DST400 • DST440
Digi-Stem® Thermometer
User Manual

WD1095 Rev F
December 11, 2024

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Thank you for purchasing a Wahl Digi-Stem® Thermometer.
We appreciate your business.

1. Application and Key Features

The Wahl DST400 is designed for temperature monitoring applications where a high degree of accuracy and ease of use are desirable. To achieve this objective the DST400 incorporates the following features:

- High reliability, thin-film platinum RTD Cold Junction Compensation sensor.
- High accuracy 24-bit Delta-Sigma Analog/Digital Converter.
- Error checking: Checks for open wire/sensor, under-range, over-range conditions and low battery.
- Selectable Thermocouple Type: Allows programming of meter to measure Type K, J, T, E or S thermocouples.

2. Installation

Caution! DO NOT USE HIGH PRESSURE WATER OR STEAM FOR CLEANING!

Caution! See important information regarding Lithium Batteries on the enclosed document #WD1053, before proceeding!

Your unit was shipped partially assembled. Installation of the battery by the end-user is necessary as transportation regulations prohibit shipping units with the battery installed. Units with long probes or remote cables may be shipped unassembled. After installation of the battery, verify the display is operational and remove the protective film from the window. In the event the display is not operational, check that the battery is installed properly by following the battery installation procedure, section 3 of this manual.

2.1. Meter Mounting – Fixed Probe

Fixed probes may be mounted by the threaded fitting or sanitary clamp into the process. Apply thread sealing compound or Teflon tape to threaded fittings as required. Units with swivel nut fittings or adjustable angle stems may be adjusted after installation for best viewing angle.

Caution! Do not rotate Digi-Stems with adjustable angle stems more than 360° in one direction as wire breakage may occur. See section 2.5 for adjustment procedure.

Caution! Do not use the Digi-Stem enclosure to tighten meter. Use a wrench on the coupling nut for tightening.

2.2. Meter Mounting – Remote Probe

An optional mounting bracket is available for mounting remote meters to walls, panels, pipes, etc. The mounting bracket may be attached by the top or rear surface with user provided mounting screws, clamps, etc. The mounting bracket is available in 2 styles, p/n DSA3030, without ground lug and DSA3031, which includes a grounding lug for grounding of the meter when the probe shank is not grounded.

2.2.1. For remote mounting:
2.2.2. Mount the bracket with the Digi-Stem mounting screw towards the bottom (see Fig. 1).
2.2.3. For remote cables, thread the cable through the slotted sections of the mounting bracket holes, so the cable moves freely. Insert the meter's coupling nut through the top hole of the mounting bracket and secure with the large slotted Digi-Stem mounting screw.

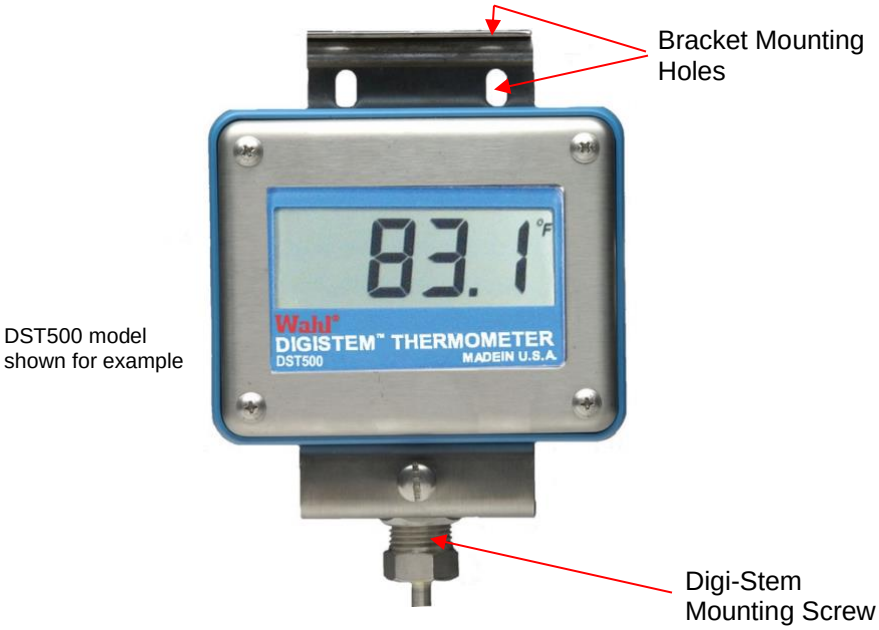

Fig. 1

2.3. Wire Connections – Remote probes or uninstalled fixed probe.
2.3.1. Loosen the four Phillips head screws in the front cover until the cover is removed.
Note: The screws are held captive by retaining washers and should not be removed completely.
2.3.2. Remove J1, the 2-pin pluggable terminal strip connector (see Fig. 2) from the PCB mating connector and connect probe wires as follows.

