



INSTRUCTIONS

TEMPERATURE INDICATOR

Hottest Spot Dial Type

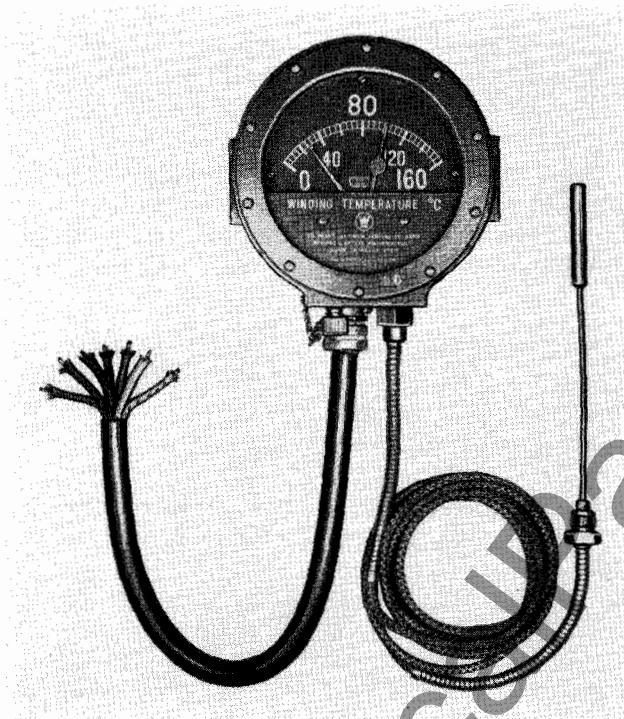
Non-Submersible**Three Switch****Remote Indicating**

FIG. 1. Front View of Indicator Showing Flexible Tube for Distant Mounting

DESCRIPTION

The Westinghouse Non-submersible temperature indicator is a dial type instrument. It consists of a bourdon gauge connected through a capillary tube to a thermometer bulb. The heating coil and thermometer bulb are located in a well of thin wall construction. The well bolts on to a flange on the tank wall, making an oil tight connection. The thermometer bulb or the heating coil can be removed from the well in the tank wall without the loss of liquid and without lowering the oil level. The portion of the capillary tube outside of the transformer from the gauge to where it enters the tank is protected by a flexible covering. The long flexible capillary tube of the distant type thermometer permits mounting the gauge on the side of the tank at eye level. This capillary tube should be installed so that long bends or spans are not free to vibrate. Very sharp bends

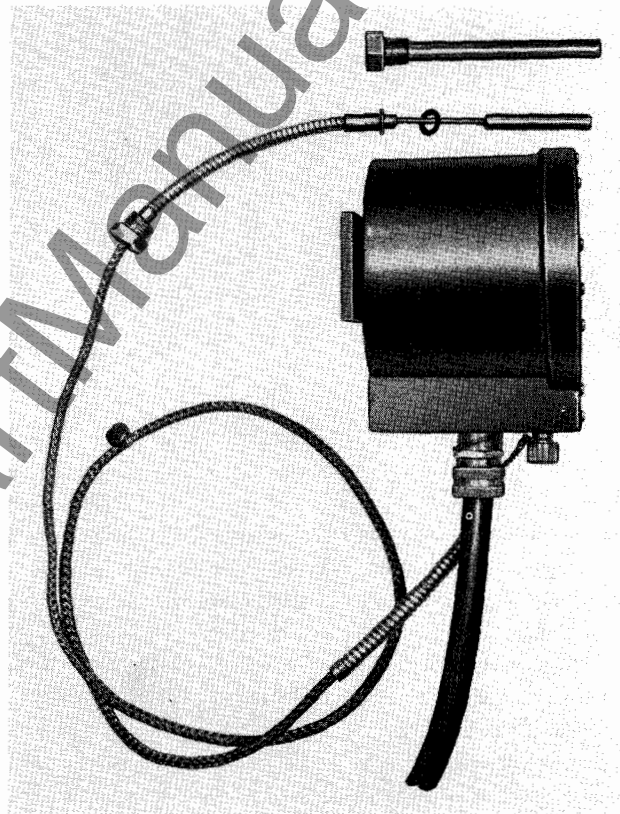


FIG. 2. Side View of Indicator Showing Cover in Place Over Reset Stem

should also be avoided since both of these things may result in failure of the tube.

