



## 400 Series Temperature Controls

**Types: B400, B402, B403, C400,  
C402, C403, E400, E402, E403,  
F400, F402, F403**




UNITED ELECTRIC  
CONTROLS


### Installation and Maintenance Instructions

Please read all instructional literature carefully and thoroughly before starting. Refer to the final page for the listing of Recommended Practices, Liabilities and Warranties.

#### GENERAL

The 400 Series temperature switch utilizes either a liquid filled sensing stem (immersion stem, direct mounting) or liquid filled sensing bulb (bulb & capillary, remote mounting) to detect a temperature change. The response at a predetermined set point(s) actuates one, two or three snap-acting switches, converting the temperature signal into an electrical signal. Control set point(s) may be varied by turning an internal calibrated pointer and dial (B & E type) or internal adjustment screw (C & F) according to the procedures outlined (See Part II – Adjustments)

 THESE PRODUCTS DO NOT HAVE ANY FIELD REPLACEABLE PARTS.

 MAXIMUM TEMPERATURE\* STATED IN LITERATURE AND ON NAMEPLATE MUST NEVER BE EXCEEDED, EVEN BY SURGES IN THE SYSTEM. OCCASIONAL OPERATION OF UNIT UP TO MAX. TEMPERATURE IS ACCEPTABLE (E.G., START-UP, TESTING). CONTINUOUS OPERATION SHOULD BE RESTRICTED TO THE DESIGNATED ADJUSTABLE RANGE.

\*Maximum Temperatures - the highest temperature to which a sensing element may be occasionally operated without adversely affecting set point calibration and repeatability.


Please refer to the product bulletins for product specifications. Product bulletin may be found at [www.ueonline.com](http://www.ueonline.com)


#### PART I - Installation

##### Tools Needed

- Flathead Screwdriver
- Hammer (for alternative wire knockouts)
- Adjustable wrench

#### MOUNTING

 ALWAYS LOCATE UNITS WHERE SHOCK, VIBRATION AND TEMPERATURE FLUCTUATIONS ARE MINIMAL. DO NOT MOUNT UNIT IN AMBIENT TEMPERATURES EXCEEDING PUBLISHED LIMITS.

 400 SERIES TEMPERATURE CONTROLS CAN BE MOUNTED IN ANY POSITION, PROVIDED THE ELECTRICAL CONDUIT IS NOT FACING UP. THE PREFERRED MOUNTING POSITION IS VERTICAL (TEMPERATURE CONNECTION FACING DOWN), SPECIFICALLY WHERE HEAVY CONDENSATION IS EXPECTED.

For remote mounting, mount the unit via the (2) 1/4" screw clearance holes on the enclosure (see dimensions). Fully immerse the bulb and 6" of capillary in the control zone. It is generally desirable to place the bulb close to the heating or cooling source in order to sense temperature fluctuations quickly. Be sure to locate the bulb so that it will not be exposed to temperatures beyond the instruments range limits.



JOINTS.

ALWAYS HOLD A WRENCH ON THE IMMERSION STEM HEX WHEN MOUNTING UNIT. DO NOT TIGHTEN BY TURNING ENCLOSURE. THIS WILL DAMAGE SENSOR AND WEAKEN SOLDERED OR WELDED JOINTS.

On models supplied with an external manual reset button, be sure to leave sufficient finger space over the reset button for the operator to reset the control.

#### WIRING



TERMINALS IS 7 TO 17

DISCONNECT ALL SUPPLY CIRCUITS BEFORE WIRING UNIT. WIRE UNITS ACCORDING TO NATIONAL AND LOCAL ELECTRICAL CODES. MAXIMUM RECOMMENDED WIRE SIZE IS 14 AWG. THE RECOMMENDED TIGHTENING TORQUE FOR FIELD WIRING TERMINALS IS 7 TO 17 IN-LBS.



FAILURE ON THE FIRST CYCLE.

ELECTRICAL RATINGS STATED IN LITERATURE AND ON NAMEPLATE SHOULD NEVER BE EXCEEDED. OVER-LOAD ON A SWITCH CAN CAUSE FAILURE ON THE FIRST CYCLE.

Remove the two screws retaining the cover and cover gasket, a 3/4" NPT E/C is provided on the right of the enclosure in addition to the two (2) cast-in 7/8" diameter knockouts for 1/2" electrical conduit that are located on the left side and rear of the enclosure. These can easily be knocked out by placing the blade of a screwdriver in the groove and tapping sharply with a hammer.

Connect conduit to the enclosure and wire directly to the switch terminals according to local and national electrical codes. Bring the wires up to terminals from the rear of the enclosure. (See Figure 1.) If manual reset switch or DPDT options are used, lead wires are supplied, color coded as follows:

	Manual Reset Option 1530 (for 400)	Manual Reset Option 1530 (for 402)	
	Switch 1	Switch 1	Switch 2
<b>C</b>	Violet	Violet	Yellow
<b>NO</b>	Blue	Blue	Orange
<b>NC</b>	Black	Black	Red



ALLOW ENOUGH SLACK SO AS NOT TO AFFECT SWITCH MOVEMENT WHEN MAKING SETTING ADJUSTMENTS AND ENSURE THAT THE WIRES ARE NOT TOUCHING THE COVER WHEN INSTALLED.

