

DST500-FM Digi-Stem[®] Thermometer User Manual



Intrinsically Safe - Sécurité Intrinsèque
IS/CL I, II, III / DIV 1 / GP ABCDEFG;
T4A Ta=70°C; Type 4X
CL I, II, III / DIV 2 / GP ABCDEFG;
T4A Ta=70°C; Type 4X

Do not revise without prior FM approval

Palmer Wahl Instruments, Inc.
234 Old Weaverville Road
Asheville, NC 28804
Toll Free 800-421-2853
Phone 828-658-3131
Fax 828-658-0728
www.palmerwahl.com

DST500-FM USER MANUAL

Index

1	<i>Introduction</i>	3
2	<i>Application and Key Features</i>	3
3	<i>Factory Mutual Approval</i>	3
4	<i>Installation</i>	5
5	<i>Battery Installation/Replacement</i>	7
6	<i>Operation</i>	8
7	<i>Calibration</i>	9
8	<i>Installation Control Drawing</i>	11
9	<i>Specifications</i>	12
10	<i>Service</i>	12


**WARRANTY & CALIBRATION
REGISTRATION at
www.palmerwahl.com/register**

Registration is fast and easy. In about a minute you can have your product automatically registered for Warranty Protection and our Calibration Reminder service. Let Palmer Wahl help you protect your investment, and maintain product accuracy and compliance with ISO and other quality standards. Questions? Call Customer Service at 1-800-421-2853 or 828-658-3131 Or email: register@palmerwahl.com

1 Introduction

The following symbols are used in this manual.

Please adhere to all  **Warnings** and **Cautions!** in this manual.

 **Warning** – identifies conditions and actions that may be dangerous to the user.

Caution! – identifies conditions and actions that may cause damage to the product or equipment.

Note: - provides additional explanatory information.

2 Application and Key Features

The Wahl DST500-FM is designed for temperature monitoring applications in Classified Hazardous Locations, where a high degree of accuracy and ease of use are desired. To achieve this objective the DST500-FM incorporates the following features:

- High reliability, 4-wire, 100 ohm, $.00385\Omega/\Omega/^\circ\text{C}$, thin-film platinum RTD sensor per DIN EN 60751, Class A.
- Hazardous Location approval by FM Approvals as defined in Section 3 of this manual.
- High accuracy 24-bit Delta-Sigma Analog/Digital Converter.
- Probe Error checking: Checks for open wire, open sensor, shorted sensor, incorrect wiring.
- Programmable R \emptyset : Allows programming of the sensing probes specific R \emptyset value into the meter for accurate temperature calibration.


3 Factory Mutual Approval

3.1 The DST500-FM when used with the Wahl p/n DSA3060 battery (Tadiran model TL-2200), carries hazardous location approval and is suitable for use in the following locations.

- Intrinsically Safe; Class I, II and III; Division 1; Groups ABCDEFG; Temperature Class T4A Ta = 70°C; Indoor and Outdoor (Type 4X) Hazardous Locations.
- Class I, II, III; Division 2; Groups ABCDEFG; Temperature Class T4A Ta = 70°C; Indoor and Outdoor (Type 4X) Hazardous Locations
- All Non-hazardous Locations

3.2  **English Warnings**


 **Warning – Please adhere to the following warnings:**

 **Warning - Battery MUST be changed in an Unclassified Location only.**

 **Warning – Electrostatic Charging Hazard**


The DST500-FM enclosure includes 2 non-metallic components, consisting of the polycarbonate window and the blue colored polycarbonate H-frame, which thereby increase the risk of electrostatic charge buildup. The following precautions may be used to reduce the risk of static discharge.


- Do not contact the viewing window or the blue H-frame when a flammable or combustible atmosphere is present.
- Coat the window and H-frame using a topical anti-static coating such as Desco Industries part number 10415 or equivalent, re-coating as needed.
- Do not use in the presence of high electro-magnetic fields.
- Clean only with damp cloth using clean water.
- Ensure either the enclosure or the probe is grounded to building or earth ground.


 **Warning** – Substitution of the following components may impair suitability for Division 2:

- Battery – Wahl P/N DSA3060; Manufacturer – Tadiran, model TL-2200

3.3  **Avertissements Français**


 **Avertissement** - S'il vous plaît respecter les avertissements suivants:

 **Avertissement** - La batterie doit être changée en dehors d'une zone classifiée.

 **Avertissement** - Risque de charge électrostatique
Le boîtier DST500-FM comprend 2 composants non métalliques en polycarbonate, la fenêtre et le cadre bleu en forme de H, qui augmentent le risque d'accumulation de charges électrostatiques. Les précautions suivantes sont à suivre pour réduire le risque de décharge électrostatique.

