



TALLER DIESEL



**ELECTRO-MOTIVE**



**M.I. 5524**  
\*Rev. C

# MAINTENANCE INSTRUCTION

## TEMPERATURE SENSITIVE SWITCH — TYPE 9025

### DESCRIPTION

The temperature sensitive switch shown in Fig. 1 is an immersion type DPST thermostatic switch that provides an electrical output in response to a prescribed change in temperature. The electrical switch and its mechanical actuating device are located within a cast aluminum housing that is dust and oil resistant.

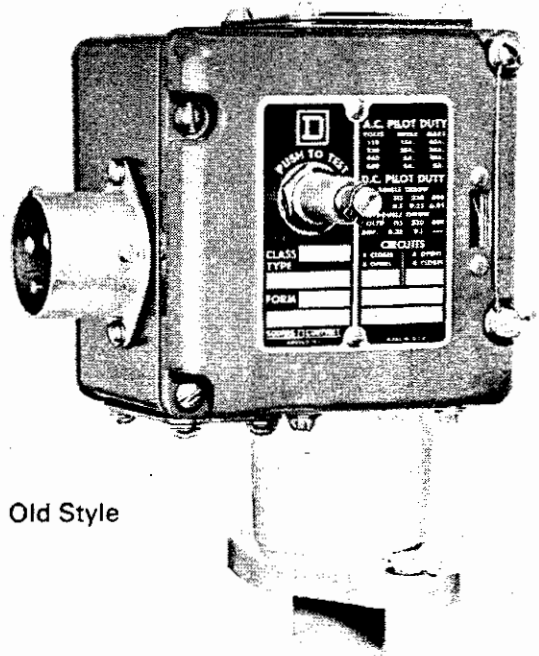
Current revisions have modified these switches both internally and externally. In order to point out these alterations, both the old and new style switches are shown.

### OPERATION

The thermal element of the switch contains a liquid that boils when a predetermined temperature is reached. The expansion of this liquid when it vaporizes causes a pressure to be exerted upon a metal bellows located inside the coupling connection. The bellows is connected to a plunger which actuates the electrical switch.

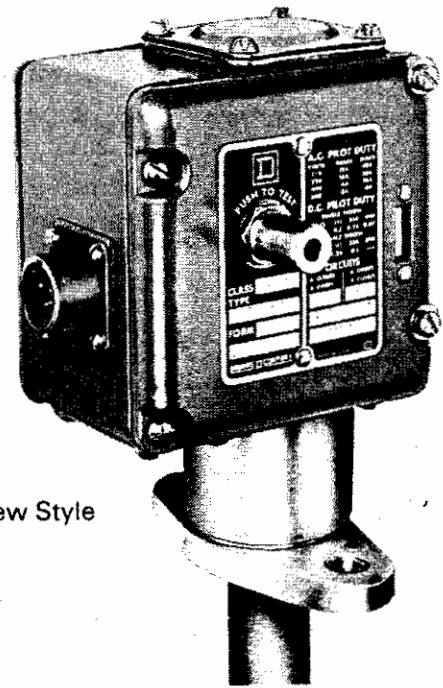
### MAINTENANCE

Minimum maintenance of the switch is required except to inspect it for proper operation, and



Old Style

19441



New Style

19425

Fig.1 - Temperature Sensitive Switches

\*This bulletin is revised and supersedes previous issues of this number.  
 ■ Areas of change are indicated by vertical bars.

current pickup and dropout settings. Such inspections should be made at intervals specified in the applicable Scheduled Maintenance Program or when cooling or lube oil difficulties are encountered. Should the need for adjustments be found during inspections they can be made with a minimum of tools and equipment.

The two adjustments provided on this type of switch are:

**RANGE** - The range adjustment determines the reset (dropout) or low temperature point. This is the setting at which the switch goes back to its original (before being actuated) position.

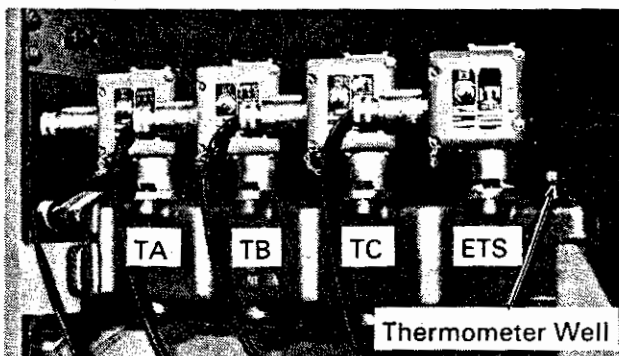
**DIFFERENTIAL** - The differential adjustment sets the high temperature point (pickup) for the switch. This is the point where the switch initially responds to a specific temperature. This adjustment establishes the amount of change, or differential, between the low setting (range) and high setting. The range adjustment, because of its influence on the differential, should be set first.