Note: Do not fill the well with a solid or liquid before inserting the stem of the indicator since this may damage the instrument without appreciably helping in the transfer of heat from the heating coil to the sensitive element.

The dial is calibrated in degrees centigrade and is easily read because of the contrasting black face with yellow characters, graduations and indicating points.

A red maximum indicating pointer indicates the maximum temperature reached since it was last

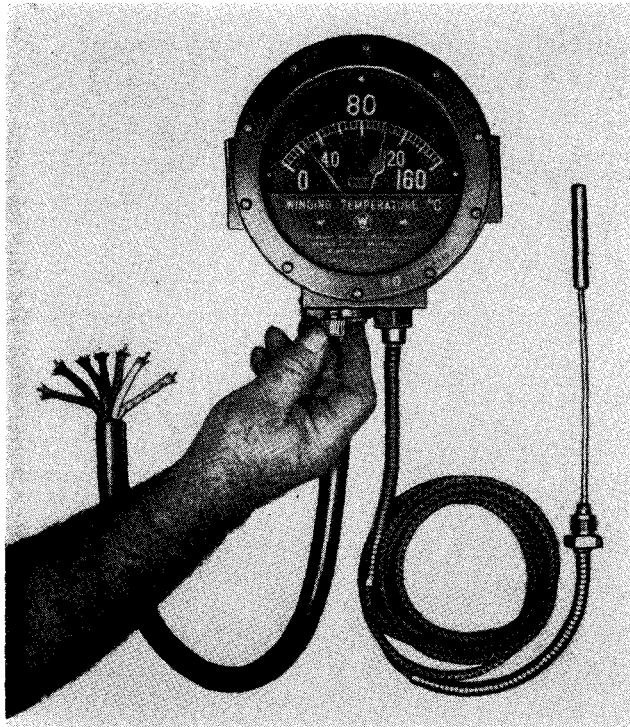


FIG. 3. Method of Resetting Maximum Indicating Pointer. Maximum Pointer Shown Reset

reset. This hand is easily reset by removing the screw at the bottom of the indicator and pulling down on the reset stem. The method of resetting the maximum indicating pointer is shown in Fig. 3.

When the alarm and control circuits are used, external connections are made through the neoprene jacketed cable. A cable grip, which screws up into the case, serves to grip the lead cable and seals the gauge from the atmosphere. If the contacts are not to be connected into circuits, the external neoprene jacketed cable is coiled and taped in place for possible future use.

There are three microswitches in this type of indicator. Switch #1 is set to close at 70°C for a control circuit. Switch #2 is set to close at 75°C for the other control circuit. Switch #3 is set to close at 117°C for the alarm circuit. These are nominal values and will be supplied unless otherwise ordered. The switches are adjustable over the entire range in relation to the above-mentioned values. The method of adjustment is described in later paragraphs. The switches reset at approximately $7\frac{1}{2}^{\circ}\text{C} \pm 2\frac{1}{2}^{\circ}\text{C}$ below the closing temperature. The ratings for the switches are given in Table No. 1 with the connection diagram shown in Fig. 4.

Table No. 1

VOLTAGE	NON-INDUCTANCE LOAD—AMPS	INDUCTIVE LOAD *AMPS
125 A-C	10	10
250 A-C	5	5
125 D-C	0.5	0.05
250 D-C	0.25	0.025

* L/R Less than 0.026

L=Inductance in henrys; R=Resistance in ohms

Important: When checking circuits through this instrument it is necessary to follow Table No. 1. This means that a low voltage bell ringer cannot be used unless switched through a high impedance relay. An indicating-light type of device is generally recognized as best for checking circuits through instruments containing microswitches of similar capacities.

INSTRUCTIONS FOR RESETTING THE ALARM SWITCH OPERATING TEMPERATURES ON THREE SWITCH AUTO-LITE MODEL RM THERMAL RELAYS

The bezel ring may be released by removing the screws in its face. Remove the bezel ring, outer "O" ring gasket, glass and inside "O" ring gasket. Remove the plate which covers the bottom portion of the dial.

