ST9120A-H
Electronic Fan Timers

APPLICATION

The ST9120A-H Electronic Fan Timers integrate control of all combustion blower and circulating fan operations in a gas warm air appliance. This control is the central wiring point for most of the electrical components in the furnace. The basic purposes of the ST9120 are to monitor the thermostat for heat, cool and fan demands, run the induced draft blower motor and run a circulating fan (up to two speeds) as required. The electronic fan timers also monitor limit switch strings and energize separate ignition control systems through spst pressure switches. The electronic fan timers feature either a fixed or field-adjustable heat fan-on delay, a fixed or field-adjustable heat fan-off delay and a fixed or field-adjustable cool fan-on delay, depending on the model.

Cooling fan on/off delay, extended combustion air blower post purge, and an enclosure are available on selected models as noted in Table 1.

Electronic air cleaner (EAC) and humidifier (HUM) convenience terminal connections can be provided as an option. Continuous low speed indoor air circulation is also available as an option.

SPECIFICATIONS

Electrical Ratings:
Power Voltage Requirements: 18 to 30 Vac, 60 Hz.

Contact Ratings:
Combustion Blower:
1.5A full load, 10A locked rotor at 115 Vac.
0.75A full load, 5A locked rotor at 230 Vac.
(Reduce full load rating by humidifier [HUM] load.)
Circulating Fan:
Heat-Cool speed:
15A full load, 30A locked rotor at 115 Vac.
7.5A full load, 15A locked rotor at 230 Vac.
(Reduce full load rating by electronic air cleaner [EAC] load.)
Continuous speed (optional):
8A full load, 16A locked rotor at 115 Vac.
4A full load, 8A locked rotor at 230 Vac.
EAC and HUM: 0.8A maximum combined load at 115 Vac.
Thermostat Load: 0.06A plus ignition system load.

Continuous low speed indoor air circulation is also available as an option.

Table 1. ST9120 Specifications.

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Heat Fan On/Off Delay</th>
<th>Cooling Fan On/Off Delay</th>
<th>Extended Post Purge</th>
<th>Enclosure</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST9120A</td>
<td>Fixed</td>
<td>None</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>ST9120B</td>
<td>Fixed</td>
<td>None</td>
<td>Fixed</td>
<td>No</td>
</tr>
<tr>
<td>ST9120C</td>
<td>Fixed</td>
<td>Fixed</td>
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<td>No</td>
</tr>
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<td>ST9120D</td>
<td>Fixed</td>
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<td>No</td>
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<td>ST9120G</td>
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</tr>
<tr>
<td>ST9120H</td>
<td>Fixed</td>
<td>Fixed</td>
<td>Fixed</td>
<td>Yes</td>
</tr>
</tbody>
</table>

* Select models also available with both fixed heat fan on and off delays or with both adjustable fan on and off delays.

b Delay timing starts when gas valve is energized.

c Delay timing starts when gas valve is de-energized.

d Select models also available with adjustable cool fan on delay.

On/Off Delay Settings:
Heat Speed.

Delay On: Fixed or field-adjustable, depending on model; timing depends on model.
Delay Off: Fixed or field-adjustable, depending on model.
Cool Speed: Delay On: Fixed or field-adjustable, depending on model.
Delay Off: 0 seconds on ST9120A,B,E,F models.
(Extended cool speed on and off delays are available on ST9120C,D,G,H models.)
Timing Tolerance: Larger of ±5% or ±2 seconds.
Post Purge Timing: 5 seconds; extended post purge timing available on ST9120B,D,F,H models.

Environmental Ratings:
Temperature: -40°F (-40°C) to +175°F (+79°C).
Humidity: 5 to 95 percent, noncondensing.

Approvals:
Underwriters Laboratories Inc. File No.: MP466.
Canadian Standards Association File No.: LR95329.

INSTALLATION

When Installing this Product...
1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings and specifications given in the instructions and on the product to make sure the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. After installation is complete, check out the product operation as provided in these instructions.

