EMD MAINTENANCE INSTRUCTION

AUTOMATIC TEMPERATURE CONTROL SWITCH - 8178411

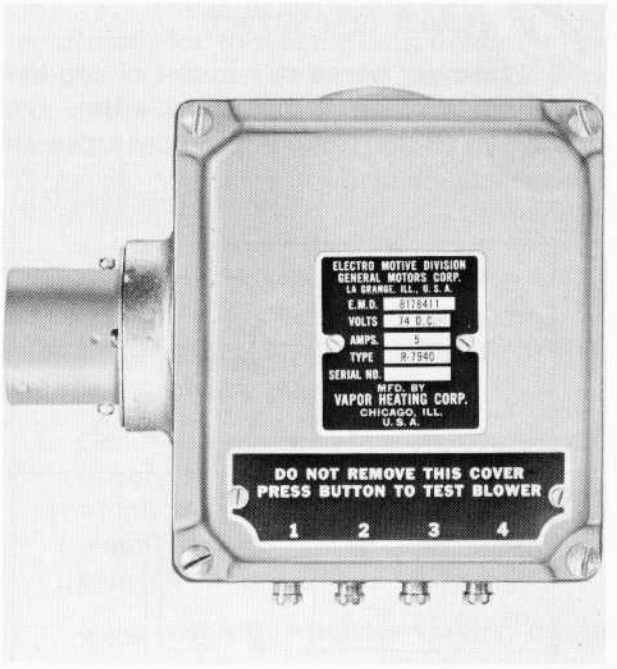
DESCRIPTION

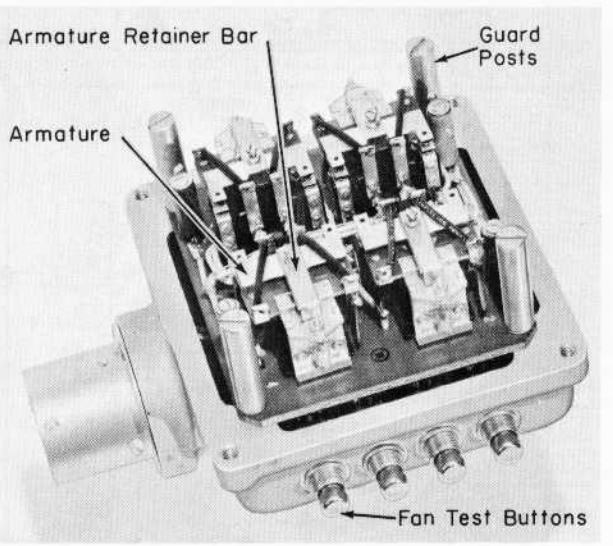
Best performance of the diesel engine is obtained when it operates within controlled limits of engine water temperature. The temperature of the engine cooling system will vary with the engine load, surrounding air temperature and other factors, which make control of engine water temperature necessary.

The automatic engine water temperature control switch, Fig. 1, described in this bulletin, is designed to accurately determine engine water temperature and function to establish electrical circuits to actuate cooling fans and air intake shutters, to control engine water temperature.

The switch is provided with a cast metal case to furnish protection and support of the switch components. Four encased temperature measuring thermometers, supported by the case, protrude from the back of the case. Four relays, one for each thermometer to which they are connected, are mounted on the case and are protected by a gasketed cover. Guard posts, Fig. 1, at each corner of the case protect the relays against possible damage from the cover, when upon unusual necessity, it is removed. Armature bar retainers further protect the relays. An eight point connector plug is provided to connect the internal circuits of the switch to external circuits. Fan test buttons, one for each relay, permit actuation of the relays to simulate temperature increase and determine fan operation.

The switch is installed at the engine water discharge elbow, with the four temperature measuring thermometer bulbs inserted into the discharge water flow. Installation is secured by a bolted flange.





Cover Removed

Fig. 1 - Temperature Control Switch 8178411

* THIS BULLETIN SUPERSEDES ALL ISSUES OF M.I. 1563.

