Wahl

DST550
Digi-Stem® Thermometer
User Manual

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1. **Application and Key Features**
The Wahl DST550 is designed for temperature monitoring applications where recording of minimum and maximum temperatures with a high degree of accuracy is needed. To achieve this objective the DST550 incorporates the following features:
- User viewable and resettable MIN and MAX temperature registers.
- High reliability, 4-wire, 100 ohm, .00385$\Omega/\Omega/°C$, thin-film platinum RTD sensor per DIN EN 60751, Class A.
- High accuracy 24-bit Delta-Sigma Analog/Digital Converter.
- Probe Error checking: Checks for open wire, open sensor, shorted sensor, incorrect wiring.
- Programmable R0: Allows programming of the sensing probes specific R0 value into the meter for accurate temperature calibration.

2. **Installation Caution! See important information regarding Lithium Batteries on the enclosed document #WD1053, before proceeding!**
Your unit was shipped assembled and ready for out-of-box usage. Units with long probes or remote cables may be shipped unassembled. Prior to installation 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 seated properly by following the battery installation procedure, section 4.   Extremely rough handling conditions during shipment may have dislodged the battery.

    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 the threaded fitting 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 angles more than 360° in one direction as wire breakage may occur. See 2.5 for instruction.
    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 will not be grounded.
        2.2.1. For remote mounting:
        2.2.2. Mount the bracket with the Digi-Stem mounting screw towards the bottom (Fig. 1). The Digi-Stem's coupling nut should be inserted from the top, with the display facing out and secured with the Digi-Stem mounting screw.

2.2.3. For remote cables with a connector at the meter end, disconnect the cable connector from the meter connector, insert the meter's coupling nut through the top hole of the mounting bracket and secure with the large slotted screw. Re-connect the cable and secure.

2.2.4. For remote cables without connectors, it is recommended to install the meter prior to installing the probe. This will prevent the probe cable from twisting during the threading of the probe fitting into the meter housing. Before connecting the probe to the meter, insert the meter's coupling nut through the top hole of the mounting bracket and secure with the large slotted screw. Apply thread sealing compound or Teflon tape to the cables ½" NPT meter fitting, feed the wires up through the coupling nut and into the meter housing and thread the probe's meter fitting into the Digi-Stem's probe coupling nut and secure.

Caution! Do not use the Digi-Stem enclosure or bracket as a wrench. Hold the coupling nut with one wrench and tighten the remote cable nut with another wrench.

Note: If battery power is on, the unit will display "CbL4" when the cable is disconnected, indicating an open sensor. It will self-correct when the cable is reconnected.
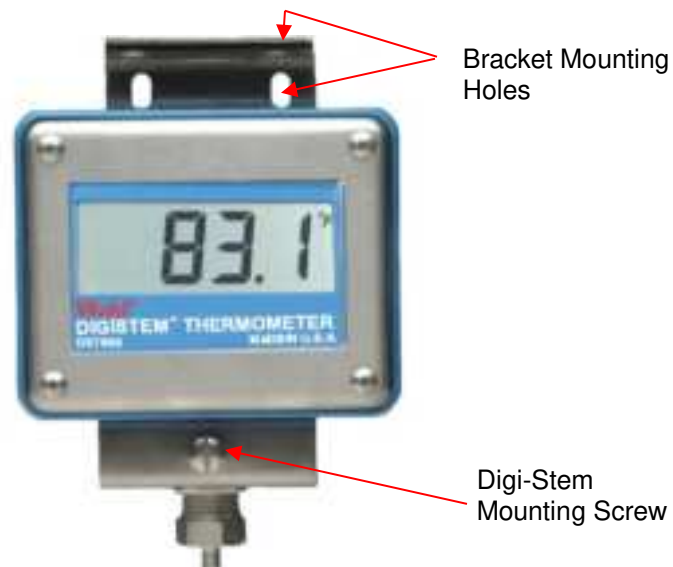

Bracket Mounting Holes

Digi-Stem Mounting Screw

Fig. 1

2.2.5. <u>Wire Connections</u> – Remote probes w/o connector or uninstalled fixed probe.