J1 – DST400 Probe Wiring

Thermocouple Type	USA/Canada per ANSI/ASTM E230		International per IEC 584-3	
	+ Positive +RTD/TC	- Negative -RTD/TC	+ Positive +RTD/TC	- Negative -RTD/TC
K	Yellow	Red	Green	White
J	White	Red	Black	White
T	Blue	Red	Brown	White
E	Violet	Red	Violet	White
S	Black*	Red	Orange	White

*Type S designation for Extension wire only

2.3.3. Re-connect pluggable terminal strip to PCB connector J1.
2.3.4. Install battery with polarity as indicated on battery holder.
2.3.5. Replace cover on Digi-Stem enclosure and secure with four screws tightened to a force of 4 to 5 in-lbs. of torque.

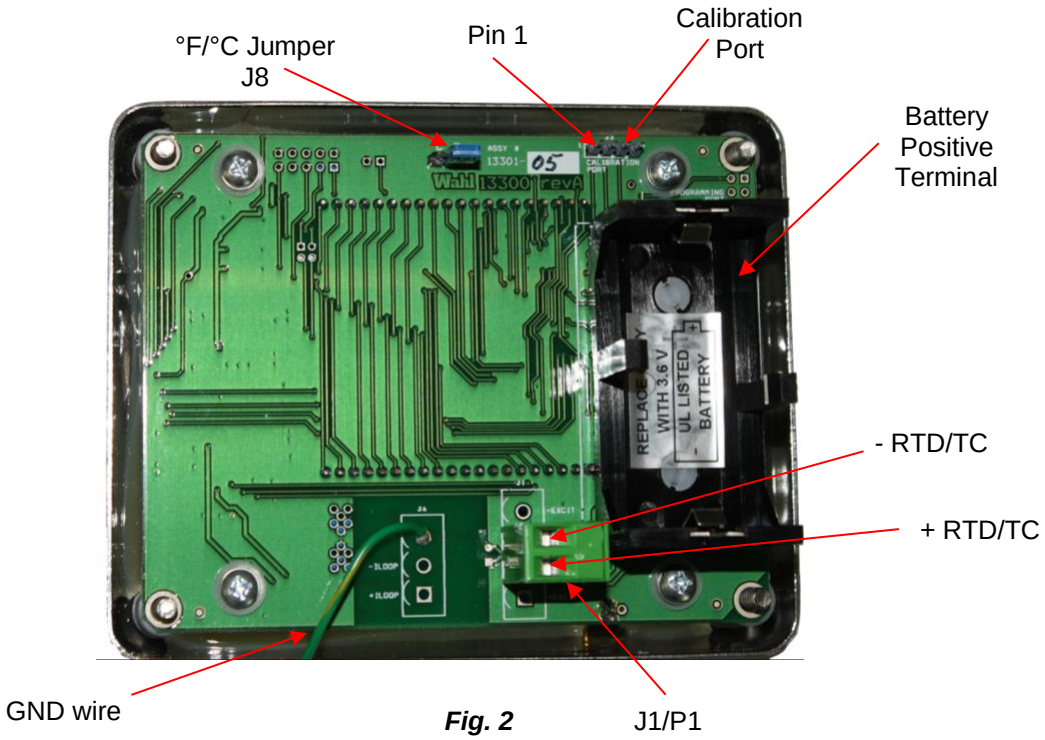

Fig. 2

2.4. Ventilation
2.4.1. The DST400 should be installed in an area of adequate air exchange so that the specified ambient conditions are not exceeded.