- Ne pas toucher la fenêtre de visualisation ou le cadre bleu en forme de H en présence d'une atmosphère inflammable ou combustible.
- recouvrir la fenêtre et le cadre en utilisant un revêtement antistatique tel que du Desco Industrie référence 10415 ou équivalent, recouvrir de nouveau si besoin.
- Ne pas utiliser en présence de forts champs électromagnétiques.

- Nettoyer uniquement avec un chiffon humide et de l'eau propre. S'assurer que le boîtier ou la sonde sont mis à la terre.

 **Avertissement** - Le remplacement des composants suivants peut altérer l'aptitude à la Division 2:
Batterie - Référence Wahl DSA3060, Fabricant - Tadiran, modèle TL-2200

4 Installation

Caution! Installation should be in accordance with Wahl Control Drawing 13327.

Caution! See important information regarding Lithium Batteries found in Wahl 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 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 5 of this manual.

4.1 Meter Mounting

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

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

4.2 Wire Connections –The following is for installation of fixed probe.

- 4.2.1 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.
- 4.2.2 Remove the 4-pin pluggable terminal-strip connector (P1) from the PCB mating connector J1 and connect probe wires as shown in the table below and in Fig. 4 and following the ferrite installation as defined in paragraph 4.3.

P1/J1 – DST500-FM Probe Wiring

Pin #	Label	Fixed Probe
1	+ EXCIT	WHITE
2	+ RTD / TC	WHITE
3	- RTD / TC	BLACK
4	- EXCIT	BLACK

DST500-FM USER MANUAL

- 4.2.3 Connect pluggable terminal strip to PCB connector P1.
- 4.2.4 Install battery with polarity as indicated on battery holder.
- 4.2.5 Replace cover on Digi-Stem enclosure and secure with four screws tightened to a force of 4 to 5 in-lbs. of torque.

4.3 Ferrite Installation

The Wahl DST500-FM requires installation of 2 ferrites, installed on the internal wiring. This is normally installed when the system is delivered, however on units with extremely long probes these may need to be installed by the end-user during the installation process.

To install the ferrites, (reference Fig 2) first, mount the large ferrite as shown. Clamp the small ferrite around the 4 probe wires and the green/yellow ground wire as close to the ground wire spade terminal as possible. Make certain not to pinch the probe wires in the ferrite. Route the 4 probe wires through the solid ferrite and loop back *around* through the ferrite 2 more times for a total of 3 passes through the ferrite. Connect wires to PCB plug P1 per probe wiring table.

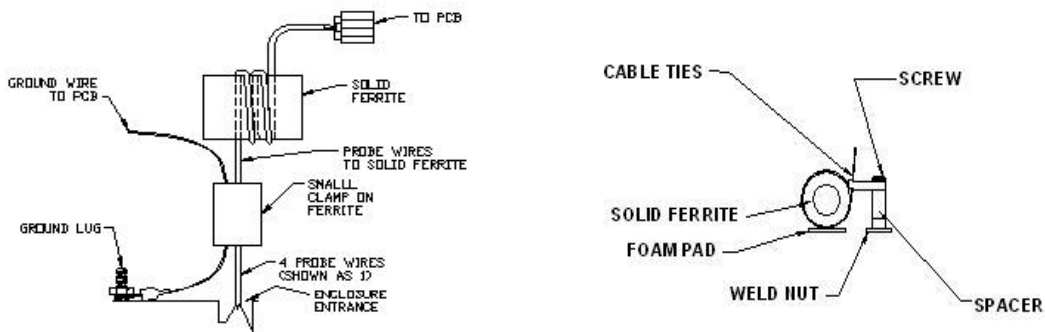


Fig. 2

4.4 Grounding

- 4.4.1 The DST500-FM should be grounded for optimum noise immunity. Install in compliance to Wahl Control Drawing 13327.
- 4.4.2 Grounding on DST500-FM's with rigid probes is accomplished by grounding the probe shank. Typically, the equipment that the probe shank is installed in will be grounded, which will also ground the DST500 meter assembly.
- 4.4.3 After servicing, be certain the Printed Circuit Board's ground wire is connected to the housing's ground lug.

DST500-FM USER MANUAL

4.4.4 If you have questions about grounding of the DST500-FM please contact Wahl Instruments Customer Service as listed in section 9 of this manual.

4.5 Ventilation

4.5.1 The DST500-FM should be installed in an area of adequate air exchange so that the specified ambient conditions are not exceeded.