**NOTE:** For larger wire gauges, a one time shift may be experienced or expected due to space limitations within the enclosure. Verify set point after installation.

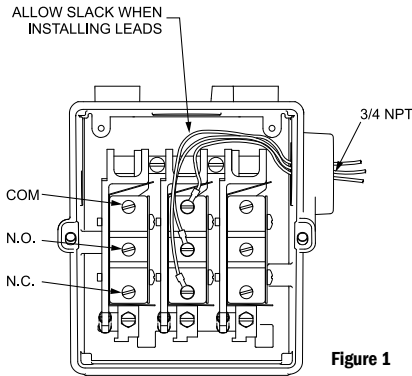


Figure 1

**NOTE:** The middle switch assembly is omitted for dual switch controllers. The outer two switch assemblies are omitted for single switch controllers. Type "C" and "F" controls have internal hex screw adjustments and type "B" and "E" have cam assemblies for internal calibrated adjustments, via a reference dial.

## PART II - Adjustments

### Tools Needed

Screwdriver

**NOTE:** For set point adjustments and re-calibration, insert bulb or immersion stem into a calibrated temperature bath. Allow temperature to stabilize for 10 minutes.

### Type C400 & F400

Remove cover. Switch has screw adjustments inside enclosure. If switch transfer point differs from actual temperature, adjust setting. To RAISE the temperature setting turn the screw left (clockwise) and to LOWER the setting turn the screw right (counter clockwise). When making adjustments, do not exceed the maximum temperature rating on nameplate (see Figure 2).

### Types C402, C403, F402 & F403

Remove cover. Follow same procedure as paragraph above. Switches may be set together or apart, up to 100% of range scales. On dual switch models, either switch may be set high. On triple switch models, the third (middle) switch has no over-travel mechanism and must always be set to the highest temperature when switches are set apart. Altering the setting of one switch will usually have little effect on the other(s), however re-adjustment may be desired at a critical temperature setting (see Figure 2).

### Types B400, B402, B403, E400, E402 & E403

Controls are factory calibrated for maximum accuracy at the dial midpoint. Switches may be set together or apart up to 100% of the range scale. On dual switch models either switch may be set high. On triple switch models, the third (middle) switch has no over-travel mechanism and must always be set to the highest temperature when the switches are set apart. Altering the setting of one switch will usually have little effect on the other(s), however re-calibration may be desired at a critical setting.

To re-calibrate, turn pointer to desired set point. If the actual temperature and set point temperature do not agree, turn zero adjustment screw clockwise to raise and counter clockwise to lower set temperature setting (See Figure 2)

### Types With Manual Reset (Option 1530)

These optional models incorporate a snap switch that, when actuated, remains tripped until temperature decreases and the reset button (located on top of the control) is manually depressed to the reset position. On multi-switch units, this switch must be set to the highest setting.

### Re-Calibration Adjustment

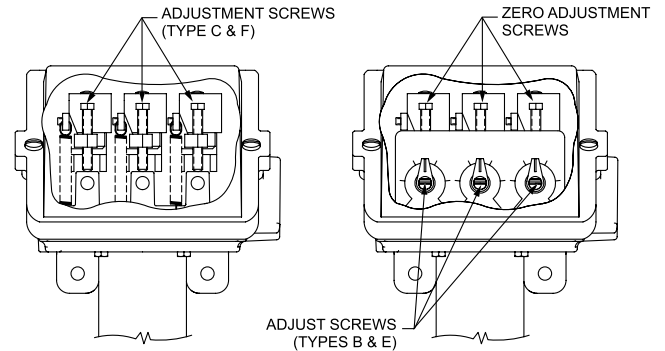
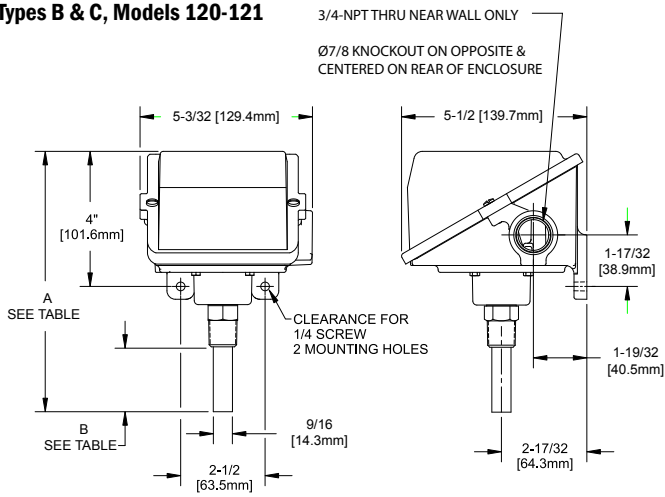