2.5. Adjustable Angle Probe – Adjustment
2.5.1. Rotational adjustment, loosen the two long Phillips head screws on the ends of the bracket and rotate the bracket around the coupling nuts. Tighten screws when position is set to the desired location.
Caution! Do not rotate Digi-Stems with adjustable angles more than 360° in one direction as wire breakage may occur.
2.5.2. Angular adjustment, loosen the two short Phillips head screws in the center slots and pivot the bracket to the desired angle. Tighten screws.

3. Battery Installation/Replacement

The DST400 uses a single 3.6V Lithium Thionyl Chloride battery, Wahl Catalog # DSA3062. Low battery is indicated by “LOW BATT” displaying in the lower right

corner of the display (see Fig. 3). This indicates approximately 4-6 weeks of battery life left. Actual time will vary dependent on Display Update Rate Setting. If the "LOW BATT" warning is ignored a "- - - -"will appear on the display indicating battery voltage is too low to make accurate measurements. This will be followed by a shutdown of the thermometer.

3.1. For installation or replacement, loosen the four Phillips-head screws in the front cover until the cover is removed.
Note: The screws are held captive by retaining washers and should not be removed completely.
3.2. Remove old battery and dispose of in accordance with local, state and federal regulations.
3.3. Insert new battery, Wahl Catalog # DSA3062, with polarity as indicated on battery holder. Positive terminal should be at the top of the PCB.
3.4. Replace cover on Digi-Stem enclosure and secure with four screws tightened to a force of 4 to 5 in-lbs. of torque.

Fig. 3

4. Operation

4.1. Scale Selection °F/°C - Temperature scale is user selectable via jumper J8 (Fig. 2) on the Printed Circuit Board (PCB). The scale is indicated in the upper right corner of the display (Fig. 3).
4.2. Making measurements - With the battery installed and probe connected the meter automatically updates the display with the most recent measurement. Factory default for measurement sample/display rate is 1 per 2 seconds for standard unit and 1 per 4 seconds for "I" versions.
4.3. Error Codes - During normal operation, the DST400 continually performs diagnostic testing on the meter and sensor. Errors are indicated by the following error codes:

DST400 Display Error Codes

Error Code	Description
Hi	Open sensor/wire or reading is above specified range Note: Open sensor indication may take up to 12 sample periods to display after the input is initially opened. It will however, show steadily increasing readings, prior to displaying "Hi".
Lo	Reading is below specified range
- - -	Indicates Low Battery Shutdown Mode

5. Calibration

5.1. Background - As with all electronic Thermocouple thermometers, there are two main components to the system. The first component is the electronics, which measures the millivolt signal from the sensing element and then converts this signal to a temperature indication. The second component is the probe, also referred to as the sensor. The probes voltage output is a function of its temperature as defined in the ITS-90 voltage vs. temperature tables. With thermocouple sensors, the voltage measured is the sum of the "Hot Junction", at the sensing tip and the "Cold Junction" of where the T/C wire is joined to the copper conductors in the meter. To get an accurate reading of the sensor tip, the signal of the "Cold Junction" must be subtracted out. This process is sometimes referred to as "Cold Junction Compensation" or "CJC".

The DST400 meter includes calibration of the Cold Junction Compensation circuit and **must** be performed anytime the meter is set to a different thermocouple type. Programming and/or calibration requires the use of the DSTCAL software package. This package includes the USB cable, USB/DST Interface Box and DST calibration cable. DSTCAL programming software includes the ability to set the Sample Rate, Thermocouple Type, meter mV calibration and CJC calibration. The DST400 uses the following methods for calibration. For more details on the calibration, see the DSTCAL software manual, WD1037.

5.2. mV Meter calibration – mV calibration on the meter is a 2-point calibration, which calibrates the DST400 voltage measuring circuits. It requires a NIST traceable mV source with a known accuracy of ± 0.003mV or better at 0.000mV and ±0.012mV or better at 75.000mV.

5.3. Cold Junction Compensation (CJC) calibration – CJC calibration is a single point calibration performed to calibrate the cold junction compensation signal with the selected thermocouple type. This calibration MUST be performed anytime the thermocouple type of the meter is changed and must be performed using a T/C calibrator and connecting cables of the same T/C type. The T/C calibrator should have a known accuracy of ±0.4°C or better for types K, J, T and E or ±1.1°C or better for type S.