2.2.6. 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.

2.2.7. Remove the 4-pin pluggable terminal strip connector (J1) from the PCB mating connector and connect probe wires as follows (Fig. 4).

J1 – DST550 Probe Wiring

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

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

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

2.2.10. Replace cover on Digi-Stem enclosure and secure with four screws tightened to a force of 4 to 5 in-lbs. of torque.

2.3. Ventilation

2.3.1. The DST550 should be installed in an area of adequate air exchange so that the specified ambient conditions are not exceeded.

2.4. Adjustable Angle Probe – Adjustment

2.4.1. For 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.

2.4.2. 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 DST550 uses a single 3.6V Lithium Thionyl Chloride battery, Wahl Catalog # DSA3060. Lo battery is indicated by "LOW BATT" displaying in the lower right corner of the display. This indicates approximately 4-6 weeks of battery life left. Actual time will vary dependent on Display Update Rate Setting.

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 # DSA3060, 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. <u>Scale Selection °F/°C</u> - 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).

   4.2. <u>Sample Rate Selection</u> – Sample rate selection is factory set at 6-second intervals. To select 60-second interval, move the blue jumper on the back of the PCB assembly per Fig. 4.

   4.3. <u>Power Up</u> - Operator presses and releases (less than 3 seconds) Operator Interface Switch. Unit activates display and displays CURRENT temperature.

   4.4. <u>Measurement Recall -</u> The Operator Interface Switch will be used to scroll between the current temperature, minimum temperature and maximum temperature, in that order. The MIN and MAX display icons will be on as appropriate. No icon indicates it is the most recent sample of current temperature. To change the reading, the switch should be depressed momentarily (less than 3 seconds) and then released. Each depression and release will toggle to the next display option with it looping back to the current temperature after displaying maximum temperature.

   4.5. <u>MIN/MAX Reset</u> – To reset the MIN/MAX registers, the unit must have the display powered on and have scrolled through at least one complete cycle of Current- Min-Max-Current registers.   Then press and hold the Operator Interface Switch for greater than 6-seconds. After 3-seconds the meter will display "r S t ", indicating "reset" mode. Continue to hold the Operator Interface Switch for an additional 3-seconds and the display will blank, indicating reset of MIN and MAX registers is complete. The unit then goes into sleep mode. Operator then releases Operator Interface Switch. To abort MIN/MAX reset, release Operator Interface Switch anytime within the 6-second period and the unit will return to the present reading, without resetting the MIN/MAX registers.

   4.6. <u>Sleep Mode</u> – The following will cause the unit to power down the display and go into sleep mode. Note that while in sleep mode the meter wakes up and takes readings every 6-seconds or 60-seconds, as selected by the sample rate selection jumper, without powering up the display. It updates MIN and Max registers as required.

4.6.1. 1-minute period of inactivity of the Operator Interface Switch.
4.6.2. Successful completion of a MIN/MAX Reset.

4.7. Error Codes - During normal operation, the DST550 continually performs diagnostic testing on the sensor lines. Errors will be displayed in place of the current temperature when display is activated until the fault is corrected. MIN/MAX Reset function is disabled when in Error Condition. Errors are indicated by the following error codes:

DST550 Display 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

4.8. Data Extraction in Error Condition – When an error is detected the unit will display the error code in place of the current temperature. Min and Max values will be displayed as normal, per paragraph 4.4, Measurement Recall.
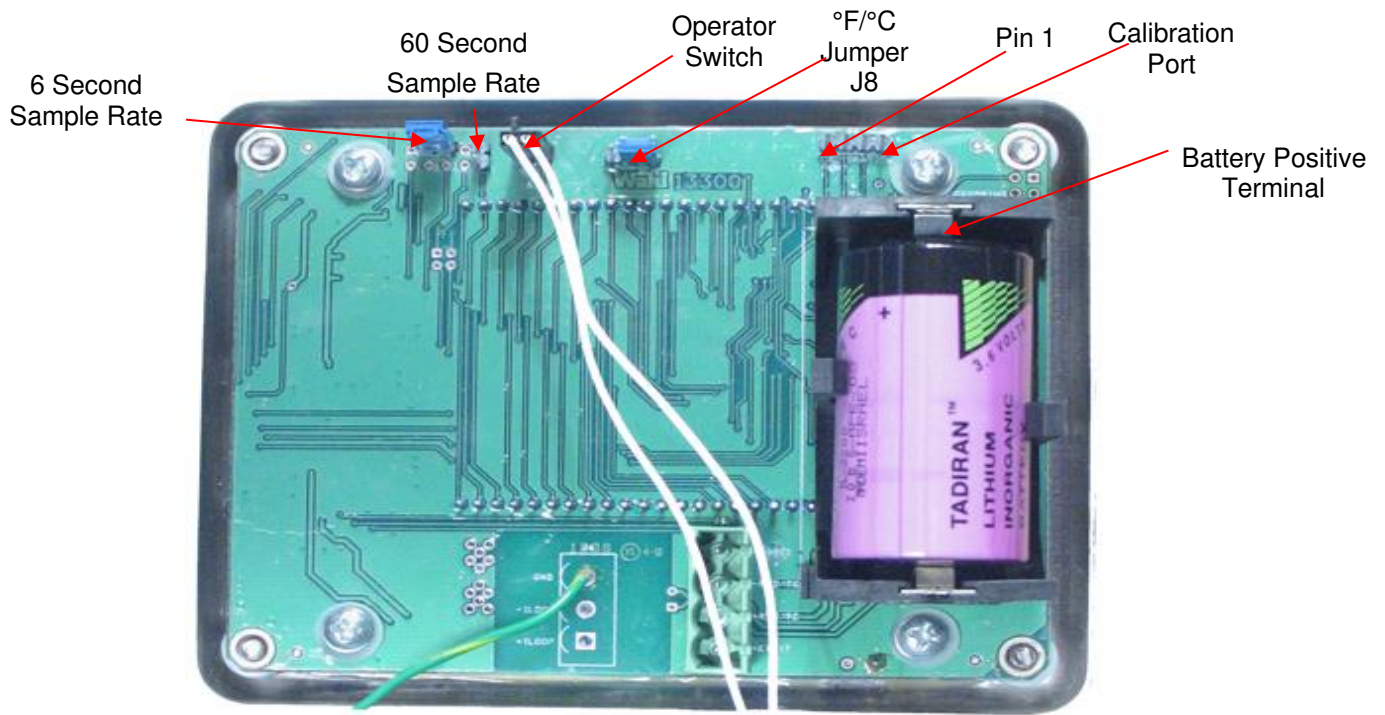

Fig. 4

5. <u>Calibration</u>
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 DSTPROG or DSTCAL software package. These packages include the USB cable, USB/DST Interface Box and DST calibration cable. DSTPROG programming software includes the ability to set the Sample Rate, R0 and associate a new probe with the meter. DSTCAL includes this plus calibration of the meter and/or calibration of the system (probe with meter). The DST550 uses the following methods for calibration. For details of the calibration, see the DSTCAL software manual.

5.1. <u>Ohm Meter calibration</u> – Ohm Meter calibration is a 2-point calibration, which calibrates the DST550 electronics. It requires a NIST traceable precision resistance source with a known accuracy of $\pm$ 0.03 ohms at 50.00 and 280.00 ohms. Resistors used should have a temperature coefficient of <5.0-ppm.

5.2. <u>Probe (system) calibration</u> - Probe calibration is a single point calibration that is performed by placing the probe into an ice bath and following the on screen prompts of the DSTCAL software. The DST550 and software will measure the probes R0 value and program it into the DST550 memory. After the 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.