The tolerances to be observed when inspecting or adjusting these switches are shown on the Service Data page. Switches which do not respond normally and cannot be adjusted should be replaced.

## SWITCH ADJUSTMENTS BY BULB IMMERSION

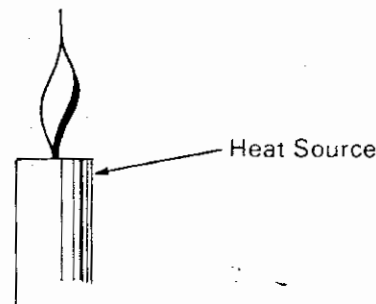
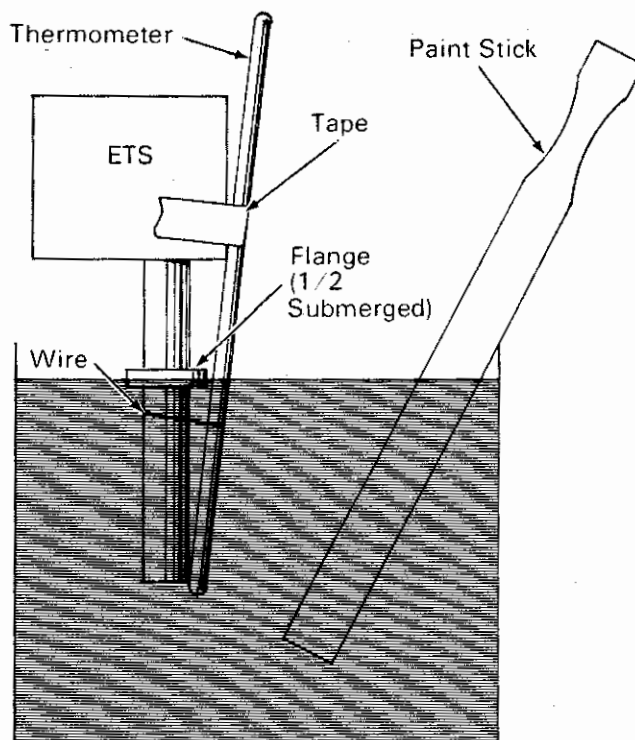
This method of adjustment requires the removal of the switch from its mounting, Fig. 2. In most cases, water temperature switches must be tested in a water bath and oil switches in oil due to boiling point differences. A 104° C (220° F) oil switch will not trip in water because boiling water can never be heated above 100° C (212° F). In some cases where an installation is located at high altitude, it may be necessary to test a water switch in oil. That is, if an ETS is set for 99° C (210° F) and the water at the altitude boils at 90.6° C (195° F), the trip temperature will never be reached no matter how long the water is boiled.

Refer to Fig. 3. The type of container and heat source is unimportant and any suitable equipment can be used. A thermometer (accurate to  $\pm .56^\circ\text{C}$  [ $1^\circ\text{F}$ ]) and stirring rod (paint stick) will be needed. The thermometer bulb should be fastened next to the sensing element so that the true sensor temperature is measured. The sensor and thermometer should be submerged in the bath up to the flange.



16534

Fig.2 - Typical Multiple Switch Installation (Type 9025)



28086

Fig.3 - Test Setup

As the bath temperature rises to within 8° C (15° F) of the trip value, the tester should begin mixing to provide a uniform bath temperature. At the same time, the heat source must be regulated to produce a

temperature rise of .56° C (1° F) per minute to allow for the switch time response. Mixing and temperature regulation should continue until the switch trips, at which instant the temperature should be recorded.

In no case should the thermometer or sensor be allowed to touch the bottom of the container or the sides, for these surfaces will be much hotter than the actual fluid. In addition, continuous mixing is important to dispel convection currents which can produce hot and cold regions within the bath.

Due to heat transfer characteristics, switches rated above 99° C (210° F) will trip about 2.2° C (4° F) higher in a test bath than when mounted in a manifold. For this reason, switches in this category should be set to trip 2.2° C (4° F) higher than the nameplate rating.