6. Specifications

Digi-Stem DST400 Series Specifications

CASE STYLE	Stainless Steel Case Polycarbonate H Frame/Window	DST400K	DST400J	DST400T	DST400E	DST400S
	Stainless Steel Case and H Frame/Polycarbonate Window	DST440K	DST440J	DST440T	DST440E	DST440S
PROBES	Thermocouple Type	Type K	Type J	Type T	Type E	Type S
	Probe Accuracy	Special Limits of Error				
	Sensor Lead Resistance	1000 ohms Maximum				
METER SPECIFICATIONS	Meter Range	-40° to 2500°F (-40° to 1371°C)	-40° to 2192°F (-40° to 1200°C)	-40° to 752°F (-40° to 400°C)	-40° to 1832°F (-40° to 1000°C)	32° to 3200°F (0° to 1760°C)
	Scale	User Selectable for °F or °C				
	Meter Accuracy @ Tamb = 23°C ±5°C*	< 1000 = ± 0.5°F, ± 0.3°C > 1000 = ± 2°F, ± 1°C		± 0.5°F, ± 0.3°C	< 1000 = ± 0.5°F, ± 0.3°C > 1000 = ± 2°F, ± 1°C	Full Range = ± 2°F, ± 1°C
	Ambient Operating Environment	-40° to 158°F (-40° to 70°C)				
	Relative Humidity	10% to 100% RH non-condensing				
	Ambient Temperature Coefficient From 23°C ±5°C	Input: < 200°C, Maximum of: ± 0.02°C/°C Input: > 200°C, Maximum of: ± 0.05°C/°C				
	Vibration	Vibration - MIL STD 202G				
	Meter Battery, User Replaceable	1 - C size, Lithium Thionyl Chloride, 3.6 V Optional "I" Model: 1 - AA Battery Lithium Thionyl Chloride				
	Battery Life	Approximately 4 Years at 2 second sample rate, 1 to > 10 years (approximate) when set to .25 to 10 second sample/display rate				
DISPLAY SPECIFICATIONS	Display	1.0 inch 4-digit LCD display, readable from 30 Feet				
	Display Icons	°F and °C, Low Battery, Error Warnings				
	Display Resolution	< 1000 = 0.1°; > 1000 = 1°				1°
	Sample / Display Update Rate	2 Seconds, adjustable in .25 second intervals to .25 to 10 seconds with optional DSTCAL software				
ENCLOSURE	EMI Interference	DST440 laser welded stainless steel H-Frame for additional protection against RFI and water ingress.				
	Protection	NEMA 4X				
	Enclosure Dimensions / Weight	5.3" W x 4.3" H x 2.7" D (135 x 109 x 69 mm) / Weight: 2.0 lbs. (1kg)				

Models using a "AA" battery have a Sample/Display update rate of 4 seconds, and a 2 year battery life, 0.5 to > 3 years when set to .25 to 10 second rate.

7. Service

For calibration, service or technical support, contact our Customer Service.

Palmer / Wahl
BEYOND THE SCALE

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DIGI-STEM® PANEL MOUNT INSTRUCTIONS

The Panel Mount system for Wahl Digi-Stem® is designed for use with panels from 1/8" to 3/8" thickness. The table below shows the models compatible with the Panel Mount Option.

The system uses a square O-ring to seal around the meters H-Frame and the panel. The unit is secured by a U-bracket with 2 #8 wing-nuts and lock washers.

For Panel cutout dimensions and installation reference Wahl Drawing 13615. (Shown on next page).

1) Remove Hardware and bracket from mounting studs on rear of meter enclosure.

2) Ensure the square O-ring is installed flat against the H-frame and is not twisted.

3) Slide the meter from the front surface of the panel through the panel opening.

4) Install the U bracket over the mounting studs with the short arms facing the rear side of the panel.

