

UW-7 Ultrasound Wattmeter



User Manual

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Warranty

Bowles Corporation (Bowles) warrants the UW-7 against defects in materials and workmanship for one year from the date of original purchase. The standard warranty is extended for a second year if the instrument is returned to Bowles for its recommended yearly recalibration. Recalibration is not covered under the warranty.

During the warranty period, we will repair or, at our option, replace at no charge a product that proves to be defective, **provided you return the product in its custom shipping box and with shipping prepaid to Bowles Corporation.**

Only serialized products are covered under this warranty.

The warranty may become void if:

- **You elect to have the unit serviced or “calibrated” by someone other than Bowles.**
- **The tamper-resistant Quality Seal and/or the serial number tag is removed or broken without proper factory authorization.**
- **the product has been damaged by accident or misuse or as the result of:**
- **Service or modification by other than Bowles.**
- **Shipping the product without adherence to the procedures found on page 39 of this manual.**
- **Shipping the product in packaging other than the original custom shipping box and foam set.**

Bowles reserves the right to discontinue the UW-7 at any time, and change its specifications, price, or design without notice and without incurring any obligation. Bowles does not guarantee availability of service and service parts after the manufacture of the unit is discontinued, but will do its utmost to service the product for five years following discontinuation.

The purchaser assumes all liability for any damages or bodily injury, which may result from the use or misuse of the unit by the purchaser, his employees, agents, or customers.

In no event shall Bowles Corporation be liable for consequential damages.

Notices

Copyright

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Certification

This instrument was thoroughly tested and inspected. Calibration measurements are traceable to the National Institute of Standards and Technology (NIST). Devices for which there are no NIST calibration standards are measured against in-house performance standards using accepted test procedures.

Trademarks

Bowles and UW-7 are trademarks of Bowles Corporation. Any other trademark names used in this manual are only for editorial purposes and the benefit of the respective trademark owner with no intention of improperly using that trademark.

Refunds and Credits

Only products returned within 90 days from the date of original purchase are eligible for refund/credit. A restocking charge will be applied to any returns (see below).

In order to receive a refund/credit of a product's purchase price, the product must not have been damaged by the customer or by the carrier chosen by the customer to return the goods, and the product must be returned complete (meaning with all manuals, cables, accessories, etc.) and in "as new" and resalable condition, and must be returned properly packed in the original shipping container.

Products not returned within 90 days of purchase, or products, which are not in "as new", and resalable condition, are not eligible for credit return and will be returned to the customer. The Return Procedure (see below) must be followed to assure prompt refund/credit.

Restocking Charges

Products returned within 30 days of original purchase are subject to a minimum restocking fee of 10 %. Products returned in excess of 30 days after purchase, but prior to 90 days, are subject to a minimum restocking fee of 15 %. Additional charges for damaged and/or missing parts, including the custom box set, and accessories will be applied to all returns.

Return Procedure









A Return Material Authorization (RMA) number must be obtained from Bowles Corporation customer service at **802-425-3447**, before a product is returned for any reason, including yearly calibration. The RMA form found on page 47 must be filled out and included with the product. The RMA number should be clearly marked on the outside of the package.

All items being returned (including all warranty-claim shipments) must be sent freight-prepaid to our factory location. When you return an instrument to Bowles, we recommend using United Parcel Service, Federal Express, or Air Parcel Post. We also recommend that you insure your shipment for its actual replacement cost. Bowles Corporation will not be responsible for lost shipments or instruments that are received in damaged condition due to improper packaging or handling. We recommend that you use the original carton and packaging material for shipment. If they are not available, contact Bowles for replacement packing. **See the repackaging and shipping instructions on page 39 for the proper procedure to avoid damage to the unit in transit.**

Safety Considerations

Use of this instrument is restricted to qualified personnel who recognize shock hazards and are familiar with safety precautions used when operating electrical equipment. Read the manual carefully before operating the UW-7.

The following warning symbols may be found on the UW-7:

Symbol	Description
	Caution: Risk of electric shock
	Caution: Refer to documentation
	Power Off (Mains)
	Power On (Mains)
	DC/AC
	DC
	AC
	Earth (Ground)

Hazard Warnings



☒ **Warning!** Power Rating. The UW-7's main power input must be connected to an external power transformer that provides voltage and current within the specified rating for the system.

Use of an incompatible power transformer may produce electrical shock and fire hazards. See *Specifications and Optional Accessories* in Chapter 2.

☒ **Warning!** Internal Voltage. Always turn off the power switch and unplug the power cord before cleaning the UW-7's outer surface.

☒ **Warning!** Liquids. Avoid spilling liquids on the digital scale; fluid seepage into internal components creates a potential shock hazard. Do not operate the instrument if internal components are exposed to fluid. Use a soft cloth to wipe off any spilled water.

* **Warning! Unauthorized user modifications or application beyond the published specifications may result in electrical shock hazards or improper operation. Bowles Corporation will not be responsible for any injuries sustained due to unauthorized equipment modifications.**

* **Warning! Changes or modifications to this unit not expressly approved by the manufacturer could void the user's authority to operate the equipment.**

Precautions

The following precautions are provided to help you avoid damaging the system or creating inaccurate readings:

☒ **Caution: Service.** Authorized service personnel should service the UW-7. Only qualified technical personnel should perform troubleshooting and service procedures on internal components.

☒ **Caution: Environmental Conditions.** Do not expose the system to temperature extremes during operation. Storage ambient temperatures should remain between **10 - 35°C (50-95° F)**. System operation should be at approximately 21 c (70 F) performance may be adversely affected if temperatures fluctuate above or below this range. Allow 45 minutes for unit to reach room temperature.

☒ **Caution:** Use of cell phones in close proximity to the unit may cause readings to vary slightly.

☒ **Caution: Do Not Immerse.** Clean only with a mild detergent, and wipe down with a gentle cloth.

Electromagnetic Interference and Susceptibility

USA FCC CLASS A

Warning: Changes or modifications to this unit not expressly approved by the manufacturer could void the user's authority to operate the equipment. This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. Like all similar equipment, this equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause interference, in which case the user will be required to correct the interference at his/her own expense.

Canadian Department of Communications Class A

This digital apparatus does not exceed Class A limits for radio emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Emissions - CLASS A

The system has been type tested by an independent, accredited testing laboratory and found to meet the requirements of EN 61326-1:1998 for Radiated Emissions and Line Conducted emissions. Verification of compliance was conducted to the limits and methods of the following:
CISPR 16-1:1993 and CISPR 16-2:1996

Immunity

The system has been type tested by an independent, accredited testing laboratory and found to meet the latest harmonized European emissions and immunity standard requirements of EN 61326 for commercial measurement equipment. Verification of compliance was conducted to the limits and methods of the following:

EN 61326-1 IAW EN 61000-4-2	Electrostatic Discharge
EN 61326-1 IAW EN 61000-4-3	Annex D Radiated & Conducted EM
EN 61326-1 IAW EN 61000-4-4	Electrical Fast Transient/Burst
EN 61326-1 IAW EN 61000-4-5	Surge Immunity
EN 61326-1 IAW EN 61000-4-6	Conducted Disturbances
EN 61326-1 IAW EN 61000-4-11	Voltage Interrupts

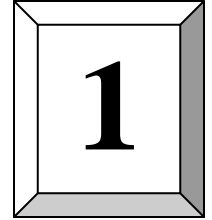
EC Directive 73/23/EEC Low Voltage (User Safety)

The system has been type tested by an independent testing laboratory and found to meet the requirements of EC Directive 73/23/EEC for Low Voltage. Verification of compliance was conducted to the limits and methods of the following:

EN 61010-1

“Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use, Part 1: General requirements” (including amendments 1 & 2).

