6 Inch Remote and Direct Mount Thermometers

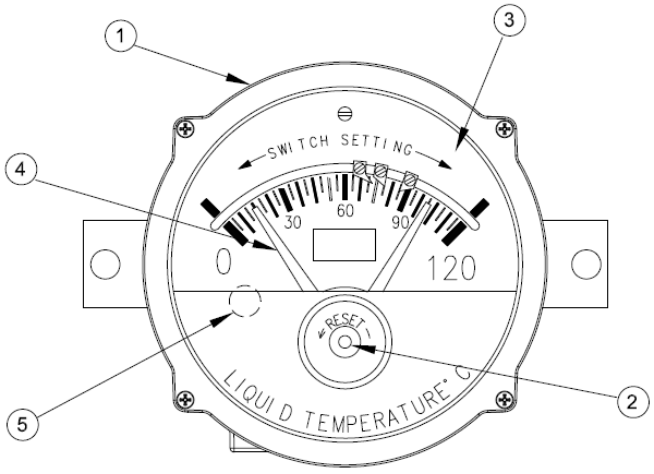
Features and Adjustments

BACKGROUND

In 1995, Qualitrol redesigned its 6 inch Series Thermometers to offer increased functionality and ease of use. At the same time, the existing mounting methods and outside envelope dimensions were maintained to assure interchangeability with the older style models. These improvements apply to all 120 series thermometers, all 104's designated by model number 104-300 and higher, and all configured TR6000 Series thermometers. Starting in 2015, housing modifications use a screw attach bezel, allowing an IP65 rating.

DESCRIPTION

The Qualitrol 120/104/TR6000 series of products is a capillary based, remote (104) or local (120) indicating, 6 inch view mechanical thermometer. Up to 4 electrical switches allow remote alarms. SCADA options for the 104 include a 4 to 20 or a 0 to 1 mA analog loop, powered with a wide range AC/DC mains supply. Several features of the current, base model are shown below:



1. Flat, face seal attachment with four screws
2. Maximum Temperature Indicator Reset
3. Switch setting range
4. Current Temperature Indicator
5. Fine calibration adjustment

WARNING: *DO NOT APPLY HEAT TO THE THERMOMETER SENSOR BULB AT TEMPERATURES WHICH EXCEED THE MAXI MUM RANGE OF THE DIAL.*

RE-SETTING THE MAXIMUM TEMPERATURE INDICATOR:

Rotate the reset adjuster counter-clockwise JUST until the movable indicator touches the Current Temperature Indicator.

NOTE: Do not continue to rotate the reset adjuster past the point of contact, since an inaccurate future maximum reading will occur.

SETTING THE SWITCHES:

Remove the front lens. Loosen the desired switch setting pointer(s), move them to the desired set-points, and retighten to 3-7 inch-lbs. Carefully reinstall the front lens, assuring it is sealed around the entire unit.

NOTE: Models specified for outdoor/sealed, corrosive, or tropical environments are sealed and switch setpoints are not adjustable. Loosening or removing the bezel voids the seal warranty.

CHECKING SWITCH SETTINGS: (SPRING LOADED POINTER)

Each switch is factory "calibrated" to actuate when the thermometer measurement pointer reaches the adjustable switch setting pointer. It will de-actuate on falling temperature at a lower temperature than the actuation point, by the amount called the Switch Differential. The measurement pointer is ***physically linked;*** via a fixed cam; to the switches so that each switch actuates when the ***MECHANICAL DIAL READING*** is at the same point as the corresponding switch setting pointer. Due to this functionality, **it is not necessary to do a lengthy test by ramping** a temperature bath to determine the switch setting accuracy.

The new series thermometers have a "Spring-Loaded" temperature indication pointer, which can be moved ***BY HAND (up-scale only),*** to verify that the switch actuates at the correct point.

To check switch actuation points, remove the thermometer lens and carefully place your thumb on the white pointer (there is a protruding tab near the center of the pointer to do this).