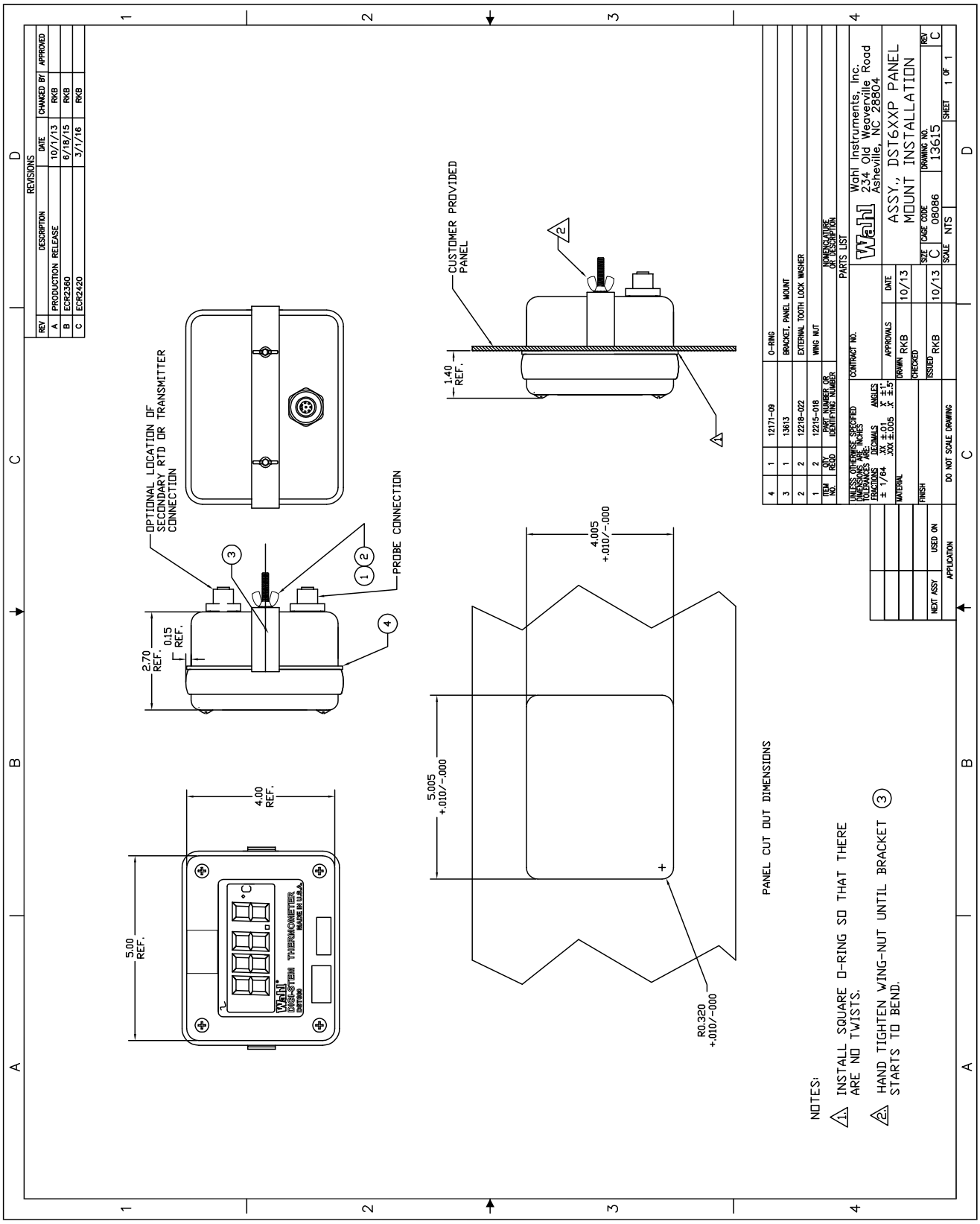
5) Install a lock washer and wing-nut onto the studs.

6) Gently tighten the wing-nuts until they just start tightening. The bracket should not be deflected more than 0.020" (approximately ¾ to 1 turn after touching).

CAUTION: Excessive force may result in bending and fracturing the U bracket or damaging the mounting studs.

DIGI-STEM MODELS COMPATIBLE WITH PANEL MOUNT OPTION				
Model	**Panel Mount Option**		**Model**	**Panel Mount Option**
DST400/440K	Yes		DST600/640	Yes
DST400/440J	Yes		DST610	No
DST400/440T	Yes		DST611	Yes
DST400/440E	Yes		DST620	No
DST400/440S	Yes		DST621	Yes
DST500/540	Yes		DST650	No
DST550	No		DST651	Yes
DSX500/540	No		DST660	No
DSX501	Yes		DST661	Yes

DIGI-STEM® PANEL MOUNT INSTRUCTIONS



LITHIUM METAL BATTERY INSTALLATION and RETURN SHIPMENT INFORMATION

MODELS: DST300, all DST400, DST500, DST600 Series and HSICBB-P

Attention! Due to changes in transportation regulations for the transport of Lithium Batteries, all Wahl Instruments products that use Lithium Metal batteries are now shipped with the **battery not installed,** with the exception of the HSICBB-P, which has a power switch and must be shipped with the unit turned OFF. For information on shipping units already in your possession, see the "Return Shipment Instructions" below, and additional information on Pg 2.