OPERATION

The switch unit functions in the cooling fan control circuits to maintain cooling water temperature between 160° F. and 182° F., in the following manner.

Normal changes in temperature will cause the mercury in the thermometer tube to expand or contract.

Platinum wires are inserted into the thermometer tube in positions which are calibrated to the various temperatures as shown in the schematic wiring diagram, Fig. 2. The normal expansion and contraction of the mercury under the influence of the water temperature will open or close the pilot circuit through the mercury column.

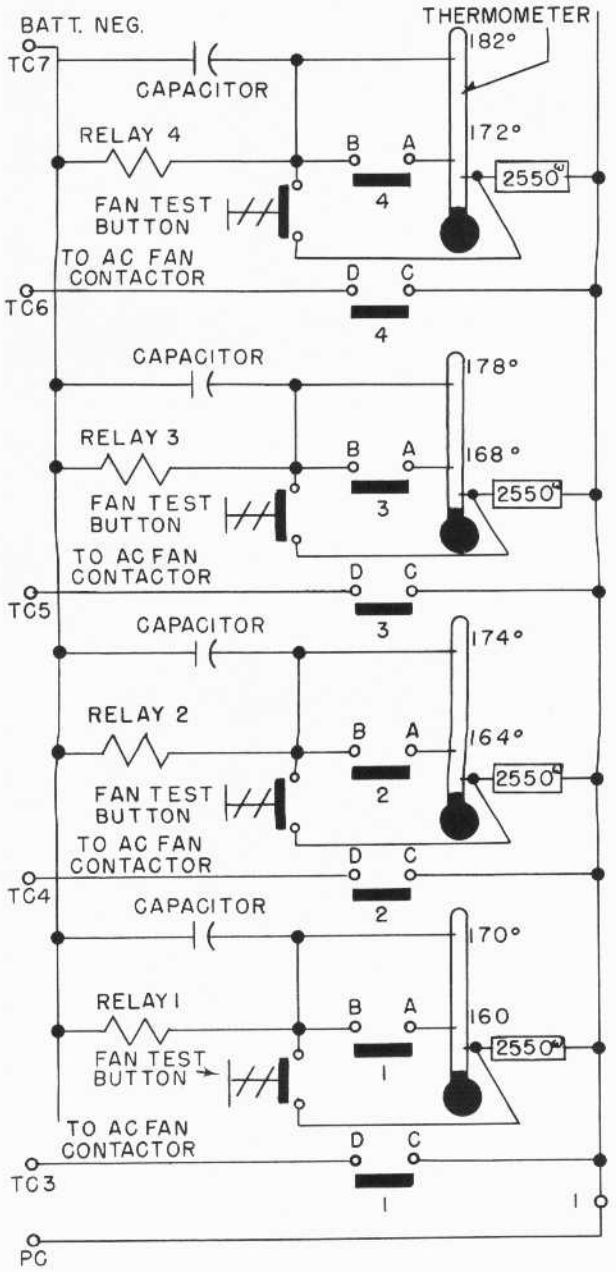


Fig. 2 - Temperature Control Switch Schematic Wiring Diagram

When the pilot circuit is established, the operating coil of a relay will be energized and the interlocks will close. The "ab" interlocks establish a holding circuit to the relay coil and the "cd" interlock closes the circuit to the fan contactor to which it is connected.

In case the water temperature continues to rise, the thermometer calibrated to the next higher temperature will close a pilot circuit as described above, and another cooling fan will operate. Increasing water temperature will actuate the entire sequence until all fans are in operation.

A decrease in temperature will cause the mercury to contract and when the point of lowest calibration for that particular thermometer is reached, the pilot circuit will open, dropping out the "ab" and "cd" interlocks and de-energizing that particular fan control circuit. The effective range of each thermometer is indicated on the schematic diagram, Fig. 2.

NOTE: Due to difference in fan (and shutter) sequence, each locomotive must be treated separately to ensure that the sequence of operation for any particular locomotive may be correct. Check the locomotive wiring diagram for proper sequence.