Chapter 1: General Information



Inside This Chapter

- Summary of Features
- Ultrasound and its Applications
- Patient Treatment with Therapeutic Ultrasound

Summary of Features

The UW-7 digital Ultrasound Wattmeter provides an accurate means of verifying and calibrating the output of therapeutic ultrasound devices. The instrument measures output through a strain gauge bridge transducer. The UW-7:

- Has a resolution of 0.01 Watt and a repeatability of $\pm 3\%$ of readings $\pm .02$ watts from 0 - 30 W
- Maintains electrical accuracy of .01 grams throughout range;
- Features a large, backlit, easy to read display that enables the user to quickly and accurately make power measurements;
- 1.5 sec electrical readout response time for fast measurements. Ultrasound readings will take 4-5 seconds.
- Can accommodate a variety of transducer shapes and sizes without interfering with the measurement;
- The UW 7 is provided with a 140-ml piston syringe for draining the tank. Under no circumstances should the water be poured out of the tank by tipping the unit on its side. Always use the syringe for convenient and controlled drainage of the tank. Once the tank is emptied use a soft cloth towel or sponge to wipe tank fully dehydrated. NEVER use paper towels for this purpose since this will leave small fibers that will degrade the accuracy of the readings.
- Measures total-pulsed or continuous-average power.
- Has a selectable readout in grams or watts.
- Unit is line-powered by a 120 VAC or 240 VAC transformer for normal testing. For portable operation an optional Li Ion battery module is available.
- Has a USB or RS232 interface cable option
- Includes a field functional check weight.
- Is housed in a sturdy case.
- Is ruggedly built for portable use to meet the needs of service groups and biomedical engineers.
- Comes with a soft carrying case as a standard accessory for ease of transporting and storage.

▪ Ultrasound and Its Applications

Human perception of sound waves is limited to frequencies of fewer than 20,000 vibrations per second. Higher frequency vibrations — between 0.7 and 3.3 MHz — are used for ultrasound therapy. (Most ultrasound equipment produces an output of between 1 and 3.3 MHz.)

An ultrasound unit produces electrical oscillations at a specified frequency that cause the transducer in the ultrasound applicator to generate sound waves. The resulting ultrasonic radiation is transmitted from the ultrasound applicator, or treatment head, through a coupling medium, to the patient's tissue.

Therapeutic Use of Ultrasound

The therapeutic use of ultrasonic energy is accepted worldwide, and most modern hospitals and clinics have ultrasound devices in their physical therapy departments.

Ultrasound therapy is primarily used in the treatment of sports-related injuries. Another common use is the treatment of circulatory disorders and rheumatic diseases of the musculoskeletal system and peripheral nerves. Ultrasound has been found to be extremely effective in treating body areas with a great deal of scar tissue.

Physiological Effects of Ultrasound Therapy

It is well documented that ultrasound therapy heals because of thermal, mechanical, and chemical effects. *

Thermal effects include *deep tissue heating* at depths to 5 cm or more. The thermal effects of ultrasound differ from diathermy (the use of electrical impulses to produce generalized vasodilation) in that the ultrasound beam heats only a small tissue area that approximates the cross-section of the beam. This heating effect is concentrated in muscles, ligaments, nerves, bones, and where the ultrasound beam crosses from one type of tissue to another.

The mechanical effects are best described as *micro massage*, a deep stirring action within the tissue. The benefit of this action is an increased circulation to the damaged tissue. In addition, ultrasound is capable of separating collagen fibers from one another and of changing the tensile strength of tendons, thereby increasing their extensibility.

* *Physical Agents for Physical Therapists, Second Edition*, James E. Griffin and Terence Karselis, Charles C. Thomas Publishing Co., 1992.

The physiological benefits from ultrasound therapy are numerous. Ultrasound therapy affects the peripheral nerves by chemically changing the conduction velocity (this has been shown clinically *in situ*). Ultrasound alters the diffusion of Na^+ and K^+ (sodium and potassium) across red blood cell membranes. Ultrasound can also remove some salt deposits from irritated tissues.

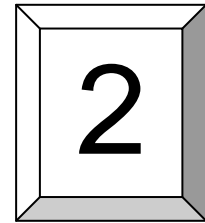
Patient Treatment with Therapeutic Ultrasound

The clinician working with ultrasound can ensure successful ultrasound treatment by assessing:

- the physical condition of the patient,
- the absorption coefficient of the tissue(s),
- the energy output of the ultrasound unit (continuous and pulsed),
- the massivity and location of the affected tissue, and
- the spread pattern of the beam.

The most essential assurance that the clinician can have is the verification that the ultrasound unit is producing the ultrasound energy for which it was designed. The Bowles UW-7 digital power meter enables the clinician to accurately measure this output energy.

Chapter 2: Description



Inside This Chapter

- Specifications
- Overall Unit Layout
- Front Panel Description
- Back Panel Description
- Standard Accessories
- Optional Accessories