Rotate the pointer ***gently*** **CLOCKWISE** (to the right). Slowly move through the switch actuation point(s), using a continuity tester to verify that the switch actuates within tolerance. After the actuation is verified, ***SLOWLY*** bring the pointer back (left) until the switch opens. The difference between the closing and opening points is the SWITCH DIFFERENTIAL.

CAUTION: **GENTLY** return the pointer to its original position. **DO NOT LET THE POINTER SNAP BACK**.

Reinstall the front lens carefully; being careful to assure it is sealed around the entire unit.

A NOTE ON BULB SIZE:

Thermometers are available in a wide range of bulb lengths and diameters to match the variety of transformer wells in use. In order to achieve accuracy, it is important that the bulb length nearly fill the well or heater depth and the bulb major diameter closely match the well or heater inside diameter.

CAPILLARY ROUTING:

The capillary tube used on the 104 or TR6000 thermometers is made from a soft copper to allow easy routing of the capillary. It also has very small internal ID of only .012" [.30mm]. If the capillary is kinked or crushed you will damage the unit. To prevent kinking the capillary we recommend a minimum bend radius of 1.5" [38mm] for unit using the stainless or neoprene capillary guard and 5/8" or 16mm for units with the copper braided protection.

FINE CALIBRATION:

NOTE: If it is necessary to perform a minor field calibration, there is an adjustment on the front of the thermometer, under the lens, to accomplish this. Only minor readjustments should be attempted.

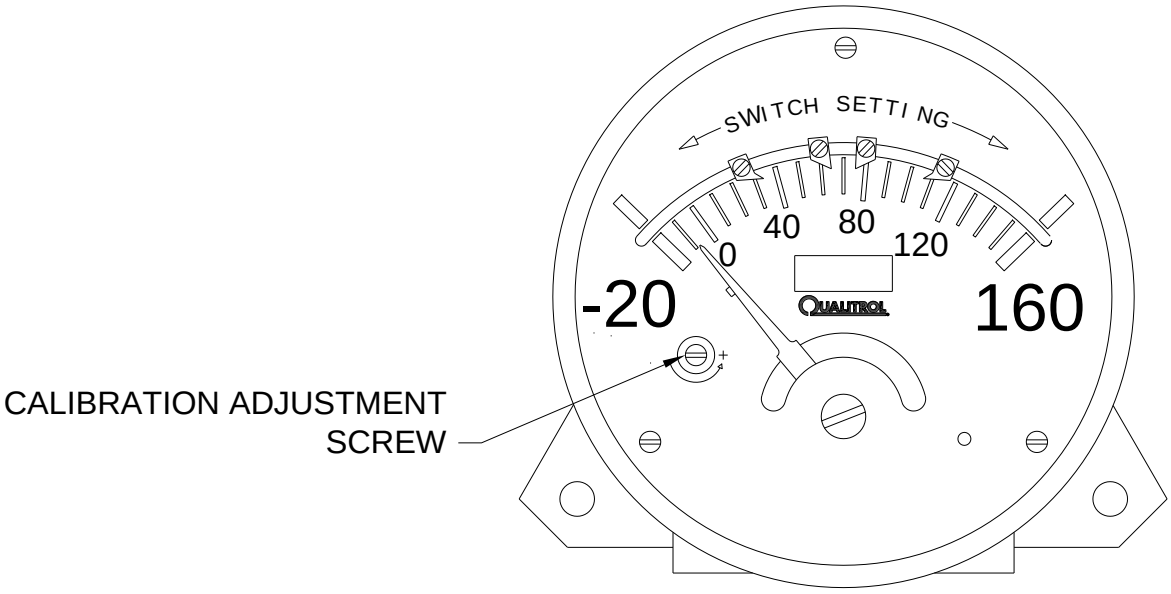
Remove the thermometer lens.

The temperature calibration screw is the large, slotted-head brass screw on the left side, underneath the lower dial. It is visible only after removing the front lens of the thermometer.

