate before calibrating.

If the probe has been inadvertently left in air and the reference electrode junction has dried out, good function can usually be restored by soaking the probe in the pH 4 solution described above.
## Error Messages

The instrument performs a Power-On Self-Test each time it is turned on. The following error messages are provided to facilitate troubleshooting. They appear on the LCD when an error is detected.

<table>
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<tr>
<th>Symptom</th>
<th>Possible Cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Instrument will not turn on</td>
<td>• Low battery voltage</td>
<td>• Replace batteries (pg 2)</td>
</tr>
<tr>
<td></td>
<td>• Batteries installed wrong</td>
<td>• Check battery polarity (pg 2)</td>
</tr>
<tr>
<td></td>
<td>• Meter requires service</td>
<td>• Return system for service (pg 21)</td>
</tr>
<tr>
<td>16. Instrument &quot;locks up&quot;</td>
<td>• Instrument has received a shock</td>
<td>• Remove battery lid, wait 15 seconds for reset, replace lid. (pg 2)</td>
</tr>
<tr>
<td></td>
<td>• Batteries are low or damaged</td>
<td>• Replace batteries (pg 2)</td>
</tr>
<tr>
<td></td>
<td>• System requires service</td>
<td>• Return system for service (pg 21)</td>
</tr>
<tr>
<td>16. Instrument will not calibrate due to unstable readings (decimal point keeps flashing)</td>
<td>• pH sensor is fouled</td>
<td>• Clean pH sensor (pg 14)</td>
</tr>
<tr>
<td></td>
<td>• pH sensor is bad</td>
<td>• Replace pH sensor (pg 4, 25)</td>
</tr>
<tr>
<td></td>
<td>• System requires service</td>
<td>• Return system for service (pg 21)</td>
</tr>
<tr>
<td>16. pH readings are inaccurate</td>
<td>• pH buffers out of spec</td>
<td>• Recalibrate with known good standards (pg 6)</td>
</tr>
<tr>
<td></td>
<td>• Cal procedure not correct</td>
<td>• Calibrate within ±20°C of sample temp (±10°C for best results)</td>
</tr>
<tr>
<td></td>
<td>• Sample temperature is over 20°C from ...cal temperature</td>
<td>• Clean pH sensor (pg 14)</td>
</tr>
<tr>
<td></td>
<td>• pH sensor is fouled or damaged</td>
<td>• Replace pH sensor (pg 4, 25)</td>
</tr>
<tr>
<td></td>
<td>• pH Sensor is bad</td>
<td>• Return system for service (pg 21)</td>
</tr>
<tr>
<td></td>
<td>• System requires service</td>
<td></td>
</tr>
<tr>
<td>16. LCD displays &quot;LO BAT&quot;</td>
<td>• Batteries are low or damaged</td>
<td>• Replace batteries (pg 2)</td>
</tr>
<tr>
<td>16. Main Display reads “nOnE”</td>
<td>• During recall, no data is currently stored in memory.</td>
<td>• Store data before attempting to recall (pg 11)</td>
</tr>
<tr>
<td>16. Main Display reads “OVEr”</td>
<td>• When calibrating, pH level is over range allowed for the buffer value selected.</td>
<td>• Recalibrate with known good standards (pg 6)</td>
</tr>
<tr>
<td></td>
<td>• When measuring, pH level is &gt; 14</td>
<td>• Clean pH sensor (pg 14)</td>
</tr>
<tr>
<td>16. Main Display reads “undr”</td>
<td>• When calibrating, pH level is under range allowed for the buffer value selected.</td>
<td>• Replace pH sensor (pg 4, 25)</td>
</tr>
<tr>
<td></td>
<td>• When measuring, pH level is &lt; 0</td>
<td>• Return system for service (pg 21)</td>
</tr>
<tr>
<td>16. Main Display reads “OVEr” (Secondary display reads “ovr”)</td>
<td>• Temperature reading is &gt;75°C</td>
<td>• Measure samples at a temperature within the range of the system.</td>
</tr>
<tr>
<td>16. Main Display reads “undr” (Secondary display reads “udr”)</td>
<td>• Temperature reading is &lt; -5°C</td>
<td>• Measure samples at a temperature within the range of the system.</td>
</tr>
</tbody>
</table>
### Attachment 3 – Troubleshooting Error Messages (Cont.)

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Possible Cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. Main display reads “PErr”</td>
<td>• Incorrect sequence of keystrokes.</td>
<td>• Refer to manual section for step by step instruction for the function you are attempting.</td>
</tr>
<tr>
<td>12. Main display reads “Err” (Secondary display reads “ra”)</td>
<td>• System has failed its RAM test check procedure.</td>
<td>• Turn instrument OFF and back ON again.</td>
</tr>
<tr>
<td>13. Main display reads “Err” (Secondary display reads “ro”)</td>
<td>• System has failed its ROM test check procedure.</td>
<td>• Turn instrument OFF and back ON again.</td>
</tr>
<tr>
<td>16. Main display reads “FAIL” (Secondary display reads “EEPROM”)</td>
<td>• EEPROM has failed to respond in time.</td>
<td>• Return the system for service (pg 21)</td>
</tr>
<tr>
<td>16. Readings on main display don’t change</td>
<td>• Meter is in recall mode.</td>
<td>• Press MODE key to return to Normal Operation (pg 5, 11)</td>
</tr>
</tbody>
</table>