Overall Unit Layout

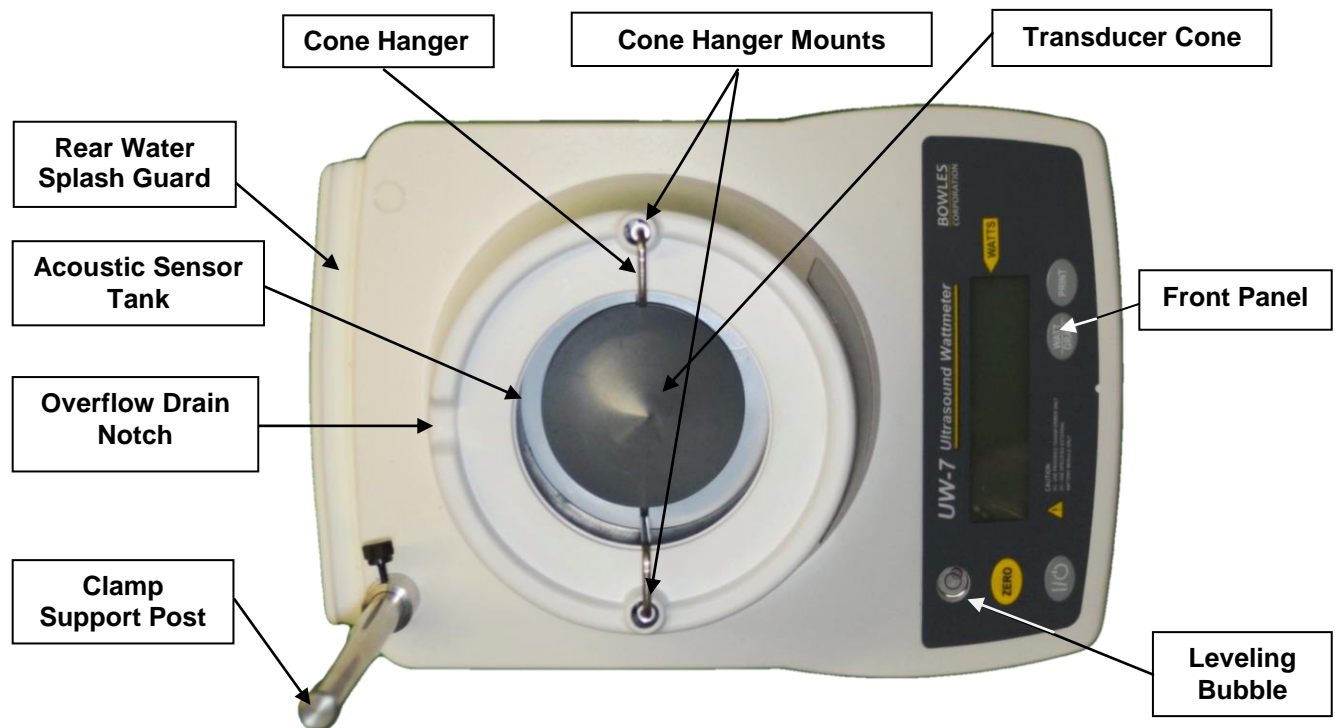


Figure 2-1: UW 6 General Layout

The top of the UW-7 Ultrasound wattmeter is shown in **Figure 2-1**. It includes the following components.

- **Front Panel:** Includes LCD readout and keyboard.
- **Rear Panel:** Includes Battery compartment, RS-232 Connector and Power Transformer Jack.
- **Sound Tank:** To be filled with 420 ml \pm 10 ml of degassed and distilled water for each use.
- **Transducer Cone:** The cone is removable for safe transporting.
- **Leveling Bubble:** Used to help level the unit before turning it on.
- **Cone Hanger:** Suspends the cone in the sound tank from the load cell mounts during readings.
- **Cone Hanger Mounts:** Connect the cone hanger and cone with the unit's load cell during readings.
- **Universal Transducer Clamp Support Post:** A removable, vertically mounted bar to which the transducer clamp may be attached.

Front Panel Description

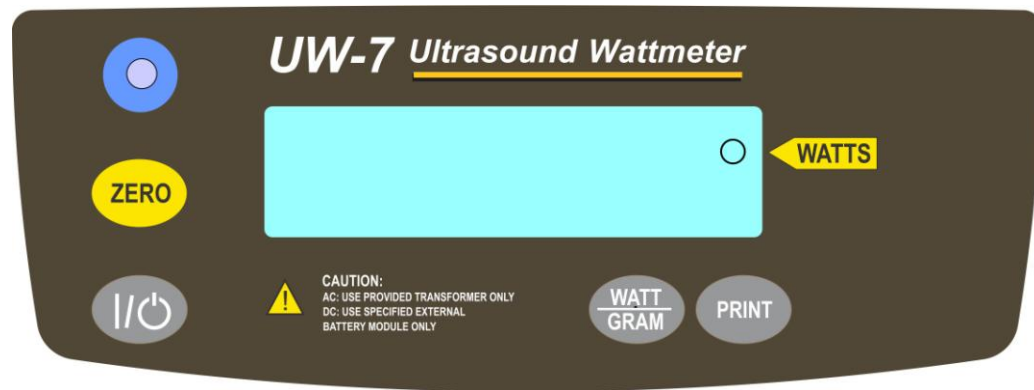


Figure 2-2: UW-7 Front Panel Layout

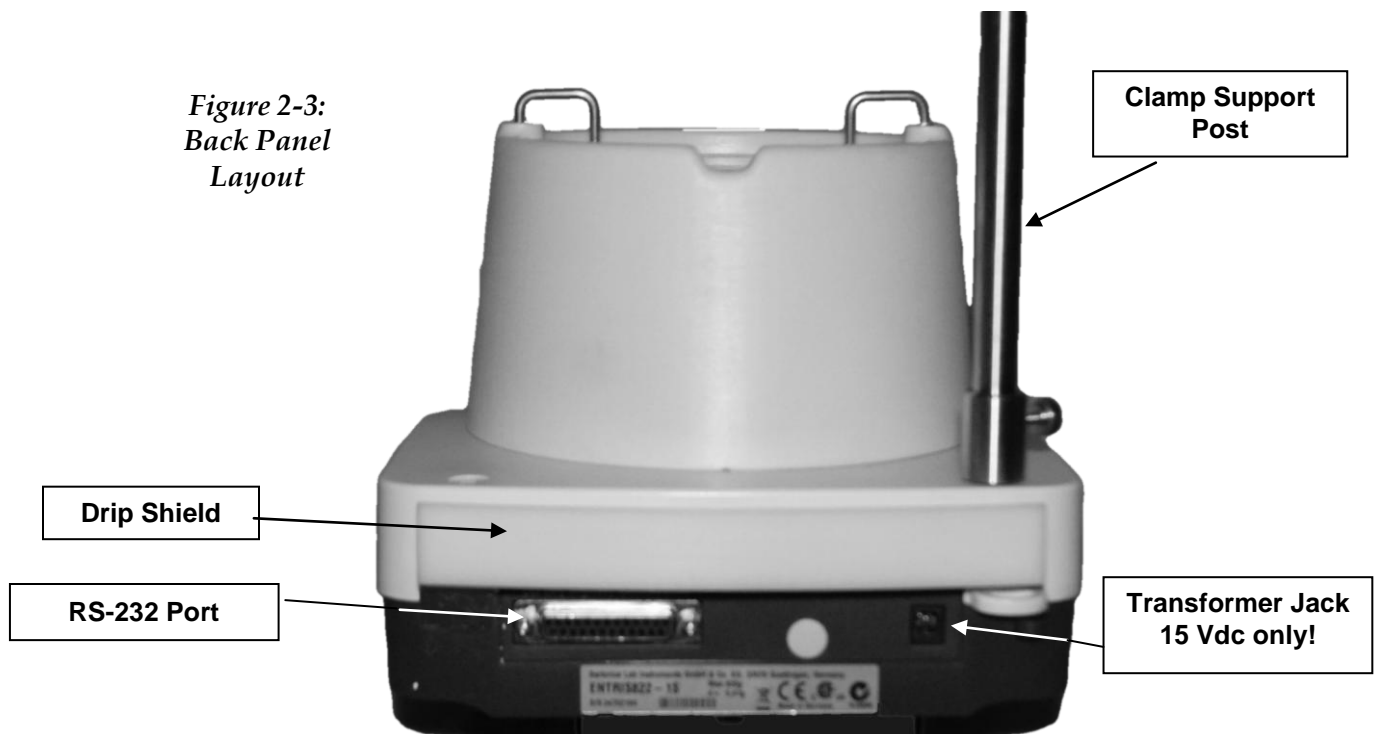
The front panel of the UW-7 ultrasound wattmeter is shown in *Figure 2-2*. It includes the following components:

- **LCD Display:** Indicates the meter reading in watts or grams.
- **Power On/Off Switch:** Turns the unit on and off.
- **Auto Zero Button:** Adjusts the LCD display to 0.00 watts or 0.00 grams depending on the mode selected.
- **WATT/GRAM button:** Switches the mode from watts to grams and back.
- **Print Button:** Sends the text on screen to the RS-232 or USB port for printing or recording.
- **Leveling Bubble:** For leveling unit.

