TECHNICAL BULLETIN

T-010

AUTOMATIC DEMAND CONTROLS (SERIES H and HA)

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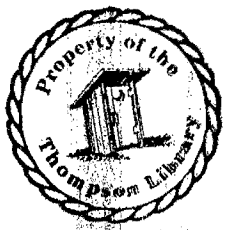
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AUTOMATIC DEMAND CONTROL

This bulletin is intended to help the non-engineer understand automatic demand controls and their use with remote-starting Onan AC electric plants.

The letter H or HA in the model number (as in model 7.5HA-21, 15.0HA-23, etc.) designates control series.

Automatic controls start the plant when a load (light, motor or other electrical device) is switched on and stop the plant when the electrical load is turned off. These controls are used when the Onan plant is the only source of electricity (not as a standby plant when commercial electricity fails). The plant becomes an "automatic plant" and doesn't need to run continuously for intermittent loads.

MODEL SELECTION

The automatic load demand control model selected must match the rating and electrical characteristics of the plant.

REMOTE CONTROL CIRCUIT

Plants must have a three-wire remote-control circuit. Series H or HA controls must not be used with plants having a two-wire remote-control circuit (such as RJC or RDJC).

KILOWATTS

The control rating must be as large or larger than the plant rating.

FREQUENCY

Used with 50 or 60 cycles-per-second electric generating plant systems.

TIME DELAY

Special models for diesel plants energize the glow plugs for 20 seconds before cranking starts.

Models for gasoline (carbureted) plants with automotive starting motor (instead of exciter crank) have a five-second delay to prevent damage by recranking before the plant has completely stopped. Time-delays can be shortened or lengthened by changing the plug-in time delay relay.

CRANKING VOLTAGE

Most electric plants have 12-volt crank starting. Some electric plants have 32-volt (code 1R4, 3R4) starting which must be matched to their respective automatic controls.

OUTPUT VOLTAGE

A different model control is required to match each of the three possible voltage and wire selections (120-volt 2-wire, 240-volt 2-wire, or 120/240-volt 3-wire).

"H" series only. For the three-phase, four-wire Delta, one-phase center-tapped plant, two conditions exist. If there are some single-phase loads, ground the plant's neutral load-wire and use a single-phase automatic control. However, if there are only three-phase loads, then isolate the plant's fourth groundable wire and use a three-phase automatic control.

OPERATION

When the plant is not running, the automatic control applies battery voltage across the line. Any load connected across the line (a light turned on for example) draws a small amount of current from the battery. This current energizes a sensitive relay to start the plant. When the electric plant reaches full speed, it energizes a contactor that disconnects the battery from the line and connects the AC output of the generator to the line.

STARTING-STOPPING-CYCLING

The plant is automatically started if the current flow through the load from the starting battery is great enough to operate the sensitive relay.

If the plant fails to start after 45 to 90 seconds of electric cranking, a thermal cranking limiter stops the cranking operation (protects the cranking system).

The plant will continue to run after it has started if there is sufficient flow of AC current from the AC generator. To keep a 120-volt plant running, a 60-watt load is required for the H series and a 40-watt load for the HA series.

Some motor or transformer loads start a plant but do not keep it running and the plant "cycles" (starts, stops, starts, stops, etc.).

INCANDESCENT (FILAMENT) BULB LOADS

Lamp bulbs (which constitute the most ordinary generating plant load) have peculiar resistance characteristics. When burning at full voltage, the resistance of a bulb is 10 to 14 times as much in ohms as it is when the same bulb is cold. When 12 volts are connected to a 120-volt bulb, the bulb does not light up, therefore its resistance remains relatively low. This permits enough current from the battery to flow through it to operate the relays to start the plant.

A bulb of 60 watts, H series, or 40 watts, HA series, will start a plant. Once the plant starts, the same size bulb keeps it running.

RESISTIVE LOADS

Heating elements (toasters, flat irons, heaters, soldering irons, etc.) have a cold resistance almost the same as the hot resistance. In effect, the current flowing from a 12-volt battery through a 60-watt, 120-volt heating element, will be only 1/10 as much as the current that will flow from the same battery through a 60-watt, 120-volt lamp bulb . . . and it will not start the plant.

Therefore, if the plant load consists of heating elements, approximately 600 watts of load will be required to start the plant (see the last page).

However, once the plant starts, only 60 watts (heating elements, lamp bulbs, etc.) will keep the plant running (see the last page).

INDUCTIVE LOADS

Inductive devices found in homes are transformers, motors and electric clocks. The following inductive-devices discussion illustrates the principle but may not be precisely true for any one device.