5.2.1. DST550 calibration adjustment - Calibration is accomplished via the DSTCAL software package and associated hardware interface. Method 1 may also be performed with the DSTPROG software. An optional cable extension, p/n 13500-04 is available for convenience in calibrating fixed probes. The optional cable extension is not required for remote cables as the remote cable itself serves this purpose.

The two methods of calibrating a meter with probe as a system are:

5.2.2. Calibration using external ohmmeter and ice bath
The first method uses an ice bath and high accuracy ohmmeter along with the DSTCAL software.
For fixed or remote probes:

1) Disconnect the probe from the meter and place the probe in an ice bath or 0°C circulating bath. Allow stabilization.
2) Use a high accuracy ohmmeter to measure the probes R0 value. (resistance at 0°C)
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 DST550 with this value.
NOTE: For this method, with fixed probes, the 13500-04 extension cable is not required.

5.2.3. Calibration using DST550 and ice bath
The second method is to use the DST550 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.
        For remote probes, 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 DST550 memory.

NOTES: 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 measurement.
        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 change in the same direction, then stability has not been achieved.

6. <u>Specifications</u>

Digi-Stem DST550 Series Specifications

CASE STYLE	Stainless Steel Case Polycarbonate H Frame/Window	DST550
	Model Feature	MIN-MAX
PROBES	Probes / Cable	Pt100 - 4 wire / PVC insulation, shielded, 4 conductor, 100°C rating
	Sensor	4-wire Class A RTD, R0 = 100 Ω, Alpha = .00385 Ω / Ω / °C
METER SPECIFICATIONS	Meter Range / Scale	-328° to 1472°F (-200° to 800°C) / User Selectable for °F or °C
	Meter Accuracy	± 0.1°F/C, over 1 year period (@ Tamb = 23°C ± 5°C)
	System Accuracy	Greater of ± 0.4°F / 0.22°C or ± 0.5% of reading, over 1 year period (@ Tamb = 23°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	Maximum of 0.003°/°C over Ambient Operating Temperature Range From 23°C ± 5°C
	Vibration	Vibration Resistant
	Meter Battery, User Replaceable	1 - C size, Lithium Thionyl Chloride, 3.6 V Optional "Y" Model: 1 - AA Battery Lithium Thionyl Chloride
	Battery Life	3 year minimum
DISPLAY SPECIFICATIONS	Display	1.0 inch 4-digit LCD display, readable from 30 Feet
	Display Icons	°F and °C, Low Battery, Error Warnings, MIN, MAX
	Display Resolution	0.1°F/C
	Sample / Display Update Rate	User Selectable, 6 second or 60 second
ENCLOSURE	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)

* All Meters come standard with a "C" cell Lithium Thionyl Chloride, ready for ground shipment in the contiguous 48 states and some areas of Canada. For air shipments, either an "Y" model with a "AA" Lithium Thionyl Chloride 3.6 V battery, or "NB" model with no battery is required to avoid additional charges in compliance with transportation regulations regarding Lithium Thionyl Chloride batteries. Specify when ordering.
"Y" Models set to 4 second update rate, adjustable in .25 second intervals from .25 to 10 seconds.

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. <u>Service</u>
For calibration, service or technical support, contact Customer Service.

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Digi-Stem® Thermometer

Panel Mount Installation Instructions

The Panel Mount system for Wahl Digi-Stem® is designed for use with panels from 1/8" to 3/8" thickness.

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.