MAINTENANCE

This is a sealed unit and it is recommended that no maintenance be attempted other than keeping the unit clean. The pickup and dropout values are determined by the location of the platinum wires built into the thermometers and no adjustment is possible. Undue arcing or physical shock may cause the mercury to vaporize or separate in the column. This condition will cause erratic operation

of the fans and should not be permitted to exist.

To eliminate the need for cover removal during operational test and inspection, four fan test buttons, Fig. 2, have been installed in the base of the switch. By pressing these buttons one at a time, a check of cooling fan operation can be made. Pressing the test button energizes the relay coil in the same manner as a temperature increase. The circuit from the temperature switch relay coil through the AC contactor to the cooling fan is then energized and fan rotation can be checked.

In case of defective operation the entire switch assembly should be returned to Electro-Motive Division for remanufacture and recalibration. When replacing a switch, the new switch should be left in its shock resistant carton until actually used, and the carton reused for storage and shipment of the removed switch. Careless handling and packaging of switches after removal, often results in damage more costly to repair than the original fault.

The assembly should be tested at periods as outlined in Maintenance Instruction 1704. A suitable testing device (which may also be used for testing the vernatherm thermostat switch assembly 8097916) may be constructed according to Maintenance File Drawing 351. The testing device control panel is shown in Fig. 3. These drawings may be obtained upon request to your Electro-Motive regional Sales or Service representative. Export customers may make their request to Service Manager, Locomotive Products, General Motors Overseas Operations, New York.

Operation Of Testing Device

The testing equipment should be used in the following manner:

1. Clean the immersion bulb assembly of any scale or other foreign deposit which may affect heat transfer, and mount the complete thermostat assembly to the flange provided.
2. Open the water supply valves, mixing the hot and cold to obtain a supply of