A transformer drawing 1/2 ampere from a 120-volt line with the transformer secondary loaded draws less than 1/20 ampere when its secondary is unloaded. For example, control transformers (used on oil burners) are usually permanently connected to the 120-volt line. They use little power except during the short intervals that the transformer is operating some control device in the furnace.

If the same transformer is connected to a 12-volt, DC battery, about 1 ampere will flow (20 times more than expected by the application of Ohm's Law). Why? Because the current was AC in one case, DC in the other case which is the peculiarity of all inductive devices. Their resistance to direct current is very low.

A transformer (or similar inductive device) connected to an automatic plant, may start the plant. Then, after the plant starts (the load from the AC 120-volt line is only a few watts), the plant stops. The transformers will make it start again, stop, etc.

For this reason, special wiring is necessary for small doorbell transformers, electric clocks, oil burners, control transformers, etc.

If a separate switch connects the small transformer, arrange the circuit so a lamp bulb turns on at the same as the transformer (60-watt bulb for H series, 40-watt bulb for HA series).

FLUORESCENT LIGHTING

The reason fluorescent lights may or may not start a generating plant or may cause it to cycle is most single-tube fixtures have a ballast and a starter in series. Most starters offer infinite resistance when connected to a low-voltage power source (like the 12-volt starting battery). Therefore, no current can pass to initiate plant starting.

Most multiple-tube fixtures have a ballast and direct current from the battery passes through it to start the plant. But once the plant starts the AC is thrown on the ballast, a second or two elapses before the first starter acts to turn on one of the several tubes. During this time interval, the plant stops because there is not sufficient AC load to keep it running. The plant then cycles (starts, stops, starts, stops, etc.). If an automatic plant is already running, there is no problem.

If the plant must be started by fluorescent fixtures, arrange your switches so a 60-watt bulb (H series) or 40-watt bulb (HA series) is turned on at the same time as the fluorescents. After the plant is running (all fluorescent tubes are lighted), the bulb may be turned off if the minimum load remains.

OIL BURNER INSTALLATIONS

To use an Onan automatic electric plant with an ordinary oil-burner requires wiring changes in the oil-burner controls. Figure 1 shows a typical installation.

