

used in the condenser, the amount of water should be modulated according to the demand as measured at the condenser outlet by means of a temperature controller and control valve.

Well water if available in sufficient quantities at low temperatures during the cooling season, it may be pumped directly to air washers or cooling

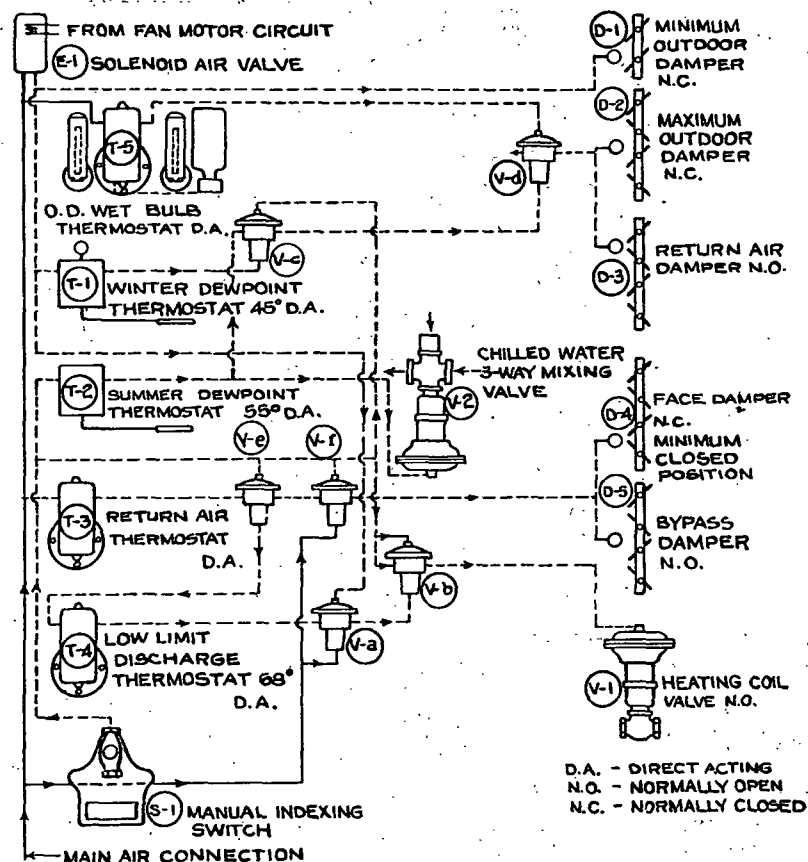


FIG. 2. CONTROL DIAGRAM FOR YEAR 'ROUND AIR CONDITIONING SYSTEM

coils. Control is usually effected through control valves on the water supply to the cooling unit actuated by temperature or humidity controllers, or both, located either at the outlet of the conditioner or in the conditioned space.

APPLICATION OF CONTROLLING DEVICES TO A TYPICAL SYSTEM

Fig. 1 shows the location of controlling devices for a year 'round air conditioning system such as shown in Chapter 21, Fig. 3. A control diagram for pneumatic control

equipment is shown in Fig. 2 for convenience in explaining the function and sequence of operation of the control in Fig. 1, but obviously the individual controls may also be of self-contained or electrically operated type provided they obtain the same control of valves and dampers.

The auxiliary controlling devices indicated may all be mounted together on an instrument board which may also contain a framed copy of the control diagram and the description of the automatic control cycle. Air gages, identified by suitable inscription plates, may be installed in the branch connections to and from the auxiliary devices on the instrument board to indicate the functioning of the various devices.

A description of the automatic control cycle follows:

When the fan motor is stopped, solenoid air valve E-1, actuated from the fan motor circuit, is de-energized and exhausts its branch to close minimum outdoor damper D-1, reposition three-way air valve V-a to close heating coil valve V-1, and remove main air from remote bulb indicator dew-point thermostat T-1, thereby closing maximum outdoor damper D-2 and opening return air damper D-3.

When the fan motor is started, E-1 fills its branch, thereby opening minimum outdoor damper D-1, repositions V-a to permit T-3 and T-4 to control V-1 and supplies main air to T-1 to permit same to operate D-2 and D-3.

During the summer cooling season, manual indexing switch S-1 is positioned to fill its branch, whereby it supplies main air to dew-point thermostat T-2, positions three-way air valves V-e and V-f to permit T-3 to control face damper D-4 and bypass damper D-5, positions three-way air valve V-b to close heating coil valve V-1, positions three-way air valve V-c to remove the control of maximum outdoor damper D-2 and return air damper D-3 from dew-point thermostat T-1 and place these dampers under the control of dew-point thermostat T-2.

When S-1 is positioned as noted above, remote bulb dew-point thermostat T-2 functions on a rising temperature to first gradually open maximum outdoor damper D-2 while simultaneously closing return air damper D-3 and on a further slight temperature rise, gradually positions chilled water valve V-2 to pass chilled water to the dehumidifier. The reverse operating sequence occurs on a falling dew-point temperature. Should the outdoor wet-bulb temperature rise above the desired indoor wet-bulb temperature, positive acting outdoor wet-bulb thermostat T-5, positions three-way air valve V-d to remove dampers D-2 and D-3 from the control of T-2, thereby closing outdoor damper D-2 and opening return air damper D-3.

On a rising return air temperature T-3 functions to open face damper D-4, while simultaneously closing bypass damper D-5 as required to maintain the desired return air temperature. The reverse operation occurs on a falling return air temperature.

During all seasons except the summer cooling season, manual switch S-1 is positioned to exhaust its branch, thereby making dew-point thermostat T-2 inoperative and positions chilled water valve V-2 for continuous recirculation, positions three-way valve V-b to permit heating coil valve V-1 to be operated as required, positions three-way valve V-c to permit T-1 to control D-2 and D-3, positions three-way valve V-e to permit T-3 to operate through low limit discharge thermostat T-4 to control heater valve V-1 and positions three-way valve V-f to open normally closed face damper D-4 and close normally open bypass damper D-5.

When switch S-1 is positioned as noted above, remote bulb dew-point thermostat T-1 functions on a rising temperature to gradually open maximum outdoor damper D-2, while simultaneously closing return air damper D-3 as required to maintain the desired dew-point temperature. The reverse operation occurs on a falling dew-point temperature. When the outdoor wet-bulb temperature rises above the desired dew-point temperature, the dew-point temperature will rise accordingly until such time as the system is indexed for summer cooling and chilled water is made available to drop the dew-point temperature.

Return air thermostat T-3 functions on a rising temperature to pass air through low limit discharge thermostat T-4 to gradually close heating coil valve V-1. Should the discharge temperature fall below the operating point of T-4, this thermostat will release air from its branch to gradually open V-1 as required to maintain the desired low limit discharge temperature regardless of the operation of T-3.