At this point the cam adjusting locking screws near the bottom of the instrument are exposed (see Fig. 7). The number 1 switch adjustment locking screw is in the outer circular cam slot. The number 2 switch adjustment locking screw is in the second cam slot from the outside. The number 3 switch

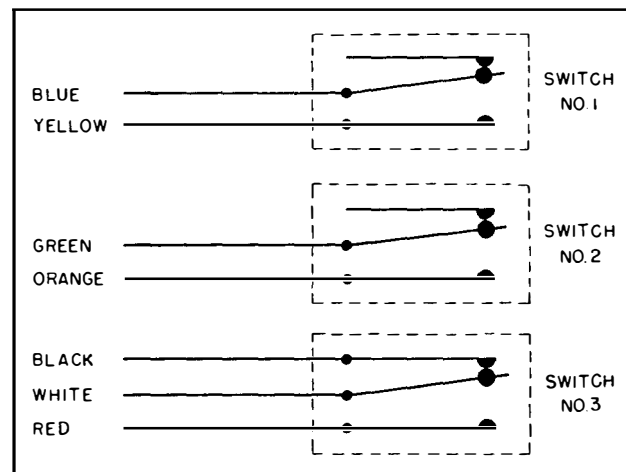


FIG. 4. Connection Diagram

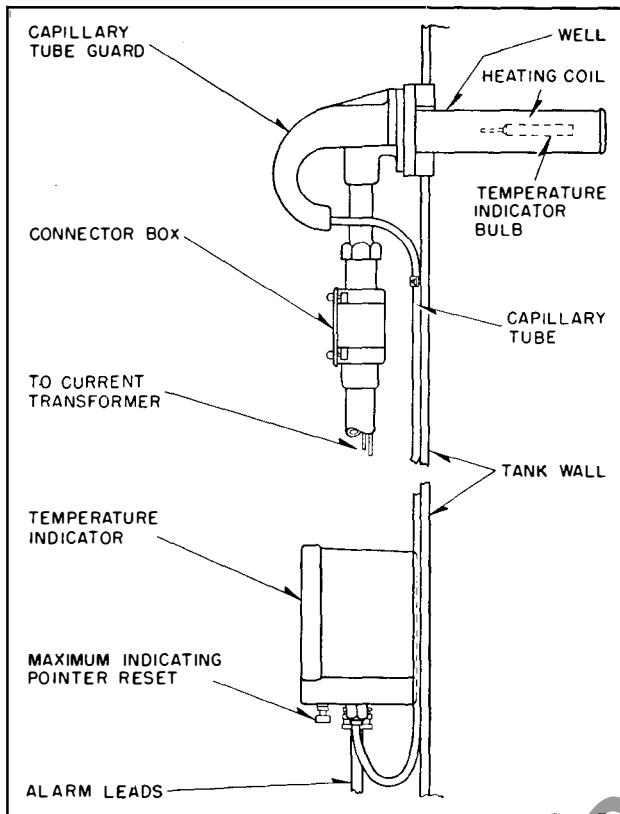


FIG. 5. Sectional View of Transformer Showing Mounting of Indicator with Flexible Tube

adjustment locking screw is in the third cam slot from the outside.

Connect small indicating lamps in the alarm circuits. Place the bulb of the thermal relay in

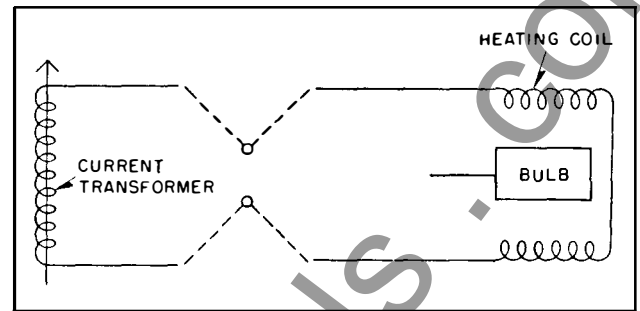


FIG. 6. Connection Diagram for Current Transformer and Heating Coil

agitated water or oil which is maintained at the temperature at which the number 1 switch contacts are to close. Observe the temperature at which the number 1 switch closes. If it closes before the desired operating temperature is indicated, the cam must be retarded. This is accomplished by loosening the number 1 switch adjustment locking screw and moving the cam in a counterclockwise direction. If the number 1 switch fails to close when the desired operating temperature is indicated, the cam must be advanced. This is accomplished by loosening the number 1 switch adjustment locking screw and moving the cam in a clockwise direction.