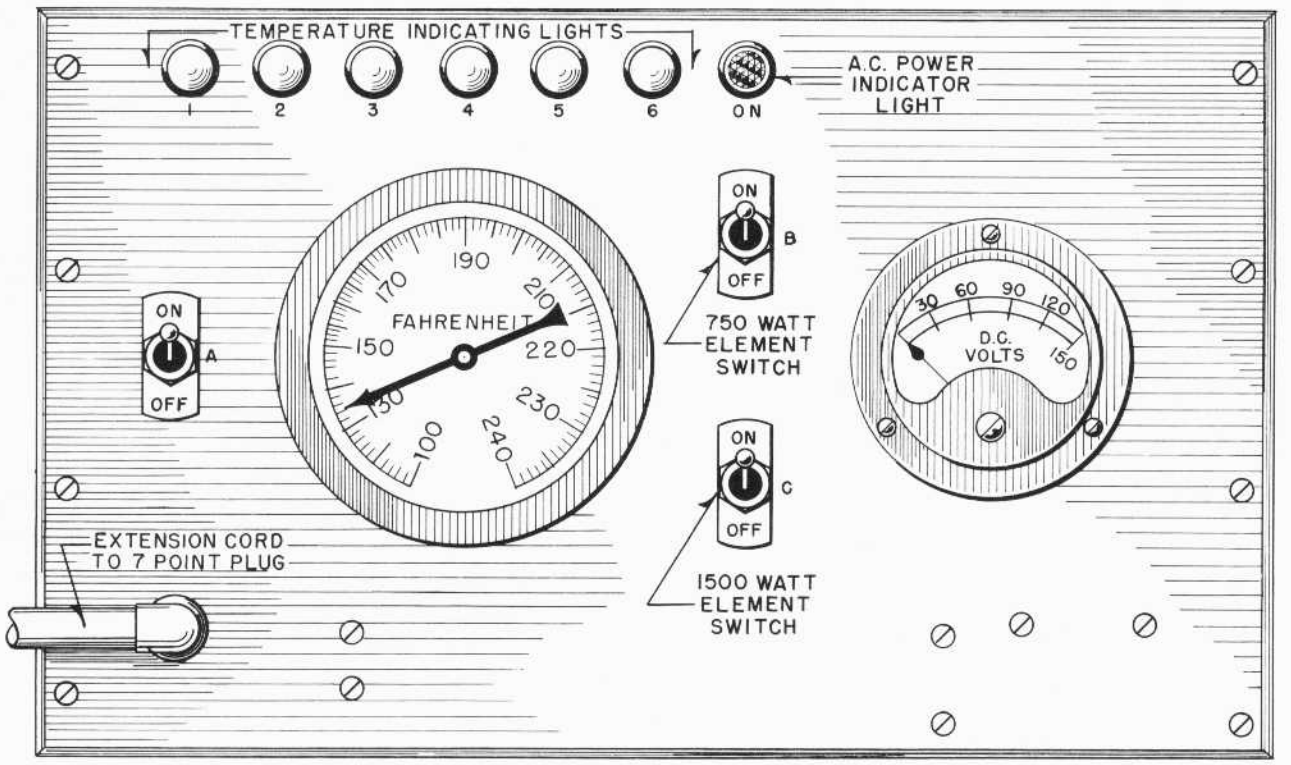


Fig. 3 - Control Panel For Temperature Control Switch Test Stand

warm water with a temperature somewhat below that necessary to operate at the lowest "dropout" setting (140-150° F. approx.). Fill to top of water level indicator. The thermostat tubes are then completely immersed in warm water.

3. Insert the 7 point plug into the receptacle on the thermostat and set switch "A," Fig. 3. If testing mercury type temperature switch assembly, switch "A" should be ON and ballast lamp will light. In either case the DC voltmeter should indicate 74-76 volts available to operate the panel indicating lights.

   The temperature gauge will show the water temperature, which should be somewhat below 160° F. as outlined in Step 2. If above 160° F. add cold water by opening the cold water valve allowing time for the temperature gauge to react and indicate the cooler temperature. Excess water will drain off through the overflow pipe.

4. The next step is to close switches "B" and "C" for quick heating of the water. This will connect both the 750 and 1500 watt elements. The red panel light will indicate that AC power is being supplied.

5. Observe the "Temperature Sequence Chart" under Maintenance Data (also shown on sheet 1 of File Drawing 351 for Vernatherm switch) and check the temperatures indicated on the temperature gauge just as the white indicator lights come on. Make a record for comparison.

NOTE: In case hot water of sufficient temperature is available, the electrical heating elements need not be used. Following testing of one assembly, cold water may be added to reduce the temperature of the water in the testing device to prepare for another testing cycle.

MAINTENANCE DATA

Contacts - - - - - - - - 5 ampere rating
Silver tungsten
8 normally open

Magnet Coils

Working voltage - - - - - - - - 74 DC

Pickup - - - - - - - - - - - - 48 volts

Dropout - - - - - - - - - 5 to 28 volts

Temperature Sequence Chart

Tube & Relay No.	Light No.	Pickup	Dropout
1	3	170° F.	160° F.
2	4	174° F.	164° F.
3	5	178° F.	168° F.
4	6	182° F.	172° F.

FAN SEQUENCE CHART

E8 AND E9 WITH SUMMER-WINTER SWITCH 8144865

IN SUMMER POSITION

Loco. Fan No.	Tube & Relay No.
Shutters	1
3	2
4	3
2	4

IN WINTER POSITION

Loco. Fan No.	Tube & Relay No.
2	1
3	2
Shutters	3
4	4

SD7 - SD9 WITHOUT SUMMER-WINTER SWITCH

Loco. Fan No.	Tube & Relay No.
1	1
2	2
3 & Shutters	3
4	4

F7 - FP7 - F9 - FP9 WITHOUT SUMMER-WINTER SWITCH

Loco. Fan No.	Tube & Relay No.
4	1
2	2
3 & Shutters	3
1	4

PRINTED IN U.S.A.