Back Panel Description

The back panel of the UW-7 is shown in *Figure 2-3*. It includes the following components:

- **Wall Transformer Jack:** When using the wall-mounted transformer, simply plug into a receptacle.



- **RS-232 Port:** To connect to a computer or a printer. Only use the special RS-232 cable to USB cable supplied by Bowles Corporation.
- **Drip Shield:** A drip shield is also provided to minimize the risk of water spillage from getting into the electrical connections. However, care should be exercised to minimize the amount of water spilling down the rear panel.

Bottom Panel Description

The bottom panel of the UW-7 is shown in **Figure 2-4**. It includes the following components:

- **Leveling Jacks:** There are three support legs located on the bottom panel, two of which are threaded to be able to act as leveling jacks for the height adjustment to level the unit.



Figure 2-4: UW-7 Bottom Panel Layout

Standard Accessories

- **Transducer Clamp:** The clamp frees the operator from holding the transducer head in the transducer well during testing.
- **Centering Rings:** Rings used to help ensure that transducers are centered and aimed at the cone properly. This is important for accurate readings.
- **Power Transformer:** An AC wall mounted transformer is provided for extended testing.
- **Calibration Check Weight:** A 100 gram OMIL class M1 weight is included. This to be used to ensure the unit is operating properly and is in allowable calibration range.
- **Calibration Weight Adapter Pedestal:** This ring provides a platform for the 100 gram check weight when checking the unit's calibration and performance.
- **Carrying Bag:** A soft bag used for safely transporting and storing the unit.

- **Shipping Container:** This corrugated box contains specifically designed foam inserts to ensure safe shipment of the UW-7 Wattmeter. **Please save both the box and the foam inserts for future shipment of the unit for service or calibration.**

Note: The Carrying Bag is an integral piece of the shipping container. Ship with the carrying case in its *original packing*. See **Chapter 4- Repackaging and Shipping**.

Optional Accessories

- **Dissolved Oxygen Test Kit:** Tests the dissolved oxygen content of the degassed water. Dissolved oxygen test kits are available at Chemetrics (800-350-3072) Kit- P/N K-7512; Refills- P/N R-7512.
- **RS-232 to USB Cable:** Used for connecting the unit to a computer or a serial printer. Call Bowles for ordering information: **802-425-3447**.

- **AC Transformer Unit:**

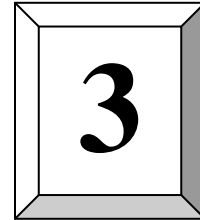
Output: 15V === DC 300 mA

Input:

Description	Part Number
120V~/60 Hz USA 2-Pin UL/CSA	UW 7-AC1
220 V~/50 Hz Euro 2-Pin CE	UW 7-AC2
220 V~/50 Hz UK 3-Pin CE	UW 7-AC3
100 V~/60 Hz Japan 2-Pin	UW 7-AC4
220 V~/50 Hz AUS/NX 2-Pin T-Mark	UW 7-AC5

- **15 Vdc Lithium Ion battery pack:** Optional – for portable operation when AC power is not available.

Chapter 3: Installation & the Operating Environment



Inside This Chapter

- Unpacking and Inspection
- Operation
- UW-7 Systems Check
- Beginning Ultrasound Power Measurements
- Using the Universal Transducer Clamp Assembly and Centering Rings
- Ultrasound Unit Testing
- Using the RS232 Port

Unpacking and Inspection

When you receive the UW-7, inspect the shipping carton for damage. If the shipping carton is damaged, unpack the instrument and note any dents and scratches on the UW-7. **Immediately notify if the UW-7 was damaged in shipping.** Bowles will arrange repair or replacement of your instrument without waiting for settlement of the claim against the carrier. **Retain the damaged shipping carton and packing material for the carrier's inspection.**

Be sure to save the box and packing materials. They will be needed when you return the UW-7 to Bowles for recalibration or future service. (Refer to **Chapter 4** for shipping instructions.)



If there is no shipping damage, continue removing the carrying case, with the UW-7 in it, from the shipping case. Then check the carrying case for the following accessories that are shipped with every UW-7:

- UW-7 Operator's Manual
- Transducer Cone



- Cone Hanger



- Clamp Support Post



- Clamp



- Clamp Tie Hook



- 100 Gram Cal Check Weight



- Calibration Weight Adapter Pedestal



- Centering Rings (3)



- Syringe



- Universal Power Transformer



- Country specific AC Plug Adapter (1)
You will receive the one adapter specified for your country.



- Carrying Case



- 15 Vdc Lithium ion battery pack.
(OPTIONAL)



Operation

When operated according to the instructions given in this chapter, the UW-7 digital Ultrasound Wattmeter will quickly and accurately measure the energy output of ultrasound devices.

Operating Environment

The UW-7 **must be allowed to adjust to room temperature** before the unit can be operated. The relative humidity in the room should not exceed 90%.

Refer to ***Chapter 4*** for additional information on safety, storage and shipping requirements for the UW-7.

Precautions

When using the UW-7 to test ultrasound devices, follow the safety precautions outlined by the ultrasound manufacturer.

- **Do not use any coupling medium other than degassed and distilled water.** Use of improper media can lead to reading variations of up to 10%.
- Do not spill water on the front or rear panel.
- Do not apply more than 30 W of input power to the UW-7.
- Do not operate the UW-7 for more than 1 hour during testing. Change water after 45 minutes of use.
- Remove and dry the cone when the test is complete.
- Drain the unit completely after each test session.

Preparing the Distilled and Degassed Water

Distilled and degassed water must be used as the coupling medium to obtain stable and accurate readings with the UW-7. **The water must also be allowed to reach room temperature** before pouring into tank in order for unit to stabilize quickly.