**CAUTION**

Extreme care should be used when removing the thermal element from the engine piping. The slightest damage to the element or connection will result in a malfunctioning device and necessitate its replacement.

If the occasion arises that a more rigorous method of testing these switches is desired, then there is

3/8" Threaded Outlet Welded To  
Pipe, 610 mm (24") On Center  
3.2 mm (1/8") Dia. Hole Thru Pipe Wall -  
Remove Burr In I.D. Of Pipe.

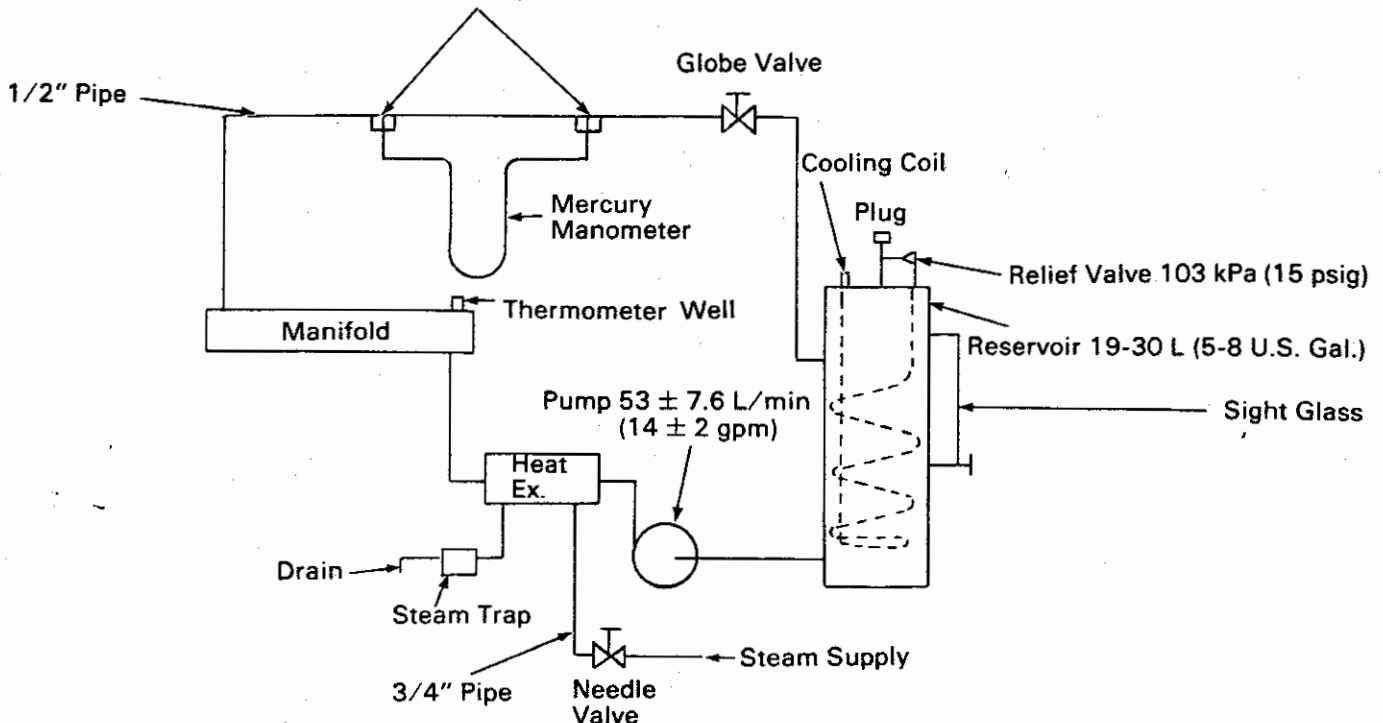


Fig.4 - Switch Test System

another acceptable method. This method more closely approximates actual locomotive operating conditions and allows setting the switch pickup point up to 102° C (215° F).

Fig. 4 shows the test rack setup and specifications for some of the equipment used in the system. The heat input to the system should be capable of raising the temperature of the system to 121° C (250° F) at a rate of .56° C (1° F) per minute.

Most of the parts required can be fabricated, obtained from railroad stock, or ordered from Electro-Motive Parts Centers.