To properly calibrate the thermometer, immerse the thermometer bulb in the calibrated temperature bath. The "ideal" calibration temperature would be at mid-scale. Allow the thermometer pointer to rise and stabilize for about ten minutes, and adjust the screw close to the new calibration point. Remove the bulb from the media, allow the thermometer to drop 10 - 20 degrees, and then reinsert it... and see where the pointer stabilizes after another ten minutes.

Repeat these steps... turn the adjustment screw, drop the temperature, raise the temperature, and stabilize... until the thermometer pointer rises to rest and stabilizes at the desired calibration point.

Reinstall the front lens carefully; assuring it is sealed around the entire unit.



Unit shown with the lens assembly removed

Warning

SWITCH WIRING:

Cordage or wires to the connector or terminal strip must be rated to at least 80 deg C.

The mounting plate must be grounded to the transformer using metallic mounting hardware.

Alternatively, product bonding may be made using wire of at least 14AWG.

Bonding must be made before and whenever the unit is energized.

Specifications

Environmental	
Storage Temperature	-50°C to 80°C
Ambient Temperature	-40°C to 60°C
Enclosure protection	IP53, IP54, or IP65, per model drawing
Electrical	
Dielectric Isolation- SWITCHES	2000 Vac for 60 seconds
Switch Rating (AC)	10A, 1/3 HP; 120-240 Vac
Switch Rating (DC)	0.5A 125 Vdc non-inductive load
Switch Rating (DC)	0.25A 250 Vdc non-inductive load
Overvoltage category, Pollution degree, Class	Category III, Pollution degree 2, Insulation Class 1
Mechanical	
Dial and switch accuracy	+/- 2% of Full Scale Range
Shock	10g, 10mSec any plane
Vibration	50/60 Hz and multiples to 4x at .004 inch displacement
SCADA (optional)	
Analog output signal	4 - 20 mA @ maximum 500 Ohms OR, 0-1 mA @ maximum 3000 Ohms
Power Consumption	Maximum mains current < 1 amp.
Dielectric Isolation-4-20mA port	500 Vac for 60 seconds
Voltage / frequency; rated	120 – 240 Vac 50/60 Hz, or 125 – 250 Vdc
Voltage operating range	EN60255-1; 80 to 110% of rated
EMC immunity	EN61000-6-5 Substation category, interface 4
EMC emissions	EN55011 Class A
Dielectric Isolation- MAINS port	2000 Vac for 60 seconds
Internal fuse	5 x 20 mm; T2A; 250V

Table 1. Specifications

SCADA option

Electrical Connection

Warning

- Make sure to ground the unit according to local regulations.
- 4 – 20 (or 0-1) mA signal connections must be made with shielded cabling.
- All user supplied cordage shall be rated at 80 deg. C or higher.
- Do not disconnect protective earthing while unit is energized.
- Operation outside of the intended use shall not be the responsibility of Qualitrol.
- Do not exceed 250V above earth for any switch or mains connection.

Power connections

- Mains power wiring to TB2 is shown in Figure 1. “Neutral” may be above earth potential. 16 or 14 AWG stranded wire shall be used. If wired to a DC source, use position 1 for +.
- User shall supply a 5 or 10A double pole (or double fuse) time delay overcurrent protector at the MAINS source.
- There is one fuse that provides mains circuit protection; 2A time delay, 5 x 20 mm, 250V rating. Marked F1 in Figure 1.

4-20 mA current loop

- The 4-20 mA curent loop is scaled to the dial pointer position.
- Set J1 and J2 jumpers to positions 2 to 3.
- Connect current sensing device to connector TB1 with polarity as shown in Figure 1. Attach the shield wire ONLY at the left/bottom printed circuit hold down screw using a ring or fork terminal. Single point shield attach/grounding shall be made.

0-1 mA current loop

- The 0-1 mA curent loop is scaled to the dial pointer position.
- Set J1 and J2 jumpers to positions 1 to 2.
- Connect current sensing device to connector TB1 with polarity as shown in Figure 1. Attach the shield wire ONLY at the left/bottom printed circuit hold down screw using a ring or fork terminal. Single point shield attach/grounding shall be made.