Use the following procedure to obtain the best coupling medium:

1. Use a Distiller to distill tap water or purchase distilled water.
2. Boil the distilled water for 30 minutes in a clean tempered glass or stainless steel flask. This will force the oxygen and nitrogen from the water. Bottle the water immediately.
3. Select some small glass bottles with good seals for storing the water. Glass canning jars work well.
4. Siphon the boiling degassed water into the bottles and fill each bottle to the brim. Leave no air space in the bottle.
5. Cap the bottles immediately.
6. Allow the water to cool in the bottles. As the water cools, it will contract and a vacuum will be formed if the bottles have been properly sealed. Allow the water to cool to room temperature.
7. Label and date each bottle. The degassed water should remain good for a long time if the seal is not broken.
8. Test each bottle for oxygen content before it is to be used. The oxygen content should be less than 2 ppm. Dissolved oxygen test kits are available at Chemetrics (800-350-3072) Kit- P/N K-7512; Refills- P/N R-7512.



Note: When the bottle is opened and exposed to air, it can be used during the following 45 minutes. Exposure to air makes this water lose its excellent coupling property; therefore, the bottles should not be opened until tests with the UW-7 are ready to begin. Be sure to allow water to come to room temperature before use.

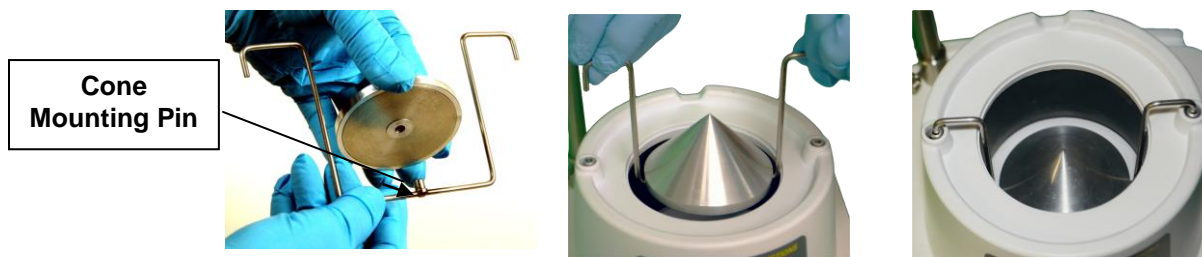
UW-7 Systems Check

1. Level the unit using the two adjustable feet in the front of the base of the unit. The unit is level when the bubble is centered. Inspect the transducer cone for dents and



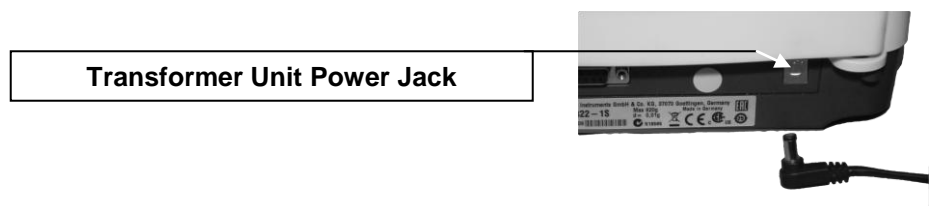
clean if needed. **Do not use a dented cone. Incorrect readings may result.**

Inspect the cone hanger to verify that the hanger is not bent or distorted. Check by laying the hanger flat on a table. Make minor adjustments as needed to ensure that the hanger lays flat. Carefully install the cone on the transducer mount pins on the cone hanger as shown below. Insert the ends of the cone hanger into the protruding cone hanger mount post holes, making sure they are properly seated.



3. If a transformer is to be used, plug it into the jack located at the lower left rear of the unit. Then plug the transformer into a wall socket.

Note: There are transformers available for all plug and voltage configurations, which can be ordered separately.



4. **Allow sufficient time for the UW-7 to fully adjust to room temperature.** If the unit is not at room temperature, the transducer will be slowly warming or cooling and will cause the readings to shift.
5. Obtain a bottle of the distilled and degassed water prepared following the procedures discussed earlier in this chapter. **Be sure that the water is at room temperature before continuing with set up.**
6. Open the bottle of degassed water. When the vacuum seal is broken you should be able to hear it. If you do not hear or feel the seal being broken, discard the water.

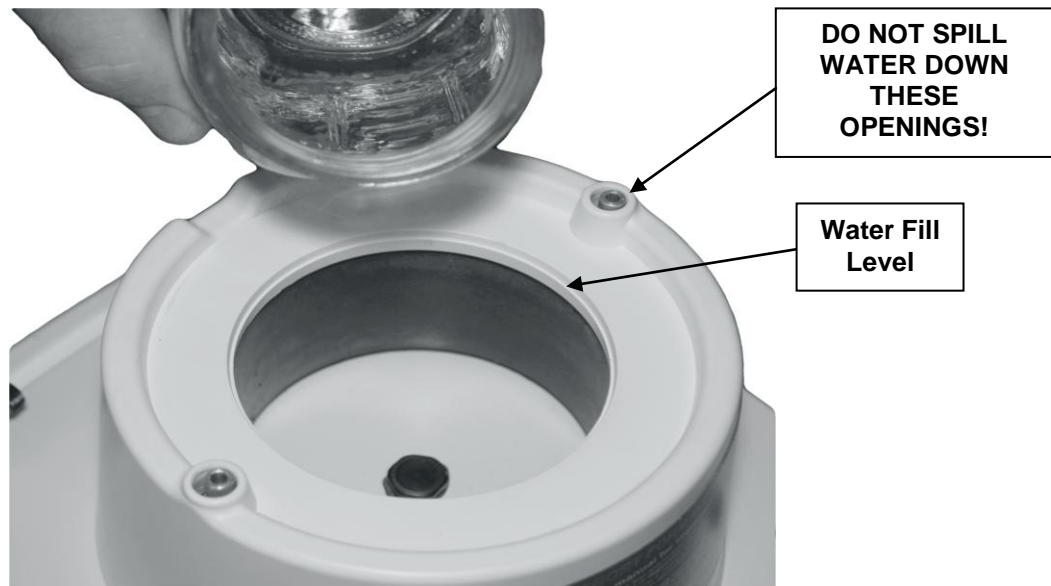
7. Use a Dissolved Oxygen Test kit to ensure that the oxygen content of the water is less than 2 ppm.



8. Fill the tank with 600 ml \pm 50 ml of fresh distilled and degassed water. Do not spill water on the panel of the UW-7. Fill until the water reaches slightly above the bottom lip of the well, as shown below.

Immediately replace the cap on the coupling water bottle.

Water Fill Note: Be sure the water has been allowed to completely come to room temperature. If the temperature of the unit, room, and water are not stabilized it will be difficult for the unit to achieve a stable zero setting.



9. Insure that there are no air bubbles on or under the transducer cone or stuck to the rubber sound absorber surrounding the cone in the tank. **Air bubbles may induce some reading errors due to buoyancy changes of the transducer cone, erratically bouncing some of the sound beam in the wrong direction or away from the sound absorber.**

The easiest way to ensure that there are no bubbles under the cone is to lift the cone hanger out of the post mount and tip it to the side. As a final measure, gently swish the cone side to side before re-seating it on the post mount. This will allow any trapped air to escape and also allow for a visible verification.