5 Battery Installation/Replacement

 **WARNING - Battery MUST be changed in the Unclassified Location only.**

The DST500-FM uses a single 3.6V Lithium Thionyl Chloride battery, Wahl P/N DSA3060, (Tadiran TL-2200). Use of this battery is required for use in hazardous locations as specified in section 3.1.

Lo battery is indicated by “LOW BATT” displaying in the lower right corner of the display (Fig. 3). This indicates approximately 1-2 weeks of battery life left. The battery should be replaced at this time. As the battery continues to drain “- - - - -” will appear, indicating the battery is too low for an accurate measurement. The battery must be replaced at this time. Battery life will vary dependent on Display Update Rate Setting as shown in the Battery Life Table below.

- 5.1 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.
- 5.2 Remove old battery and dispose of in accordance with local, state and federal regulations.
- 5.3 Insert new battery, Wahl Catalog # DSA3060, with polarity as indicated on battery holder. Positive terminal should be at the top of the PCB.
- 5.4 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

Battery Life Table

LCD Refresh	Update Rate (Seconds)	Approx. Battery Life (Months/years)
1	0.25	10.2 / 0.8
2	0.5	16.1 / 1.3
3	0.75	23.2 / 1.9
4	1.0	29.9 / 2.5
8	2.0	53.7 / 4.5

6 Operation

- 6.1 Scale Selection °F/°C – Temperature scale is user selectable via jumper J8 (Fig. 4) on the Printed Circuit Board (PCB). The scale is indicated in the upper right corner of the display (Fig. 3.)
- 6.2 Making measurements - With the batteries installed and probe connected the meter automatically updates the display with the most recent measurement. Factory default for measurement LCD Refresh (sample/display) rate is set to 8 for a 2 second update.
- 6.3 **Error Codes - During normal operation, the DST500-FM continually performs diagnostic testing on the sensor lines. Errors are indicated by the following error codes:**

Error Code	Description
HI	Reading is above meters usable range
LO	Reading is below meters usable range or sensor is shorted
CbL1	Indicates cable 1 is open (J1 pin 1)
CbL2	Indicates cable 2 is open (J1 pin 2)
CbL3	Indicates cable 3 is open (J1 pin 3)
CbL4	Indicates cable 4 is open (J1 pin 4), or open sensor
- - - -	Indicates Low Battery Shutdown Mode