Part No.	Qty.	Description
9312910	1	Heater (Fuel Preheater)
8314924	1	Manifold (4-Position Temperature Manifold)
8173558	2	Flange, Swivel
8173555	2	Insert
8057487	2	Gasket, Swivel Flange
8238644	2	Outlet, Threaded Pipe, 3/8"
8268162	1	Thermometer Well
8316180	*AR	Flange, Blanking
9570837	*AR	Gasket, Flange

\*Use blanking flanges and gaskets when testing less than a full complement of switches.

An electric immersion heater may be used in place of steam and heat exchanger for heat supply.

**Procedure:**

1. Fill system with water and rust inhibitor to top of manifold.
2. Connect mercury manometer across the pressure taps on the 3/8" threaded outlets. Bleed all air out of the lines so water is over the mercury in both legs.
3. Start the pump and, using the globe valve, throttle the flow to 66 mm (2.6") to 109 mm (4.3") of Hg difference in pressure.
4. Throttle the steam to achieve the required temperature in the manifold as indicated by a precision thermometer in the thermometer well.
5. To lower the temperature, throttle cold water through the cooling coil which is mounted in the reservoir.

## **SWITCH ADJUSTMENTS WHILE INSTALLED**

In cases where facilities are not available for removal of the switches and testing by bulb immersion, the switches can be set while installed in the locomotive.

This test should be performed while the engine is loaded for other tests. The engine should be loaded for sufficient time to allow water and oil temperatures to stabilize.

In some installations a thermometer well is located near the switches, Fig. 2. This well can be filled with oil and a thermometer can be inserted. In installations without a thermometer well, connect an engine temperature gauge into the engine water discharge piping as close to the switches as possible.

In order to obtain the proper temperatures for switch settings it may be necessary to close shutters, where used, and temporarily cause the fan and/or heat exchanger to be inoperative.

## **TEMPERATURE SWITCH ADJUSTMENTS**

The range adjustment nut and the differential adjustment are accessible by removing the front cover of the switch, see Fig. 5. To increase the reset level or dropout point (low temperature) turn the range adjustment nut to the left. The increased preload on the range spring causes it to reset the switch at a higher (relative) temperature. To lower the dropout point, turn the nut to the right.

The differential is increased by increasing the preload on the small differential spring. This spring causes a force to be exerted which is in opposition to switch pickup. The greater preload necessitates a higher temperature to overcome the spring force and throw the switch. To lower the pickup temperature, turn the screw counterclockwise or the nut to the right depending upon whether it is the new style or old style switch. See Fig. 6.

The differential adjustment should be checked after the reset level is set. To increase the differential, which raises the high temperature (pickup) point, turn the screw (old style) clockwise or the nut (new style) to the left.