9. Turn the unit on and allow 5 minutes for the electronics to warm up and become stable.



Beginning Ultrasound Power Measurements

Measurements

1. Place the transducer in the coupling medium partially submerged so that the head is facing directly downward. Use the centering ring and clamp as needed so that the transducer is exactly centered and vertical (see section on universal clamp and centering rings below). If the transducer is off center, or not aligned vertically, the reading may be low and out of tolerance. The transducer head should be completely coupled with the distilled and degassed water and there should be no bubbles beneath the radiating head of the transducer.

Note: The coupling water in the transducer well must be changed every 45 minutes or when the readings become unstable. A bottle of opened distilled and degassed water will only be usable for approximately 45 minutes to 1 hour.

2. Turn on the UW-7 using the ON switch on the front panel. Ensure that the unit is in the Watts mode (displayed units will read 0 in the right hand side). Allow five minutes for the unit to warm up and stabilize before starting the readings.

3. Once the unit is warmed up, set the digital reading to 00.0 by pressing the AUTO ZERO button. This may take several tries until the unit settles down. Avoid any vibration or movement of the test head, since the unit is VERY sensitive.

Note: Certain cell phone frequencies may affect the stability of the reading. If the reading is fluctuating erratically, turn off or remove all cell phones from the test area and try again. If the unit still cannot be zeroed, refer to *Troubleshooting* in **Appendix A**.

4. Turn on the ultrasound unit following the manufacturer's instructions. Adjust it to the desired level. Never exceed 30 watts.
5. Read the actual output power in WATTS on the LCD of the UW-7.
6. After all of the readings are completed, shut off the ultrasound unit.
7. Completely remove the water from the transducer test well when the measurements are complete. Use the syringe provided and a dry cloth. **It is important to fully drain and dry the tank when testing is complete. This will prevent bacterial growth and other potential water related damage.**

DO NOT USE PAPER TOWELS! Paper fibers left behind will affect the sound signal in the future

8. Dispose of any water left in the opened bottle of degassed and distilled water. The water will absorb oxygen over time, rendering it ineffective as a coupling medium.



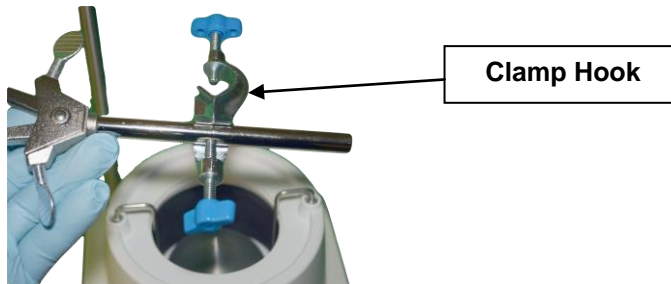
Using the Universal Transducer Clamp Assembly and Centering Rings

The universal transducer clamp assembly frees the operator from holding the transducer treatment (radiating) head in the coupling water and prevents transducer movement, ensuring more accurate and stable readings. The centering rings help to properly center and aim the transducer head in the tank.

1. Insert the support post in the mounting collar located at the rear of the unit. Securely tighten by **hand**. Do not use pliers to tighten post.



2. Center the transducer clamp assembly over the transducer well, as shown, using the clamp hook to tighten it into place.



3. Place a centering ring, with the hole sized to fit the transducer, on top of the well. The centering ring helps assure that the sound head is properly centered and aimed vertically toward the transducer cone. NOTE: It is very important to carefully center and aim the transducer straight onto the cone to obtain accurate readings.



4. Loosen the side screw of the clamp assembly so that clamp rotation is easy, and roughly center the clamp opening over the transducer well for vertical transducers without handles (as shown in A), or position it such that it aligns with the transducer handle (as shown in Figure B below).



Figure A
Clamp orientation
transducer with
handle



Figure B
Clamp orientation
transducer without
handle or Centering ring

5. Open the clamp by turning the clamp thumbscrews counterclockwise to fit the desired transducer head or handle.
6. Tighten the clamp screw to effectively grab the transducer head or handle. Make sure that the transducer radiating head remains completely submerged in the coupling water.
7. Re-center the transducer head directly over the middle of the transducer well using the centering ring to assure alignment for accurate readings. Make sure the transducer surface is entirely in the coupling medium. The transducer head should be completely coupled with the distilled and degassed water and there should be no bubbles beneath the radiating head of the transducer. **Any bubbles beneath the transducer head will create a low reading.**

☒ **Caution**

Never ship the power meter with the transducer clamp assembly mounted on the unit, or the cone and hanger still mounted in the unit. Damage to the unit will result and the warranty will be void.

Ultrasound Unit Testing

Use a performance record label or sheet during testing that will allow you to record both the ultrasound unit's settings and the corresponding outputs as measured by the UW-7. Here is an example:

Frequency MHz	Target Power Settings (Watts)	Record Actual Power Setting (Watts)	UW 6 Reading (Watts)	Allowable Variation from Actual Power Settings (Watts)
3	4.0 +/- 0.5 watts			+/- 0.3
1	10.0 +/- 0.5 watts			+/- 0.5
3	8.70 +/- 0.5 watts			+/- 0.4

Testing Using Discrete Values (Method I)

1. Follow the procedures in this section on operating the UW-7. Review the Precautions found on page 5.
2. Set the Ultrasound Unit on discrete values such as 5, 10, 15 or 20.
3. Record these values under Ultrasound Setting on the performance label or sheet.
4. Measure the output on the UW-7.
5. Record the UW-7 reading under Actual Output in Watts on the performance label or sheet.

Testing Using Exact Meter Settings (Method II)

When this method is used, an exact meter setting is obtained for each power desired. This enables the physical therapist to select exactly the ultrasound output that the patient requires.

1. Follow the procedures in this section on UW-7 operation. Review the Precautions found on page 5.
2. Adjust the ultrasound unit to read a desired value on the UW-7.
3. Record the Ultrasound Setting and the actual UW-7 reading on the label.

Using the RS232 Port

The UW-7 is equipped with a custom 22-pin female RS-232 port located at the rear of the instrument. A serial printer or a computer may be connected to the UW 7 via this port. Printing with the UW-7 means that the LCD contents are sent to the printer whenever the Print key on the UW-7's front panel is pressed.

Connecting to a Computer

Using a computer in conjunction with the UW-7 requires the following steps:

1. Be certain that the power is off on the UW-7.
2. Attach the UW-7 to the computer using a serial interface to USB cable provided by Bowles Corporation only as shown here.
3. Turn on the UW-7.
4. You will need software to communicate with the UW-7. Terminal emulation software such as *Windows Hyper Terminal™* or custom software may be used.
5. Configure the software's communications settings for the port you are using to a baud rate of 1200 bps, 7 data bits, odd parity, 1 stop bit, and select "hardware handshaking" if that setting is available. Refer to your computer software's documentation or seek help for the correct procedure.



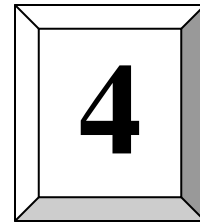
Communications Protocol

Communication with the UW-7 is full duplex. There are two commands that may be sent to the UW-7 in the form of two byte 7-bit ASCII strings:

Escape P returns the current LCD contents as 22 characters including terminating return and linefeed characters.