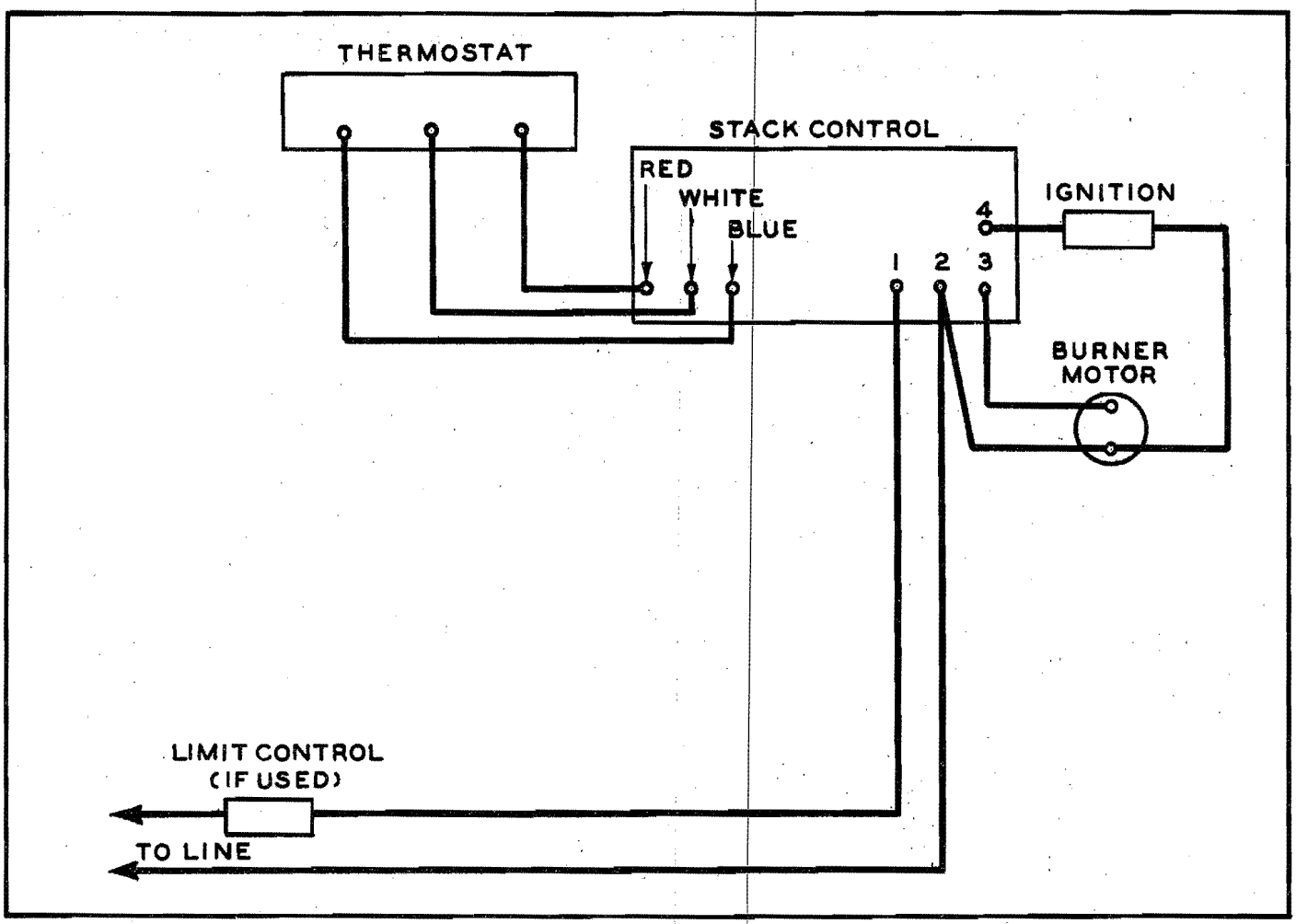


FIGURE 1

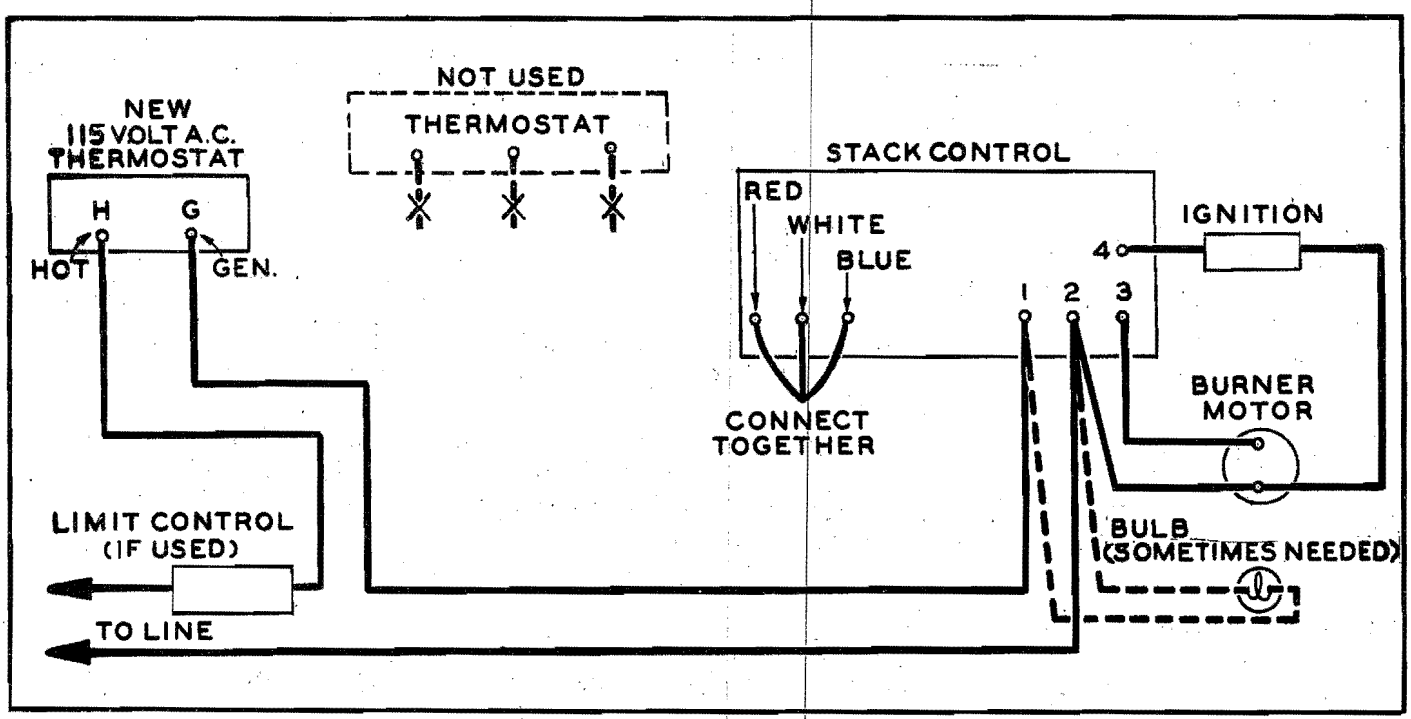


FIGURE 2

METHOD 1 - Use 120-volt thermostat:

Remove the low voltage thermostat ordinarily used in the installation. Install a 120-volt thermostat (one capable of carrying and breaking 120-volt current) as shown in Figure 2.