Figure 2

# Dimensional Drawings

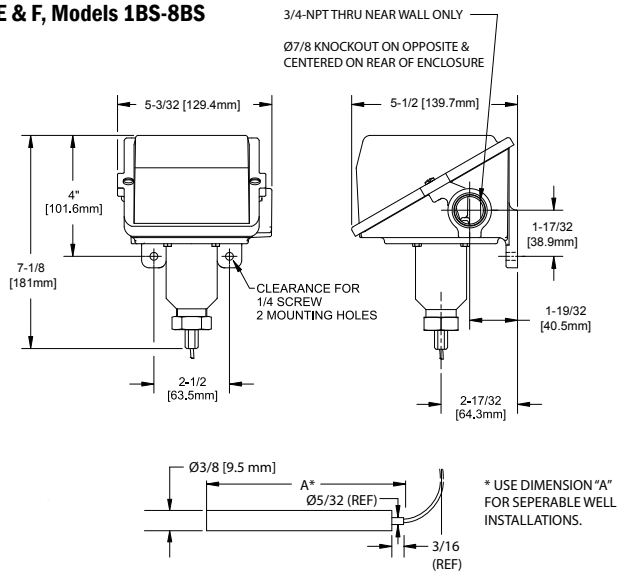
Dimensional drawings for all models may be found at [www.ueonline.com](http://www.ueonline.com).

## Types B & C, Models 120-121



Model	Dimension A	Dimension B
120	7-23/32 [196.1 mm]	1-59/64 [48.8 mm]
121	7-37/64 [192.5 mm]	1-25/32 [45.2 mm]

## Types E & F, Models 1BS-8BS



Dimension A		
Model	Inches	mm
1BS	3-3/4	95.3
2BSA	2-5/8	66.7
2BS	2-5/8	66.7
2BSB	2-5/8	66.7
3BS	2-1/8	54.0
4BS	6-3/4	171.5
5BS	5	127.0
6BS	4-1/2	114.3
7BS	3	76.2
8BS	3-1/4	82.6

## RECOMMENDED PRACTICES AND WARNINGS

United Electric Controls Company recommends careful consideration of the following factors when specifying and installing UE pressure and temperature units. Before installing a unit, the Installation and Maintenance instructions provided with unit must be read and understood.

- To avoid damaging unit, proof pressure and maximum temperature limits stated in literature and on nameplates must never be exceeded, even by surges in the system. Operation of the unit up to maximum pressure or temperature is acceptable on a limited basis (e.g., start-up, testing) but continuous operation must be restricted to the designated adjustable range. Excessive cycling at maximum pressure or temperature limits could reduce sensor life.
- A back-up unit is necessary for applications where damage to a primary unit could endanger life, limb or property. A high or low limit switch is necessary for applications where a dangerous runaway condition could result.
- The adjustable range must be selected so that incorrect, inadvertent or malicious setting at any range point cannot result in an unsafe system condition.
- Install unit where shock, vibration and ambient temperature fluctuations will not damage unit or affect operation. When applicable, orient unit so that moisture does not enter the enclosure via the electrical connection. When appropriate, this entry point should be sealed to prevent moisture entry.
- Unit must not be altered or modified after shipment. Consult UE if modification is necessary.
- Monitor operation to observe warning signs of possible damage to unit, such as drift in set point or faulty display. Check unit immediately.
- Preventative maintenance and periodic testing is necessary for critical applications where damage could endanger property or personnel.
- Electrical ratings stated in literature and on nameplate must not be exceeded. Overload on a switch can cause damage, even on the first cycle. Wire unit according to local and national electrical codes, using wire size recommended in installation sheet.
- Do not mount unit in ambient temp. exceeding published limits.

## LIMITED WARRANTY

Seller warrants that the product hereby purchased is, upon delivery, free from defects in material and workmanship and that any such product which is found to be defective in such workmanship or material will be repaired or replaced by Seller (Ex-works, Factory, Watertown, Massachusetts. INCOTERMS); provided, however, that this warranty applies only to equipment found to be so defective within a period of 24 months from the date of manufacture by the Seller. Seller shall not be obligated under this warranty for alleged defects which examination discloses are due to tampering, misuse, neglect, improper storage, and in any case where products are disassembled by anyone other than authorized Seller's representatives. EXCEPT FOR THE LIMITED WARRANTY OF REPAIR AND REPLACEMENT STATED ABOVE, SELLER DISCLAIMS ALL WARRANTIES WHATSOEVER WITH RESPECT TO THE PRODUCT, INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

## LIMITATION OF SELLER'S LIABILITY

Seller's liability to Buyer for any loss or claim, including liability incurred in connection with (i) breach of any warranty whatsoever, expressed or implied, (ii) a breach of contract, (iii) a negligent act or acts (or negligent failure to act) committed by Seller, or (iv) an act for which strict liability will be inputted to seller, is limited to the "limited warranty" of repair and/or replacement as so stated in our warranty of product. In no event shall the Seller be liable for any special, indirect, consequential or other damages of a like general nature, including, without limitation, loss of profits or production, or loss or expenses of any nature incurred by the buyer or any third party.

*UE specifications subject to change without notice.*



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