WD1100 Rev B
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DIGI-STEM® PANEL MOUNT INSTRUCTIONS
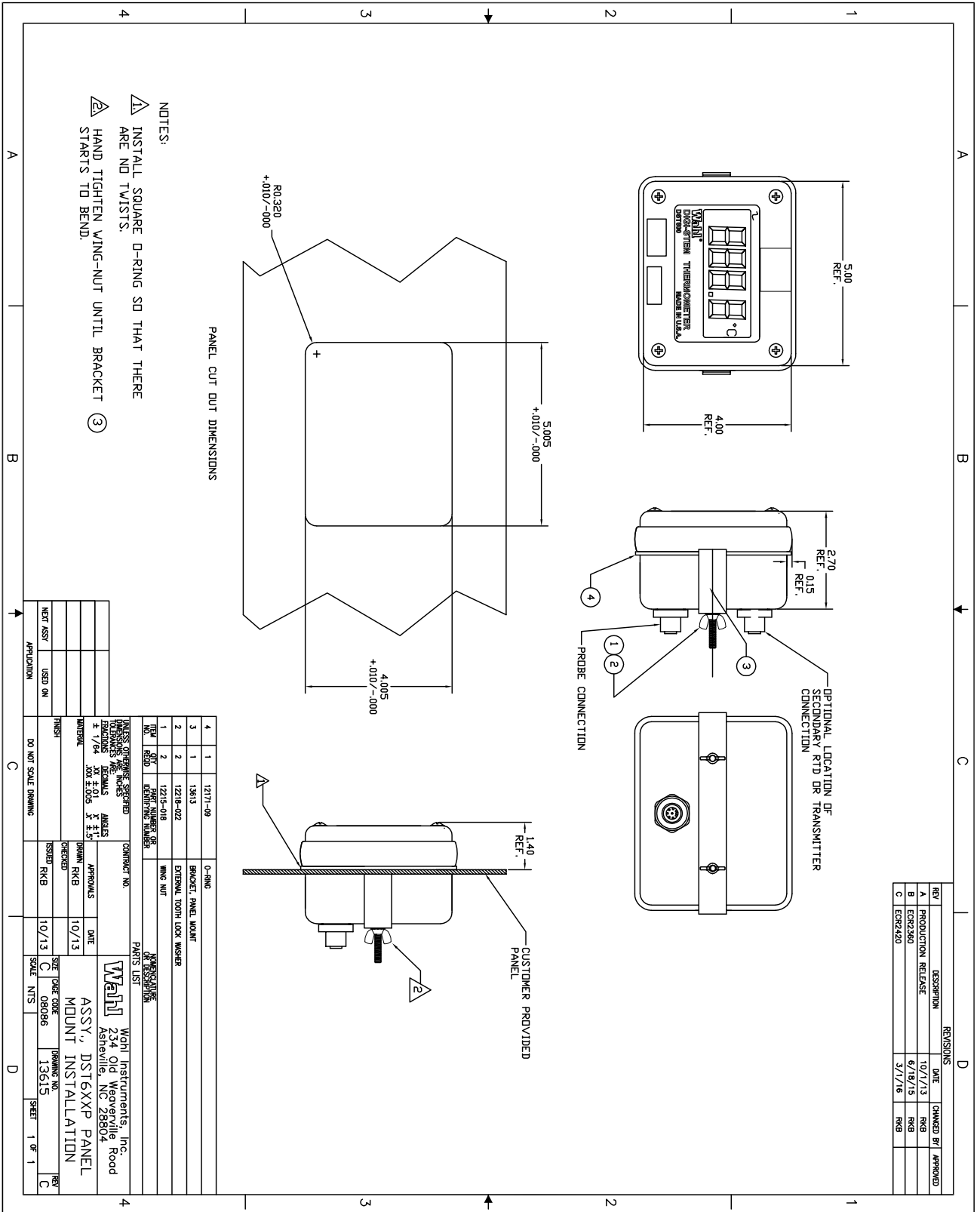
NOTES:

⚠ INSTALL SQUARE O-RING SO THAT THERE ARE NO TWISTS.

⚠ HAND TIGHTEN WING-NUT UNTIL BRACKET ③ STARTS TO BEND.

PANEL CUT OUT DIMENSIONS

R0.320
+.010/-.000

+

5.005
+.010/-.000

4.005
+.010/-.000

5.00
REF.

4.00
REF.

2.70
REF.

0.15
REF.

1.40
REF.

④ PROBE CONNECTION

① ②

③

OPTIONAL LOCATION OF SECONDARY RTD OR TRANSMITTER CONNECTION

CUSTOMER PROVIDED PANEL