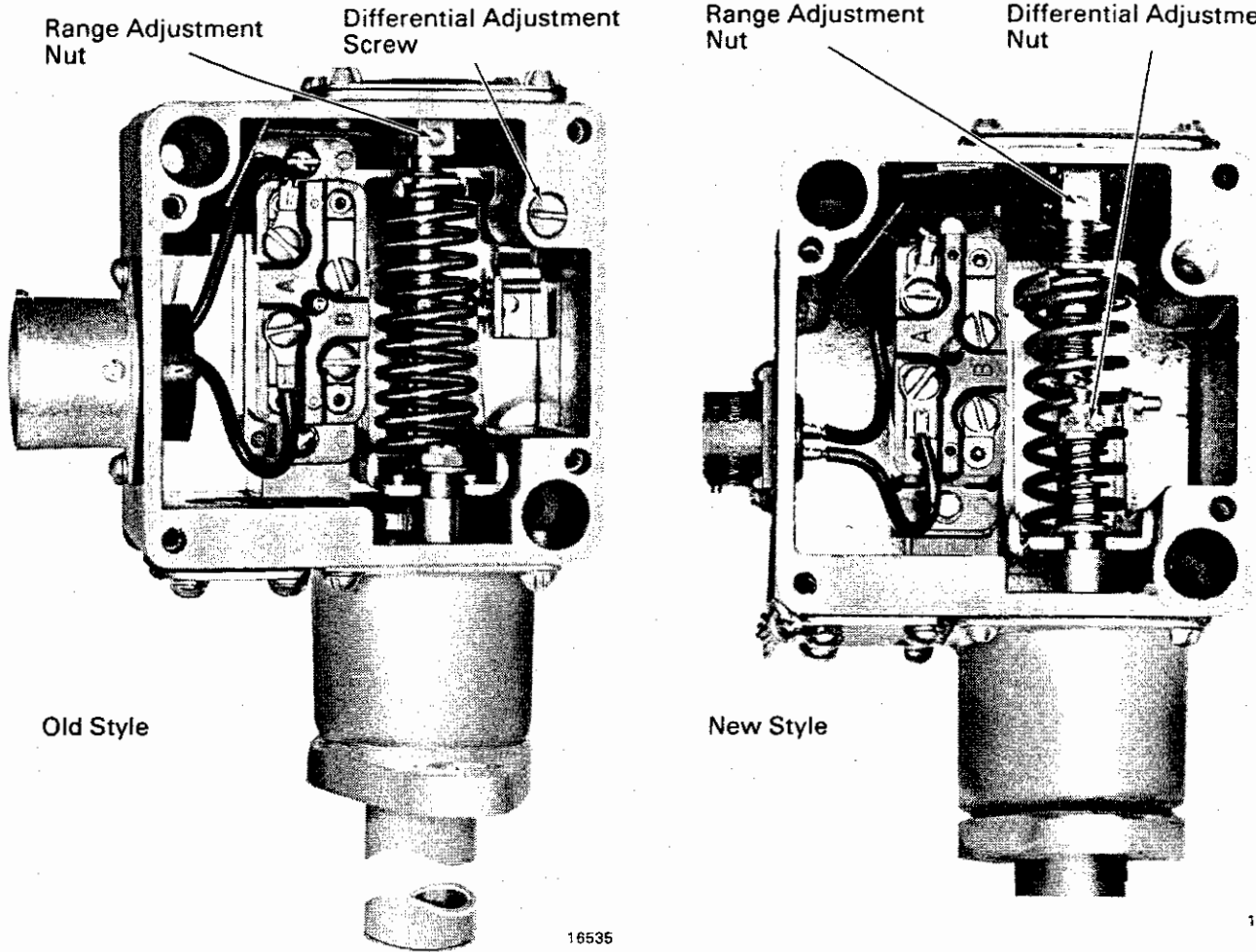


Fig.5 - Temperature Switches With Front Covers Removed

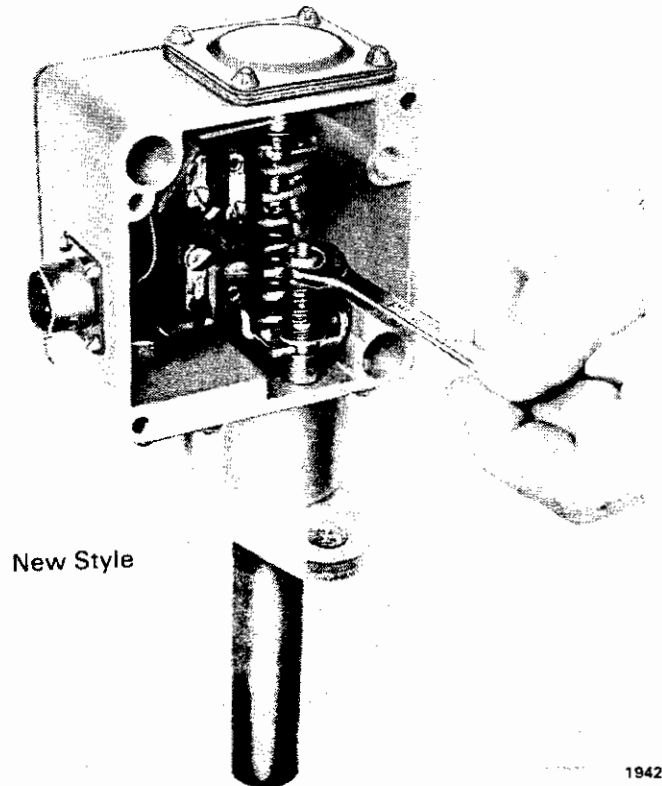


Fig.6 - Differential Adjustment

# SERVICE DATA

Temperature switch settings can be found on the nameplate attached to the device. Local operating conditions may require that other settings be used. In such cases, refer to the wiring diagram or specific instructions for particular installation.

In certain applications it is preferable to eliminate the plug-in connector and permanently wire the switch.

## Tolerances

Pickup .....	$\pm 1^{\circ} \text{ F}$
Dropout .....	$\pm 2^{\circ} \text{ F}$
Drawing for construction of container for switch adjustment .....	8102278

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