



DST400 Digi-Stem® Thermometer User Manual



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WD1095 Rev C
(02/19/15)

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DST400 INSTRUCTION MANUAL

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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! 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

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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

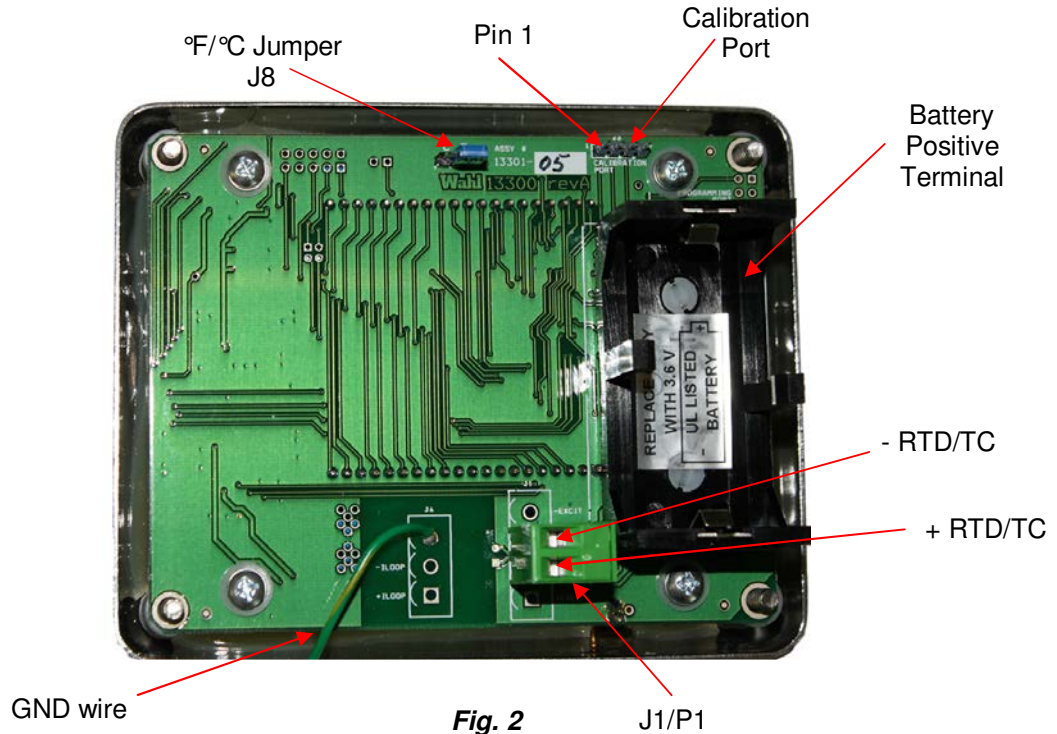
*Type S designation for Extension wire only

2.3.3. Re-connect pluggable terminal strip to PCB connector J1.

2.3.4. Install battery with polarity as indicated on battery holder.

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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.



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.

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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 $\pm 0.003\text{mV}$ or better at 0.000mV and $\pm 0.012\text{mV}$ 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 $\pm 0.4^\circ\text{C}$ or better for types K, J, T and E or $\pm 1.1^\circ\text{C}$ or better for type S.

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6. Specifications

DST400 Series Specifications					
Model	DST400K	DST400J	DST400T	DST400E	DST400S
Range °F or °C Switchable	-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
Meter Accuracy Tamb = 23°C ± 5°C (includes CJC error)	< 1000 = ± 0.5°F, ± 0.3°C > 1000 = ± 2°F, ± 1°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
Resolution	1.0" 4-digit display with icons for °F, °C, and low battery.				
Display Resolution	< 1000 = 0.1°; > 1000 = 1°				
Humidity	10 to 100% RH, non-condensing				
Ambient Operating Temperature	-40° to 158°F (-40° to 70°C)				
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				
Sensor Lead Resistance	1000 ohms Maximum				
Models	DST400K	DST400J	DST400T	DST400E	DST400S
Battery Power	1 - C size, Lithium Thionyl Chloride, 3.6V				
Sample/Display Rate	2 Seconds, adjustable in .25 Second intervals to .25 to 10 seconds with software				
Battery Life	> 4 Years at 2-second sample rate, 1 to >10 years (approximate) when set to .25 to 10 second sample/display rate				
"I" Models*	DST400KI	DST400JI	DST400TI	DST400EI	DST400SI
Battery Power	1 - AA size, Lithium Thionyl Chloride, 3.6V				
Sample/Display Rate	4 Seconds, adjustable in .25 Second intervals from .25 to 10 seconds sample display rate with software				
Battery Life	2 Years at 4-second sample rate, 0.5 to > 3 years (approximate) when set to .25 to 10 second sample display/rate				
Housing	Stainless Steel and Polycarbonate, Rating NEMA 4-X. Dimensions: 5.3"W x 4.3"H x 2.7"D (13.5 x 10.9 x 6.9 cm); Weight: 2 lbs. (1kg)				
Options	NIST Traceable Certificate of Conformance				

* DST Meters come standard with a "C" cell battery, ready for ground shipment in the contiguous 48 states and some areas of Canada. For air shipments, either an "I" model with a "AA" battery, or "NB" model with no battery, is required to avoid additional charges in compliance with transportation regulations regarding "C" cell lithium metal batteries. Specify on order form.

Specifications subject to change without notice

7. Service

For calibration, service or technical support, contact:

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