The batteries are shipped in sealed plastic bags and the end user must install them into the equipment. Follow the procedure below for proper installation.

BATTERY INSTALLATION INSTRUCTIONS for DST Models

1) For installation, loosen the four (4) phillips-head screws in the front cover of the enclosure until the cover is removed.
Note: The screws are held captive by retaining washers and should not be removed completely. Remove old battery and dispose of in accordance with Local, State and Federal Regulations.
2) Insert new battery with polarity as indicated on battery holder. Positive terminal should be at the top of the PCB.
Wahl #DSA3062 - Standard Lithium Thionyl Chloride "C" Battery - for all DST Models except FM versions.
Wahl #DSA3060 - FM approved Lithium Thionyl Chloride "C" Battery – required with DST500-FM.
Wahl #12234-03 - Lithium Thionyl Chloride "AA" Battery - "I" Models only.
3) The Digi-Stem display should briefly turn all segments ON, and then OFF, followed by the display of the temperature or error code in the event that the probe is disconnected.
4) Replace cover on enclosure, and secure four (4) screws with screws tightened to a force of 4 to 5 in-lbs. of torque.

RETURN SHIPMENT INSTRUCTIONS – Please follow all directions!

Ground Shipment

1) When shipping a Digi-Stem, remove the battery and seal in a zip-lock type bag.
2) Ship via ground and use the original packaging.
3) Mark package with proper labels as designated on sheet 2 of this document.
4) **Do Not** ship defective or depleted (dead) batteries. Dispose of defective or depleted batteries in accordance with Local, State and Federal Regulations.

Air Shipment

1) If air transportation is required, remove the battery and **Do Not ship batteries with the unit!**
2) If the unit is shipped without the batteries, no hazardous material labeling is required, **however removal of Hazmat sticker IS REQUIRED! See next page for more details.**
3) Air Transportation of batteries requires an active hazardous shipper contract with the transportation carrier. Lithium content of "C" battery is 2.5 grams, "AA" battery is .65 grams.
4) **Do Not** ship defective or depleted (dead) batteries. Dispose of defective or depleted batteries in accordance with Local, State and Federal Regulations.

RULES FOR SHIPPING LITHIUM METAL BATTERIES

MODELS: DST300, all DST400, DST500, DST600 Series and HSICBB-P contain Lithium metal batteries and have special shipping requirements imposed by the Department of Transportation.

- The batteries ***CANNOT*** be shipped inside the equipment, except for Model HSICBB-P which must be in the "Power OFF" position. The battery ***MUST*** be removed and packed as instructed below:

- Once removed from the equipment, the batteries ***MUST*** be placed inside a small plastic zip-lock bag to eliminate any chance of shorting the contacts.

- To satisfy DOT requirements, the appropriate labels ***MUST*** be placed on the outside of the box. Proper labeling of the ground shipment box will look like:

U- Line P/N's: S14859 S-14590 S15764

Labels must be in color (with the exception of the "Primary Lithium Battery Label" (S-14590). One source for labels is U-Line at http://www.uline.com/. If returning the equipment to us in the same box it was received in, the labels above should already be properly attached to the box. **If at all possible please return the equipment in the same box you received it in.**

Removal of Hazmat sticker is REQUIRED!
When using the original box for shipment and if the package was originally shipped from us by Air, the Hazmat Class 9 sticker shown below:

MUST BE REMOVED or completely obliterated from both panels of the Ground Shipment box.

All references to **"UN3091"** must also be removed or obliterated prior to package pickup.

➔ ***FAILURE TO REMOVE THESE FROM THE BOX WILL RESULT IN REJECTION OF THE SHIPMENT BY UPS AND MAY RESULT IN FINES.*** ➔

Failure to follow these procedures can lead **YOU** to be fined up to $110,000 and face up to 10 years in jail, per each violation.