When the number 1 cam has been reset, its adjustment locking screw should be securely re-tightened.

After the above adjustments have been made, the bulb should be removed from the hot liquid and allowed to cool until the indicator has dropped back

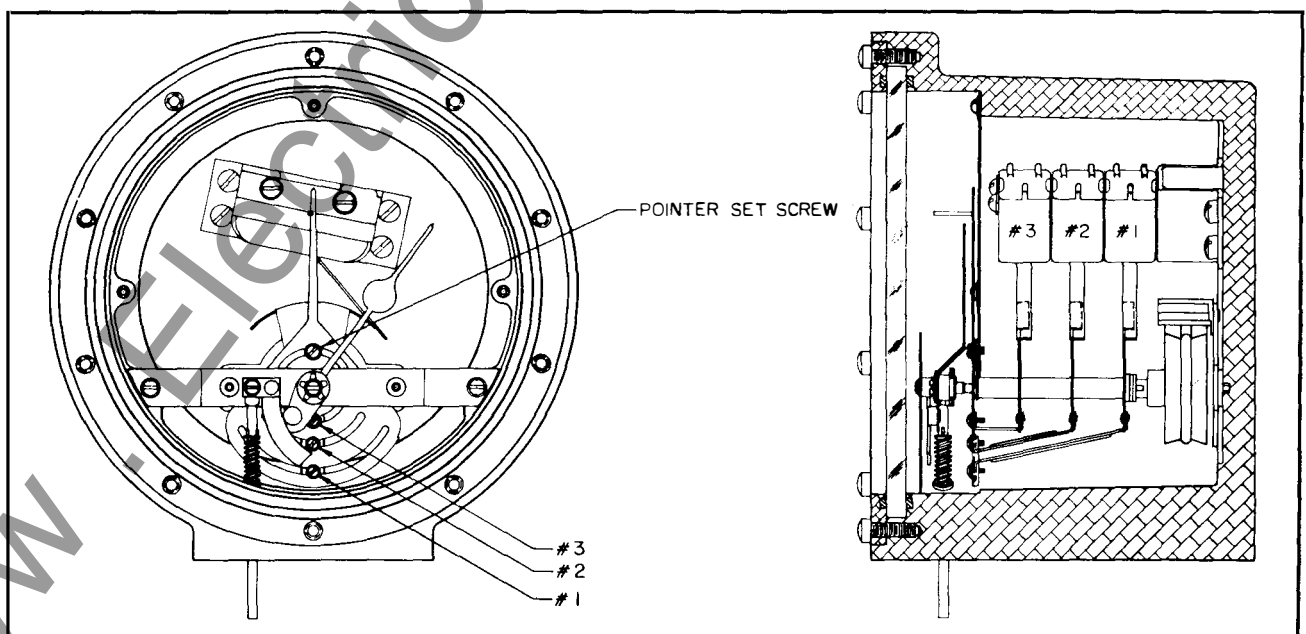


FIG. 7. Cam Adjusting Locking Screws exposed

TEMPERATURE INDICATOR

20 to 30 degrees. Re-immers the bulb in the hot liquid and recheck the relay operation in the manner outlined above. Remove the bulb from the hot liquid and allow the indicator to drop back 20 to 30 degrees before proceeding with the adjustment of the number 2 switch.

After the above adjustments to the number 1 switch have been made and checked, proceed with the adjustment of the number 2 switch in the manner outlined above except the hot liquid bath must now be maintained at the temperature at which the number 2 switch is to operate. As stated earlier the adjustment locking screw for the number 2 cam switch is in the second slot from the bottom of the indicator.

After the number 2 switch has been adjusted and checked, proceed with the adjustment of the number 3 switch in the manner outlined for switch number 1 and number 2 except that the hot liquid bath will be maintained at which the number 3 switch is to operate. The adjustment locking screw for the number 3 cam switch is in the third slot from the bottom of the indicator.

Replace the plate which covers the bottom portion of the dial, the inner "O" ring gasket, the glass, the outer "O" ring gasket, the bezel ring and the screws in the face of the bezel ring.

The thermal relay is now ready for installation.