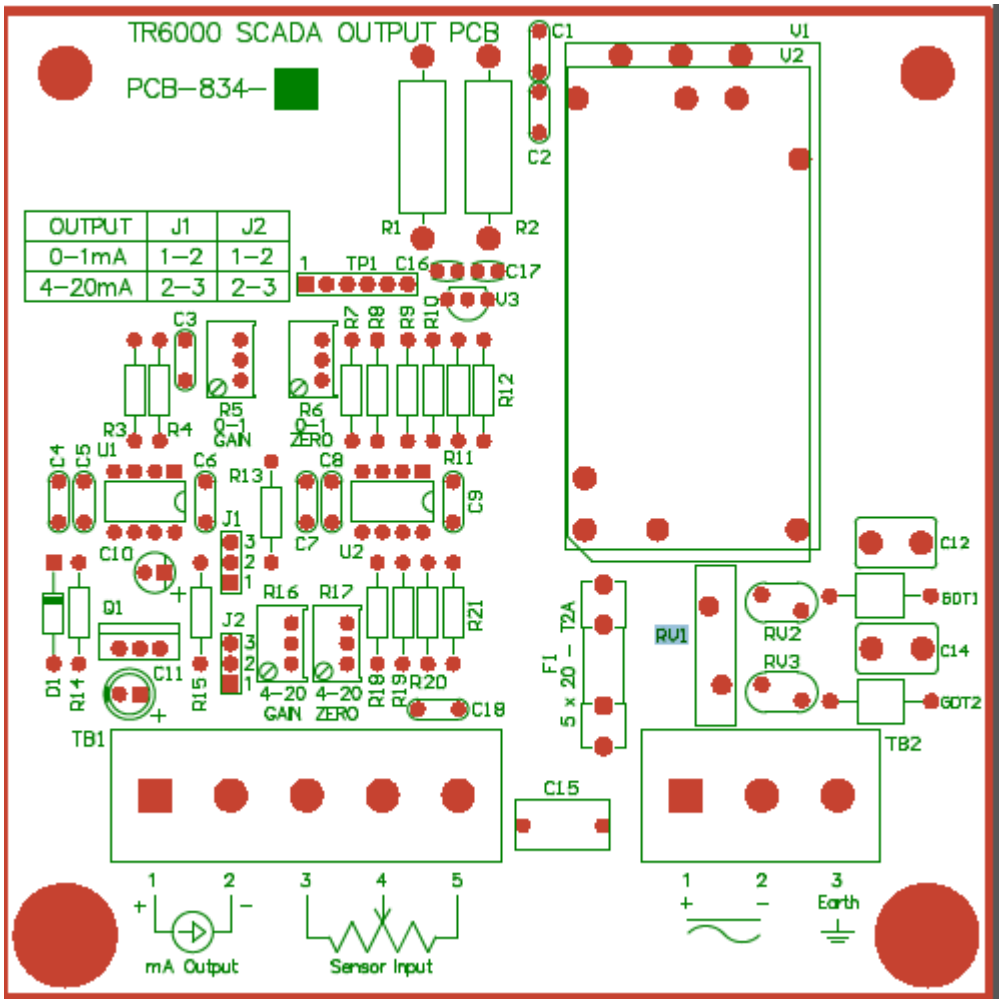


Figure 1. SCADA board view

QUALITROL®
Defining Reliability

EU Declaration of Conformity

We, Qualitrol Company LLC, declare under our sole responsibility that the products listed below comply with the harmonized standards for:

- Council Directive 2014/35/EU (February 26, 2014) for low voltage equipment safety. Per EN 61010–1:2010 for non-networked equipment or EN 60255-27:2014 for networked equipment.
- Council Directive 2014/30/EU (March 29, 2014) for EMC. Per EN 61850-3:2014 for Power Station and Substation area 4, as detailed by IEC 61000-6-5:2015 and CISPR 11:2015.

Smart Transformer Breathers:	STB-100 series, STB-200 series
Remote and local Thermometers:	104 series, TR6000 series; including SCADA option

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