Wire the thermostat in series with the transformer primary. When the thermostat completes the load circuit through the transformer, the plant and burner motor start and run as long as the thermostat is closed. When desired room temperature is reached, the thermostat opens breaking the load circuit, the burner motor and plant stop.

METHOD 2 - Use a relay with the existing thermostat as shown in Figure 3:

This method is recommended for existing installation or when a Chronotherm-type thermostat is used (built-in electric clock).

Connect the relay contacts in series with the transformer primary winding. Existing thermostat wires may be used. The thermostat closes the circuit to energize the 12-volt relay.

When purchasing new oil or coal installations, specify 120-volt AC controls.

Sometimes, it is necessary to add a lamp bulb load for proper operation (see Figures 2 and 3).

STANDBY (EMERGENCY) PLANTS

Series H or HA automatic demand controls are NOT intended to make standby plants start. Use automatic load transfer panels LT series, etc. for standby plants. Load transfer controls are covered in Technical Bulletin T-011.

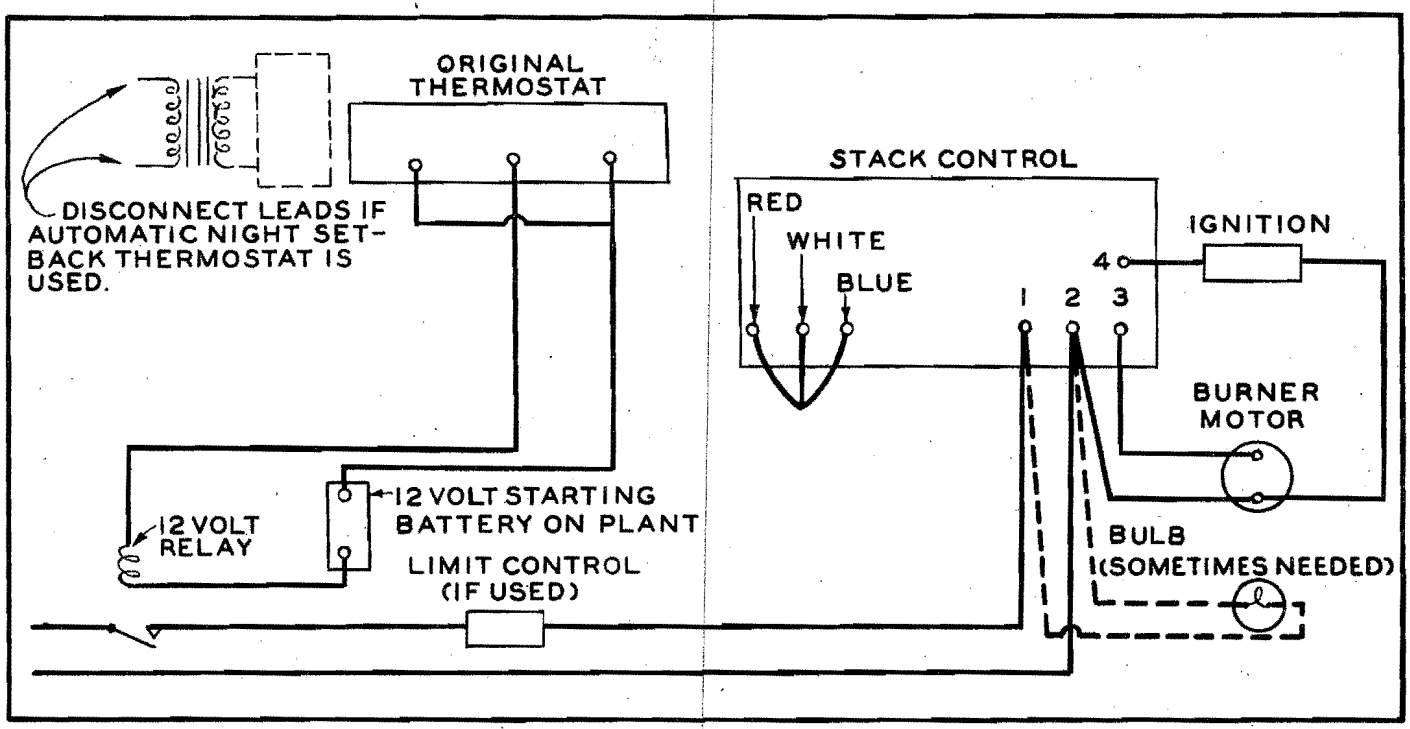
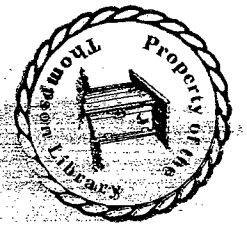


FIGURE 3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