JOHNSON CONTROLS

M-2500 Solar Compensator

In an air conditioning or heating system employing exposure zoning, the control system will be influenced by solar effect as well as by outside temperature. Outside temperature can be measured by standard outside elements, but an M-2500 Solar Compensator should be used for measuring solar heat gain.

The M-2500 Solar Compensator is a non-directional device used to compensate for the solar effects on buildings. The unit consists of a black anodized aluminum collector contained in a sealed, transparent enclosure. The collector is designed to accept either a Cybertronic nickel wire sensing element or a pneumatic T-5210 bulb.

Operation

Sunlight passing through the enclosure is absorbed by the collector which causes the temperature of the collector to increase. While the collector is receiving direct sunlight, the collector temperature will continue to rise until an equilibrium is reached between the heat gain (through solar radiation) and the heat loss (by conduction). The enclosed air acts as an insulator. Therefore, the measured temperature inside the Solar Compensator is equal to the ambient air temperature plus the increase in temperature due to solar radiation. This temperature increase is the "sensitivity" of the Solar Compensator. Should the sunlight become obscured (as by a cloud), the collector temperature will gradually decrease until it reaches a new equilibrium. During total darkness, the compensator will be at ambient temperature.

In an electronic system, the element in the Solar Compensator and a separate TE-1900 Outside Element (used to sense ambient temperature) are connected to opposing legs of abridge circuit. The bridge output voltage is proportional to the difference in temperature sensed by the two devices. This difference will vary from 0 (in the absence of sunlight) to as much as 50F (in direct sunlight) due to the sensitivity of the Solar Compensator. A minimum differential of 20F above ambient temperature is maintained in direct sunlight.

The pneumatic system is similar in operation with the exception that a T-5210 bulb element and a T-9000 series Receiver-Controller are employed. Figure 2 shows a typical pneumatic application.

Installation

The M-2500 Solar Compensator should be mounted on the outside of a building in an area that is representative of the zone it serves. If an area has full sun exposure certain hours of the day, the M-2500 should also have full exposure at the same time. Transient shadows from chimneys, trees and other buildings must be considered.

Fig. 1 M-2500 Solar Compensator

The unit must also be mounted away from sources of heat such as vents and exhaust ducts, or the temperature effects of cooling towers.

The M-2500 may be mounted with the bracket provided, or when used with a TE-1900 Cybertronic Temperature Sensing Element, it may be mounted with an electrical junction box. The sensor is non-directional due to the "pine-cone" shape of its collector. It can be mounted in either a horizontal or vertical position. The unit is packed with thermal conductive grease to insure proper thermal conductivity. If additional grease is required, use Johnson F-1000-182.

Specifications

Product		M-2500 Solar Compensator
Compatible Sensors		TE-1900 Nickel Wire Elements T-5210 Bulb Element
Response Time		Time Constant is 25 Minutes from Full Sunlight to Darkness or Vice-Versa
Sensitivity		Varies from 0 to 50F with Amount of Sunlight Received
Ambient Temperature Limits		-40F (-40°C) to 120F (49°C)
Mounting	**Pneumatic**	With Bracket Provided
	Electronic	With Bracket Provided or to Electrical Conduit Box
Material	**Enclosure**	Transparent Polycarbonate
	Collector	Black Anodized Aluminum

Code No. LIT-7171110

Figure 3 shows overall and mounting dimensions of the M-2500. Figure 4 shows the auxiliary parts of the M-2500 used for installing the T-5210 element in the compensator.

Figure 5 shows either the TE-1900-1 precision element or TE-1980-1 ultra precision element installed in the M-2500. In some cases, the use of an M-2500 may overcompensate for the effect of the sun on a building. Figure 6 shows the procedure for wrapping reflective aluminum tape (purchase locally) around the housing of the unit to reduce the effectiveness of the compensator. The tape should be wrapped upwards from the bottom of the unit.

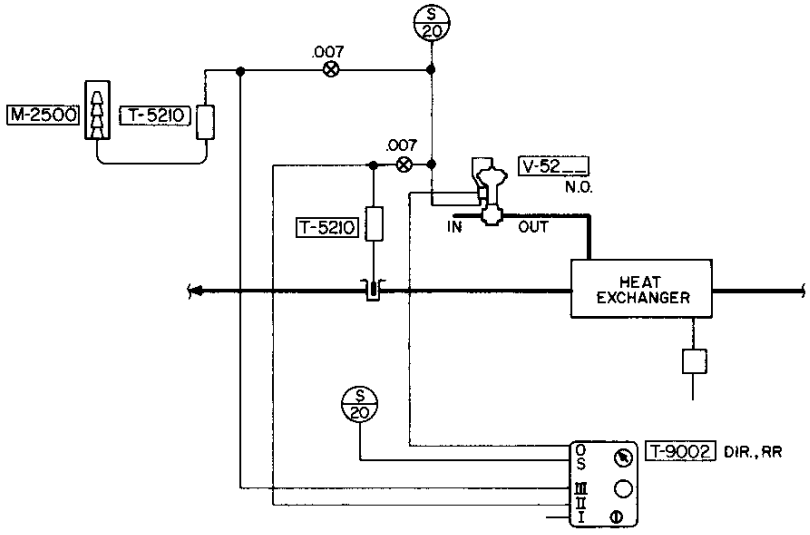

Fig. 2 M-2500 Typical Application

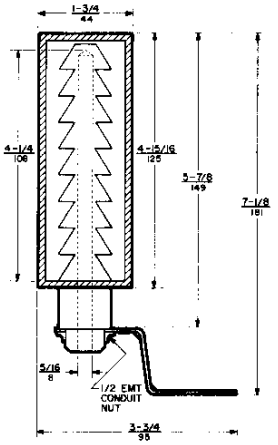

Fig. 3 M-2500 Dimensions $\frac{\text{in.}}{\text{mm}}$

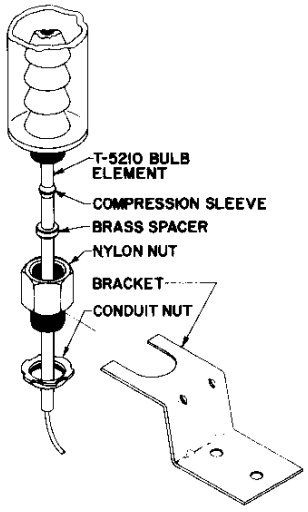

Fig. 4 M-2500 With T-5210

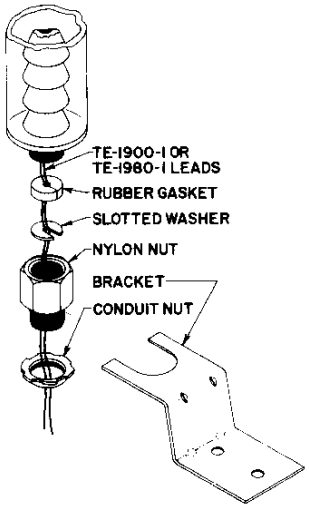

Fig. 5 M-2500 With TE-1900/TE-1980

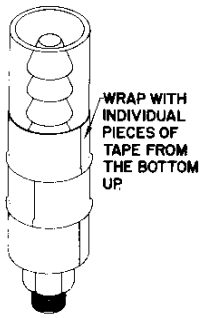

Fig. 6 Wrapping Procedure

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