SHIPMENT

The current transformer is generally shipped as part of the main transformer. It is usually of the through type which is slipped over the lower end of the bushing and mounted on the underside of the cover. In some cases it will be mounted on the top of the terminal board, bridges or end frames. In this case, a Micarta tube will probably be used to conduct the current transformer leads to a junction box. This tube will be installed in place on the current transformer.

The heating coil is located in the well of the temperature indicator.

The temperature indicator is shipped mounted on the tank wall, so that no installation is necessary.



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DESCRIPTION • INSTALLATION • OPERATION INSTRUCTIONS

TEMPERATURE INDICATOR

Hottest Spot Dial Type

Non-Submersible

Three Switch

Remote Indicating

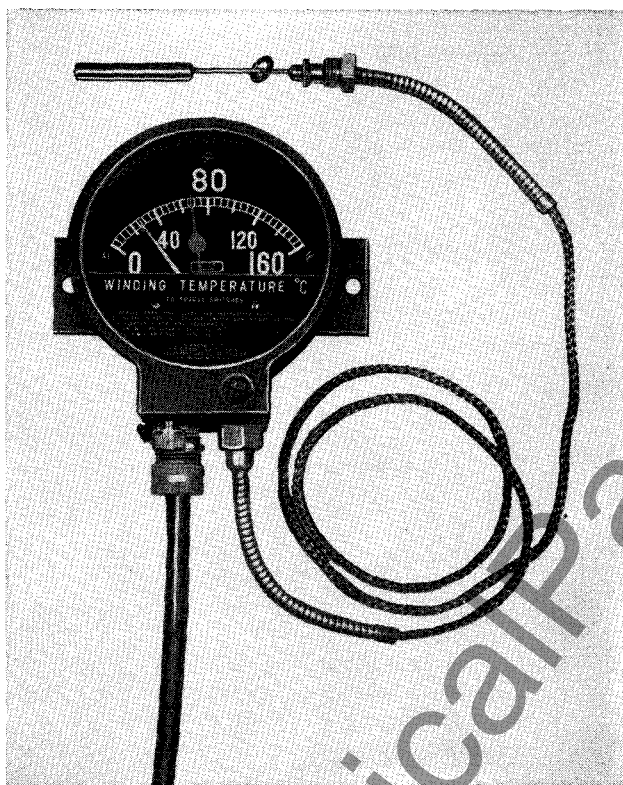


FIG. 1. Front View of Indicator Showing Flexible Tube for Distant Mounting.



FIG. 2. Side View of Indicator Showing Cover in Place Over Reset Stem.

THE THREE SWITCH TEMPERATURE INDICATOR designed for application on Westinghouse transformers or related apparatus, is used where both fan control and alarm circuits are required. This leaflet covers the type of indicator which depends on the winding temperature. It is a dial type instrument operated by a bourdon gauge connected to a thermometer bulb imbedded in a heating coil and located in the region of the hottest oil. It is a self-contained weather-proof unit designed for outdoor application on transformers. The heating coil is designed to heat the thermometer bulb to the temperature of the hottest spot in a transformer winding, when receiving a current proportional to that in the transformer winding.

The three switches of the indicator are set at different temperature levels; the lower level switches operate the fan control circuit, and the higher level switch controls the alarm circuit. The fan control circuits serve to give added cooling when the transformer temperature comes within the ranges of the switches. The alarm circuit operates at a higher temperature range to give warning in case the fans, for any reason, do not limit the temperature to a proper range. The circuits are separate so that both a-c and d-c may be used.

DESCRIPTION

The Westinghouse non-submersible temperature indicator is a dial type instrument. It consists of a