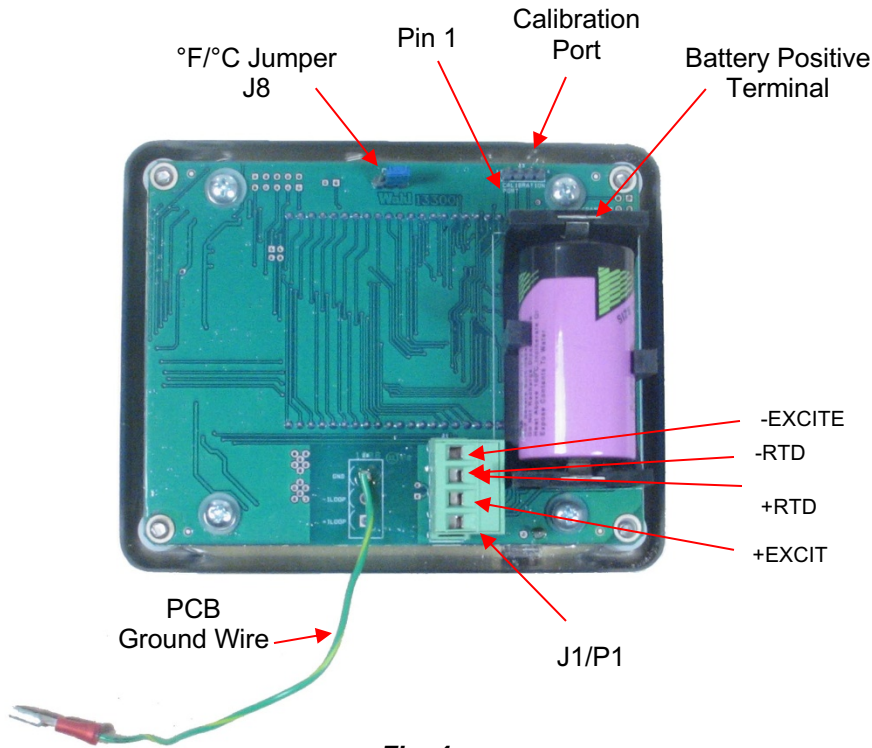


Fig. 4

7 Calibration

As with all electronic RTD thermometers, there are two main components to the system. The first component is the electronics, which measures the resistance of the sensing element and then converts this resistance value to a temperature indication. The second component is the probe, also referred to as the sensor. The probes sensor resistance changes as its temperature changes. This change is in conformance to the DIN EN 60751 Class A standard. As in all manufactured goods, there are slight variations in the finished parts. A key variable of RTD sensors is its resistance at 0°C, referred to as “R₀” value. Once this value is measured, it may be programmed into the meter to correct the temperature conversion algorithm. Programming and/or calibration require 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, R₀ value and allows calibration of the meter and/or calibration of the system (calibrates meter with probe’s R₀ value). The DST500-FM uses the following methods for calibration. For details of the calibration, see the DSTCAL software manual, Wahl P/N W1037.

- 7.1 Ohm Meter calibration – Ohm Meter calibration is a 2-point calibration, which calibrates the DST500-FM electronics. It requires a NIST traceable precision resistance source with a known accuracy of ± 0.03 ohms at 50.00 and 280.00 ohms. Resistors used should have a temperature coefficient of <5.0-ppm.
- 7.2 Probe (system) calibration - Probe calibration is a single point calibration which is performed by placing the probe into an ice bath and following the on screen prompts of the DSTCAL software. The DST500-FM and software will measure the probes R₀ value and program it into the DST500-FM’s memory. The system is then calibrated. After system calibration is completed, the calibration should be checked at the temperatures of interest to the end user, using calibrated accurate standards and calibration baths.
 - 7.2.1 DST500-FM calibration adjustment - Calibration is accomplished via the DSTCAL software package and associated hardware interface. Method 1 may also be performed with the DSTPROG software. Optional cable extensions are available for convenience in calibrating fixed probes.
 - 7.2.2 The two methods of calibrating a meter with probe as a system are:
 - 7.2.3 Method 1
 - The first method uses an ice bath and high accuracy ohmmeter along with the DSTCAL software.
 - For fixed probes:
 - 1) Disconnect the probe from the meter and place the probe in an ice bath or 0°C circulating bath. Allow stabilization.

DST500-FM USER MANUAL

- 2) Use a high accuracy ohmmeter to measure the probes R0 value.
- 3) Connect the meter to the PC via the 13506 Interface Module.
- 4) Enter the probes measured R0 value into the R0 box, under the Module Calibration Data section. Press "Set" to program the DST500-FM memory with this value.

NOTE: For this method, with fixed probes, the 13500-04 extension cable is not required, as the probe is removed from the meter.

7.2.4 Method 2

The second method is to use the DST500-FM meter to acquire the R0 value. For fixed probes, this method is made easier, by using the 13500-04 extension cable.

- 1) For fixed probes, disconnect probe from meter, and install the 13500-04, extension cable between the probe connector and the meter PCB connector. This allows the meter to be placed on a bench, rather than dangling above the ice bath. Place the probe in an ice bath. Allow stabilization.
- 2) Connect the meter to the PC via the 13506 Interface Module.
- 3) Select and run the "Probe (system) Calibration" program and follow the on-screen prompts. A running average of R0 is displayed in the R0 box. Press "Capture R0" to freeze the reading then press "Yes" to store the measured value into the DST500-FM memory.

Note: 1) When using this method, the meter may display erratic readings during the measurement of the probes resistance. This is normal and does not affect the calibration.

2) During the acquisition process, the software continues to take samples after the 10th sample. This running average allows the user to verify the probes stability. If this reading continues to drop, then stability has not yet been achieved.

8 Installation Control Drawing

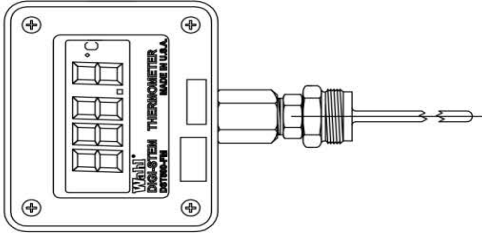
ABCD

1234

ABCD

1234

HAZARDOUS LOCATIONS
IS/CL I, II, III / DIV 1/GP ABCDEFG/ T4A Ta=70°C; Type 4X
CL I, II, III / DIV 2/GP ABCDEFG; T4A Ta=70°C; Type 4X