Escape T zeros the UW-7 display but returns no characters.

Chapter 4: Safety, Maintenance, Storage & Shipping



Inside This Chapter

- Recommended Procedures and Precautions
- Calibration Check Procedures
- Maintenance
- Service
- Returning the UW-7 for Calibration
- Battery Module Replacement
- Storage
- Repackaging and Shipping

Recommended Procedures and Precautions

When using the UW-7 to test ultrasound devices, follow the safety precautions specified by the ultrasound manufacturer.

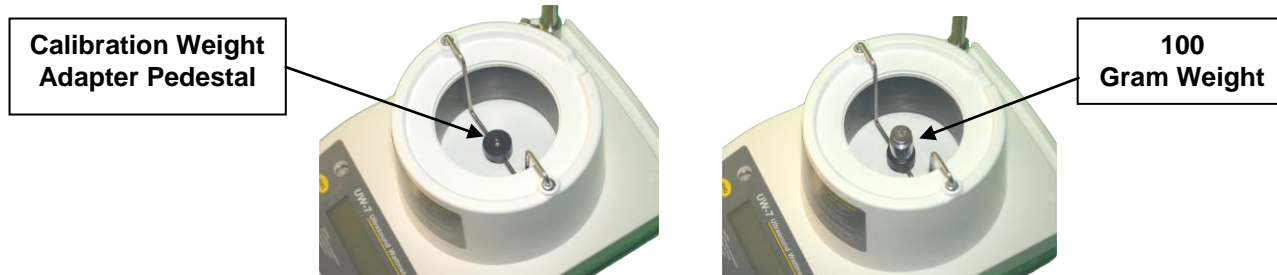
- Do not use any coupling medium other than degassed and distilled water.
- Do not spill water on the front or rear panel.
- Do not apply more than 30 W of input power to the UW-7.
- Do not operate the UW-7 for more than 45 minutes to 1 hour before changing the water (see *Preparing the Distilled and Degassed Water* on page 26).

Calibration Weight Check Procedures

You can check to make sure the UW-7 is operating within proper tolerances using the 100-gram weight supplied with the unit. The weight supplied is an OMIL class M1 weight that will weigh between 49.92 and 50.09 or (99.88 and 100.22) grams. **This procedure is NOT a substitute for regular annual calibration by the manufacturer. No facility should issue an annual calibration sticker for the UW7 based on having performed only a calibration weight check even if they are using certified weights (see page 38).**



1. The unit should be off at the beginning of this procedure. Remove the cone. Place the calibration weight adaptor pedestal on the cone-mounting pin. This provides a stable platform upon which the 100 gram checks weight will be placed.



2. Turn the unit on and allow it to warm up for 5 minutes.
3. Press the MODE button until the unit displays in grams.
4. Zero the display.
5. Place the calibration check weight on the pedestal. Allow the reading to settle down for 5 to 10 seconds. Take the reading.

6. If the reading is 99.80 or 100.90 grams, the unit is in good working order. Remove the calibration check weight, but leave the calibration weight adaptor pedestal on the cone mounting pin. It is normal for the unit to take 5 seconds to 10 seconds to completely return to zero.
7. If the unit is outside of these ranges, then the unit should be returned to the manufacturer for repair and/or calibration.

Maintenance

Maintenance of the UW-7 power meter is straightforward, requiring little more than keeping it clean. It is important to keep dust and dirt out of the transducer tank. Rinsing the tank with clean water before use, along with proper storage in the carrying case, is all that is required. It is also important that the cone and hanger be removed and stored in the carrying case after use.

Do not use *any type* of cleaner in the tank or on the transducer cone. The use of a light detergent and non-abrasive cleaning pad is acceptable on the exterior of the unit.

Service

The mechanical assembly of the UW-7 contains no parts that can be serviced by the user. The unit should be returned to Bowles Corporation for repair or calibration. The alignment and adjustment parameters are critical to the performance of the UW-7 and can be performed only at the factory.

For service, package the UW- 7 according to the *Repackaging and Shipping* instructions in this chapter. **Failure to do so may void the warranty.**

Call Customer Service at 802-425-3447 for shipping instructions.

Returning the UW-7 for Recalibration

The UW-7 should be recalibrated annually by Bowles Corporation. Annual calibration is not the same thing as a calibration weight check, which can only verify that the unit is or is not performing within its acceptable range at any given moment in time. It cannot determine how close to the edge of its range the unit may be. This means that the next time the unit is used, it may no longer be within the acceptable range.

No facility should issue an annual calibration sticker for the UW-7 based on having performed only a calibration weight check even if they are using certified weights.

When Bowles performs an annual calibration on a UW-7, we start with a weight check, using annually certified weights with ten times the accuracy of the check weight provided with the unit. We then run an acoustic verification on the unit. If the unit readings are acoustically out of range, we access and re-set the internal parameter readings to their optimal setting. This essentially restores the scale to its best possible readings, and provides the confidence that, barring misuse or accidental damage, the unit will remain well within that range for another year.

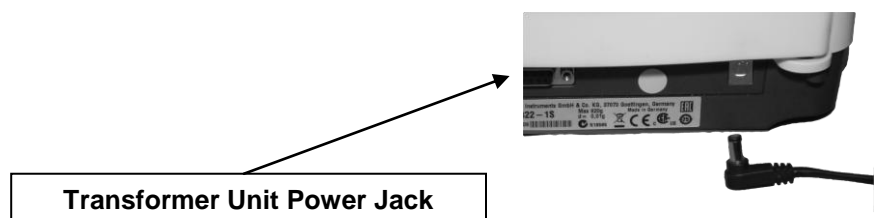
For annual calibration, call Bowles Customer Service at 802-425-3447 to obtain a Return Authorization Number and form and shipping instructions.

Pack the UW-7 according to the *Repackaging and Shipping* procedures outlined in this chapter. **Failure to do so may void the warranty.** Approved shipping boxes are available from Bowles if needed.

Using Battery Power Module

To use the Li Ion power module, plug the cord in to the power receptacle at the rear of the unit.

To power up the module press the power button to turn the battery on. This module will last about 35 hours before needing recharge.



Storage

The UW-7 **must** be stored in an upright position on a flat surface that is relatively free of vibration. The unit should be stored in the carrying bag supplied with the unit. The storage environment should be free of dust and other foreign particles.

The UW-7 must have the cone removed from the tank and be fully drained for storage. **Permanent damage may result if this is not done.**

The UW-7 should be protected from temperature extremes and high humidity that can cause condensation within the unit and should be stored away from corrosive fumes and vapors.



Repackaging and Shipping

When the UW-7 is shipped to Bowles for warranty service or repair, the unit should be shipped in the original packing and carrying case; other forms of commercially available packing are not recommended and may void the warranty.

If the original customized packaging set has been damaged or lost, contact Bowles for a replacement packaging set.