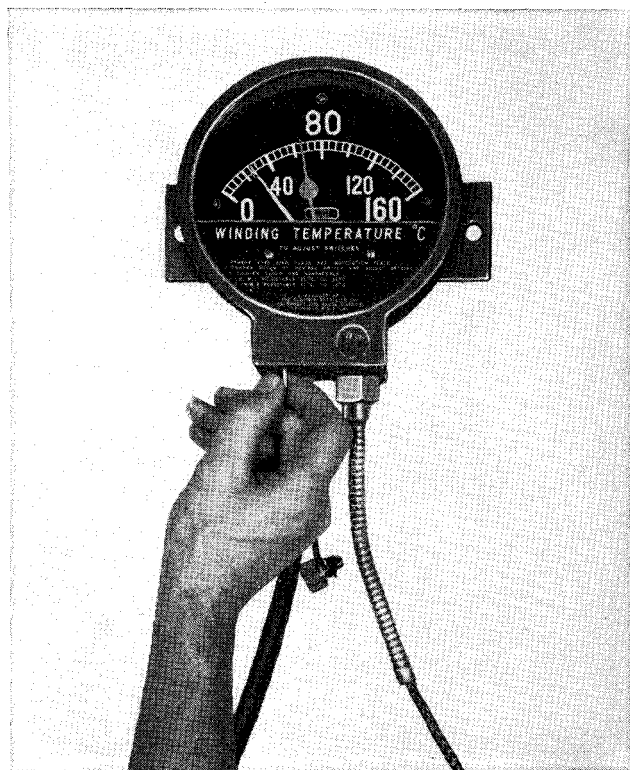


FIG. 3. Method of Resetting Maximum Indicating Pointer. Maximum Pointer Shown Reset.

bourdon gauge connected through a capillary tube to a thermometer bulb. The heating coil and thermometer bulb are located in a well of thin wall construction. The well bolts onto a flange on the tank wall, making an oil tight connection. The thermometer bulb or the heating coil can be removed from the well in the tank wall without the loss of liquid and without lowering the oil level. The portion of the capillary tube outside of the transformer, that is, from the gauge to where it enters the tank, is protected by a flexible covering. The long flexible capillary tube of the distant type thermometer permits mounting the gauge on the side of the tank at eye level. This capillary tube should be installed so that long bends or spans are not free to vibrate, nor very sharp bends made since they both may result in failure of the tube.

The dial is calibrated in degrees centigrade and is easily read because of the contrasting black face with yellow characters, graduations, and indicating points.

A maximum indicating pointer, red in color, is used to indicate the maximum temperature reached between readings. This hand is easily reset by removing the screw at the bottom of the indicator, and pulling down on the reset stem. The method of resetting the maximum indicating pointer is shown in Fig. 3.

When the alarm and control circuits are used, external connections are made through the neoprene jacketed cable. A cable grip, which screws up into the case, serves to grip the lead cable and seals the gauge from the atmosphere. If the contacts are not to be connected into circuits, the external neoprene jacketed cable is coiled and taped in place for possible future use.

There are three micro-switches in this type of indicator. Switch #1 is set to close at 70°C for a control circuit. Switch #2 is set to close at 75°C for the other control circuit, and switch #3 is set to close at 105°C for the alarm circuit. These are nominal values, and will be supplied unless otherwise ordered. The switches are adjustable over a range of $\pm 10^\circ\text{C}$ in relation to the above mentioned values. To adjust switches to a different value follow instructions given on the instruction plate of the indicator. All of the switches open at 10°C less than the closing temperature. The ratings for the switches are given in Table No. 1, and the connection diagram is shown in Figure 4.

TABLE NO. 1

VOLTAGE	NON-INDUCTIVE LOAD—AMPS.	INDUCTIVE LOAD AMPS. L/R = .026*
125 A-C	10	10
250 A-C	5	5
125 D-C	0.5	0.05
250 D-C	0.25	0.025

*Equal to or less than .026. If greater, refer to factory for adjusted rating.

Important: When checking circuits through this instrument it is necessary to follow Table #1. This means that a low voltage bell ringer cannot be used unless switched through a high impedance

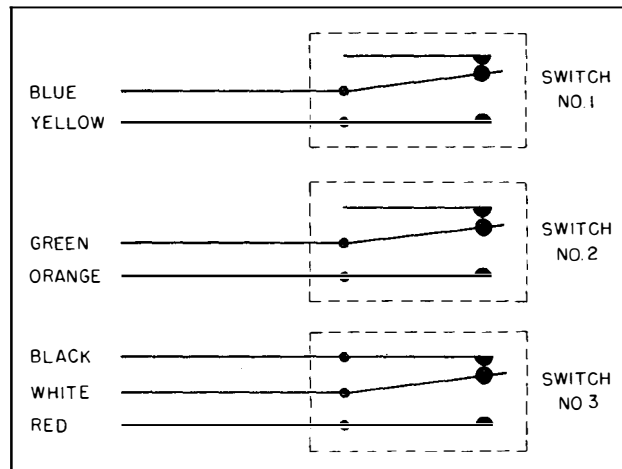


FIG. 4. Connection Diagram.