CONTROLLED DOCUMENT
DO NOT REVISE WITHOUT PRIOR FM APPROVAL

6. FOR REPLACEMENT BATTERY USE ONLY WAHL P/N DSA3060 (TADIRAN MODEL TL-2200).
 5. FOR REMOTE MOUNTING USE OPTIONAL MOUNTING BRACKETS DSA3030 OR DSA3031 (WITH GROUND LUG).
4. ⚠️ WARNING-POTENTIAL ELECTROSTATIC CHARGING HAZARD-SEE INSTALLATION INSTRUCTION MANUAL (WD1094)
3. ⚠️ WARNING-BATTERY REPLACEMENT SHALL BE PERFORMED IN AN UNCLASSIFIED AREA ONLY.
 2. INSTALLATION SHALL BE IN ACCORDANCE WITH THE MANUFACTURERS INSTRUCTIONS AND THE NATIONAL ELECTRIC CODE(I) (ANSI-NFPA70) AND THE CANADIAN ELECTRICAL (CE) CODE(I) (CEC, CAN/CSA-C22.1), WHERE APPLICABLE.
 1. INSTALLATION SHALL BE IN ACCORDANCE WITH ANSI/ISA-SP12.06.01, "INSTALLATION OF INTRINSICALLY SAFE SYSTEMS FOR HAZARDOUS (CLASSIFIED) LOCATIONS".

NOTE:
 SYSTEMS FOR HAZARDOUS (CLASSIFIED) LOCATIONS".

REV	DESCRIPTION	DATE	CHANGED BY
A	PRODUCTION RELEASE	12/21/12	RKB
B	EGR2238	1/30/13	RKB

Wahl		Wahl Instruments, Inc. 234 Old Weaverville Road Asheville, NC 28804	
CONTRACT NO.		DST500-FM CONTROL DRAWING	
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ± 1/64 .XX ±.01 ° ±15'		APPROVALS DATE	
DRAWN		RKB 10/3/12	
CHECKED		ISSUED	
MATERIAL		DO NOT SCALE DRAWING	
FINISH		SCALE NTS	
USED ON		DRAWING NO. 13327	
APPLICATION		REV B	
		SHEET 1 OF 1	

9 Specifications

DST500-FM RTD METER SPECIFICATIONS	
Model	DST500-FM Meter with Local Display
Meter Range	-328° to 1472°F (-200° to 800°C)
Scale	User Selectable for °F or °C
Meter Accuracy	± 0.1°F/C, over 1-year period (@ Tamb = 23°C ± 5°C)
Meter and Probe Accuracy	°C Temp < 300°C = ± 0.15 + 0.2% of reading, Temp > 300°C = ± 0.25 + 0.5% of reading; °F Temp < 572°F = ± 0.27 + 0.2% (reading-32), Temp > 572°F = ± 0.45 + 0.5% (reading-32)
Display	1.0" 4-digit LCD display with icons for °F, °C and Low Battery
Display Resolution	0.1°F/C; 1°F above 999.9°F
Sample/Display Rate	2 seconds standard, adjustable in .25 second intervals from .25 to 10 seconds
FM Approved For Hazardous Locations	IS/CL I, II, III / DIV 1 / GP ABCDEFG; T4A Ta = 70°C; Type 4X CL I, II, III / DIV 2 / GP ABCDEFG; T4A Ta = 70°C; Type 4X
Ambient Operating Environment	-40° to 158°F (-40° to 70°C), 10% to 100% RH non-condensing, Vibration - MIL STD 202G
Ambient Temperature Coefficient	Maximum of 0.003°/°C over Ambient Operating Temperature Range from 23°C ± 5°C
Enclosure Weight / Dimensions	Stainless Steel and Polycarbonate (NEMA 4X), Weight: 2 lbs.(1kg) Dimensions: 5.3" W x 4.3" H x 2.7" D (13.5 x 10.9 x 6.9 cm).
Sensor/Probe	<ul style="list-style-type: none"> • Sensor - 4-wire RTD, R0 = 100Ω, Alpha = .00385 Ω/Ω/°C • 316 Stainless Steel or Inconel 600 Probe construction • Fixed Stem Probes with optional 90° Elbow
Battery	1-Lithium Thionyl Chloride "C" Battery, #DSA3060 (Tadiran #TL-2200)
Battery Life	4 yrs nominal at 2 second update interval

10 Service

For calibration, service or technical support, contact:

Palmer Wahl Instruments, Inc.
 234 Old Weaverville Road
 Asheville, NC 28804
 Ph.: 800-421-2853 (US only)
 828.658.3131
 Fax: 828.658.0728
 Web: www.palmerwahl.com



234 Old Weaverville Road, Asheville, NC 28804
 800-421-2853 • 828-658-3131 • 828-658-0728
www.palmerwahl.com
info@palmerwahl.com