Repackage the instrument according to the following procedure:



Figure 4-1

- Unplug the wall transformer from the unit, if used. Store it in its box in the top left pocket, as shown in *Figure 4-1*.
- Remove the universal transducer clamp from the clamp support post. Store in front pocket of carrying bag along with the clamp hook.
- Remove all the centering rings from the tank. Remove the cone hanger from the tank. Store the centering rings and cone hanger in right side pocket of the carrying bag.
- Screw the transducer clamp support post. Store it in front pocket of the carrying bag.
- Wrap cone well in bubble wrap affixed with tape and place it in the tank.
- Use masking tape or equivalent to secure the cone hanger mounts for shipping. Failure to do so may void the warranty and cause damage to the unit.
- Place the UW-7 into the carrying bag.
- Make sure all accessories are in their individual compartments and the cover flaps are closed in the carrying bag with the exception of the Transducer Cone.



Figures 4-2-3&4

- Place the gray foam insert around the UW-7 unit in the carrying bag as shown in *Figure 4-2*.
- Zip the canvas bag cover closed.
- Pack the UW-7 in its original customized packaging material and shipping box. Call Bowles for a replacement set if needed. **FAILURE TO USE THE ORIGINAL PACKAGING MATERIAL MAY RESULT IN DAMAGE TO THE UNIT AND MAY VOID THE WARRANTY!**

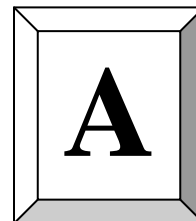


Proper placement of the foam inserts when re-using the original packaging

Before the UW-7 is returned to Bowles, make sure you have addressed each item in the following checklist:

- ✓ Obtain a **Return Authorization Number and Form** from Customer Service (802-425-3447). If the original customized packaging set is damaged or lost, request a replacement set .
- ✓ **Completely** fill out a copy of the RMA form on page 47 of this manual and include it with your return. (Alternatively, can email or fax you a copy of this form when you call for the RMA number.) Include a statement of what is required of the Service Department. State whether the unit requires calibration, cleaning, or repair. Describe any issues you are experiencing. Make sure contact information is clear.
- ✓ Follow the procedure on page 39 of this manual to properly package the unit in its customized shipping materials and preserve its warranty
- ✓ Write the Return Authorization number on, or near, the shipping label.
- ✓ Mark the shipping box clearly as **FRAGILE**.
- ✓ Mark the shipping box clearly with arrows indicating **THIS END UP**.
- ✓ Insure the UW-7 for its full value.

Appendix A: Troubleshooting Guide



The UW-7 will display an error code if improper use or an abnormal condition is detected. Consult the following table for possible error codes, the probable cause, and corrective action.

Error Code	Description	Corrective Action
LOW	Indicates that an under-load is sensed. This error usually occurs when neither the cone nor the calibration weight adapter pedestal is in place on the load cell.	Unit needs to be turned off before placement of cone or pedestal. Replace the cone, or if checking the operating range, place the calibration weight adapter on the cone-mounting pin. The condition may also indicate defective electronics or load cell. If the condition cannot be cleared, return the unit to the factory for service.
HIGH	Indicates that there may be an excessive force applied to the load cell.	Remove excessive load from the load cell immediately. If this condition occurs without any weight on the load cell, this indicates either defective electronics or a damaged load cell. Turn the unit off and back on again to see if the error clears. If the error repeats, the unit must be returned to the factory for service. If this error occurs during a calibration check with the 100 gram check weight but the unit seems to read normally without the weight on, this indicates that the unit needs to be recalibrated. The onboard processor only allows readings up to 5% over 800 grams. The processor will display the HIGH error code for any readings above this range.
SYS.Err	This symbol is displayed indicates a serious problem. Possible causes include: <ul style="list-style-type: none"> ✓ Something is causing the load cell to function out of specification. ✓ Rough or improper handling of the unit. ✓ Liquids or other materials spilled onto the electronics. 	Return the unit to the factory service center for evaluation and repair.

Communication failures between the UW-7 and a printer or a PC are usually caused by the serial cable or incorrect parameter settings. Troubleshoot as follows:

1. Verify that the correct serial cable is being used. The correct cable is Bowles PN: 1200-B-232 or equivalent 22-pin “straight-through” to USB cable.
2. If attempting to communicate with a PC, verify that the serial cable is connected to the desired port and that the port settings are **1200, 7, N, 1**.
3. If attempting to interface with a printer, check the printer’s settings.

Other Issues

Unit does not return to 0.00 +/- .01 watts after taking readings.

Allow at least 10 seconds for the reading to return to zero.

There is a possibility that air bubbles have collected under the cone causing a slight change in the buoyancy. Gently spin the cone to help dislodge them and lightly tap the sides of the unit while tipping the unit on edge until all air bubbles appear to be removed.

If allowing 10 seconds more does not allow reading to return to zero, then the unit and water have probably not fully temperature equalized. Allow the unit to sit while turned on for at least 10 more minutes then re-zero the unit and try again. Repeat the 10-minute settling time if zero drift persists.

Readings do not stabilize and slowly decrease.

This condition usually indicates that the water has absorbed too much air and should be replaced with fresh water. When too much air is in the water, air bubbles tend to build up in the sound beam and bounce some of the sound away from the cone, thus lowering the reading.

Unit fails to power up or battery drains quickly.

Verify there is a fresh 15 v Li Ion Battery Power module plugged properly into the unit. If the battery fails to hold up for approx.36 hours' operation, this indicates a problem with the electronics. Return the unit to Bowles, for factory service. Remember, when on battery power, the unit will run until it is powered down.

Use the recommended power transformer to power the unit. If the unit still fails to power up or the transformer runs hot, this indicates a problem with the electronics. Return the unit to Bowles for Factory Service.

Numbers and letters appear to the left of the display.

Should the display readout (for example, **USERDEF**) or other digits appear, then the Service Menu Codes have been inadvertently entered and your unit's calibration and communications setups could be affected. Usually, you can power the unit down and restart it and it should clear the code. If it doesn't clear the code, call Bowles Customer Service 802-425-3447 for instruction to get out of the Service Menu Codes without affecting the operation of your UW-7 and voiding the warranty.

Return Materials Authorization Form

RMA Number: _____

Customer Name and Address:

Date: _____

Phone Number: _____

Fax Number: _____

Contact Name: _____

Contact Email: _____

Unit Serial Number: _____

Reason for Return:

Product Return Policy

This policy refers to any products or parts being returned to Bowles Corp whether customer owned, leased, or rented; whether under warranty or not.

NO products or parts should be shipped twithout first contacting us for a Return Materials Authorization Number (RMA) which should then be clearly displayed on the exterior of the package. **Packages delivered without an RMA number or this RMA form will not be evaluated until the RMA form is received.**

Follow the procedure on pages 39-41 of the product manual to properly package the unit in its customized shipping materials. If the manual is not available, contact us for a pdf copy of those instructions. **Failure to follow this procedure may void the warranty and subject the unit to shipping damage.**