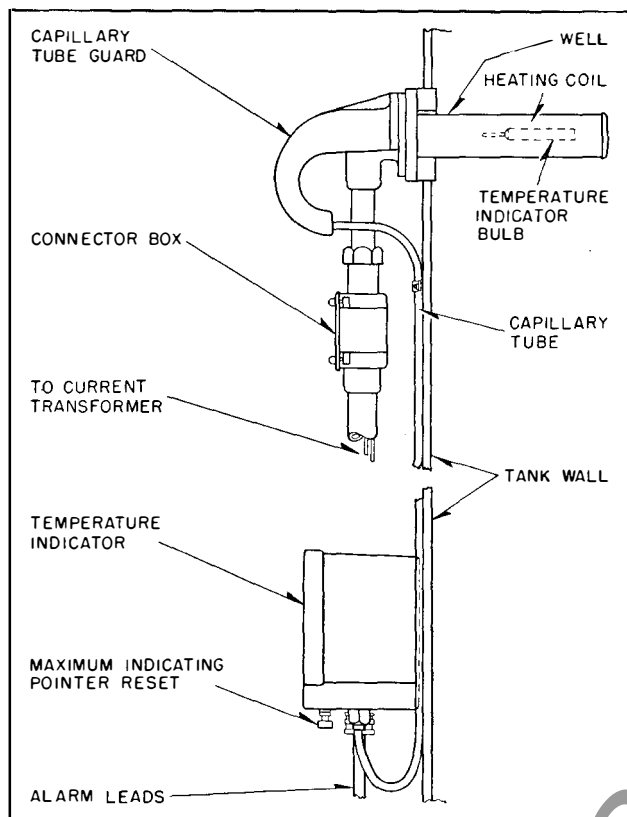


FIG. 5. Sectional View of Transformer Showing Mounting of Indicator with Flexible Tube.

relay. An indicating-light type of device is generally recognized as best for checking circuits through instruments containing micro-switches of similar capacities.

SHIPMENT

The current transformer is generally shipped as part of the main transformer. It is usually of the through type which is slipped over the lower end of the bushing, and mounted on the under side of the cover. Sometimes it will be mounted on the top of the terminal board, bridges, or end frames. In this case, a micarta tube will probably be used to conduct the current transformer leads to the terminal box. This tube will be installed in place on the current transformer. If the main transformer is not shipped in its tank, the tube is slid down or removed and tied to the current transformer.

The external terminal block will always be in

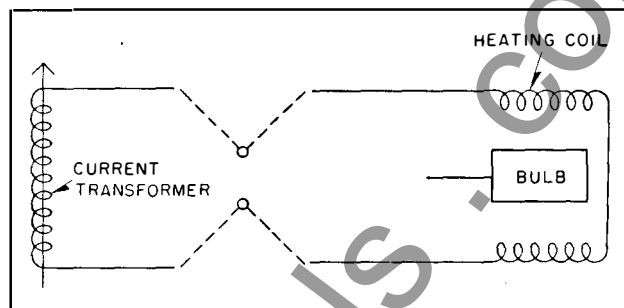


FIG. 6. Connection Diagram for Current Transformer and Heating Coil.

place, and will be covered by a weatherproof conduit box.

The heating coil is located in the well of the temperature indicator.

The temperature indicator is shipped mounted on the tank wall, so that no installation is necessary.

OPERATION

The current transformer is mounted inside the case of the transformer, usually on a bushing. Its primary winding carries the main current of one of the transformers windings and its secondary winding delivers to the heating coil a reduced current which is at all times proportional to the load current. The insulation of the current transformer serves to protect the heating coil and temperature indicating equipment from the high voltage of the main transformer windings.

The heating coil is in a well, located in the hot surface oil, and its windings are worked at the same current density as the main transformer. In addition, the insulation of the heating coil winding has the same elevation in temperature above the oil as the windings of the main transformer. By these methods the temperatures inside the transformer windings are duplicated in the area surrounding the bulb of the indicator.

RENEWAL PARTS

If it becomes necessary to repair the instrument, contact the nearest Westinghouse office. Include a complete description of the part wanted along with the data on the nameplate attached to the transformer tank wall.

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