WARNING
Electrical Shock Hazard. Can cause severe injury, death or property damage.
Disconnect power supply before wiring to prevent electrical shock or equipment damage. More than one disconnection can be required.

Location and Mounting
Mount the ST9120 Electronic Fan Timer in the appliance wiring compartment using four No. 6 screws (obtained locally).

Wiring
Make sure that all wiring complies with local codes and ordinances. Disconnect power before making wiring connections. Refer to Fig. 1 and 2 for standard wiring connections. Refer to Fig. 3 and 4 for internal schematics.

Some models include an enclosure. Make connections to optional electronic air cleaner and humidifier terminals on these models by removing knockouts on the plastic cover with a screwdriver. See Fig. 5.

Setting Adjustable Heat Fan DIP Switches
On models with adjustable heat fan-off delay, set the heat fan-off delay DIP switches as shown in Fig. 6. The off delay time starts when the main gas valve is de-energized at the end of a thermostat call for heat.

On models with both adjustable heat fan-on and -off delays, set the heat fan delay DIP switches as shown in Fig. 7. The on delay time starts when the main gas valve is energized at the start of a thermostat call for heat; the off delay time starts when the main gas valve is de-energized at the end of a thermostat call for heat.

NOTE: Times available for selection vary by model; see device label. See appliance label or instructions for appropriate settings for a particular application.

On models with adjustable heat fan on, heat fan off, and cool fan on delays, set the heat fan delay and cool fan off delays as shown in Fig. 8. The heat on delay time starts when the main gas valve is de-energized at the start of a thermostat call for heat; the heat off delay time starts when the main gas valve is de-energized at the end of a thermostat call for heat; the cool fan-on delay time starts when the compressor is energized at the start of a thermostat call for cool.
Fig. 1. Typical ST9120 wiring connections with S8600 Intermittent Pilot Ignition Module.
Fig. 2. Typical ST9120 wiring connections with SV9500/SV9501 SmartValve™ System Control.
Fig. 3. ST9120 internal schematic for Intermittent pilot application.
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Fig. 4. ST9120 internal schematic for SmartValve™ System applications.
Fig. 5. Removing terminal cover knockouts.

Fig. 6. Setting heat fan-on delay DIP switches.

Fig. 7. Setting heat fan-on and -off delay DIP switches.

Fig. 8. Setting heat fan-on, heat fan-off and cool fan-on delay DIP switches.
CHECKOUT

Operate the system through at least one complete heating cycle and cooling cycle to make sure the system operates properly. Troubleshoot by checking for appropriate voltages at the ST9120 terminals controlling the combustion blower and heat and cool speed circulating fan. The ST9120 schematics show internal switching to clarify operation and assist in troubleshooting. See Fig. 3 and 4.

<table>
<thead>
<tr>
<th>Action</th>
<th>System Response</th>
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| Thermostat calls for heat. (Terminal W is energized.) | 1. Combustion air blower is energized.  
   2. Air proving switch makes (air flow is established)  
   3. Ignition system is energized.  
   4. Gas valve opens and main burner lights.  
   5. Heat fan-on delay timing begins. When timing is complete, circulating fan is energized at heat speed. |
| Thermostat ends call for heat. (Terminal W is de-energized.) | 1. Ignition system is de-energized and gas valve closes.  
   2. Combustion air blower is de-energized after postpurge timing.  
   3. Heat fan-off delay timing begins. When timing is complete, the circulating fan is de-energized. |
| Thermostat begins call for cool. (Terminals G and Y are energized.) | 1. Cooling contactor is energized.  
   2. Circulating fan is energized at cool speed after cool fan-on delay timing. |
| Thermostat ends call for cool. (Terminals G and Y are de-energized.) | 1. Cooling contactor is de-energized.  
   2. Circulating fan is de-energized after cool fan-off delay timing. |
| Thermostat begins call for fan. (Terminal G is energized.) | 1. Circulating fan is energized at heat speed two seconds after G terminal is energized.  
   2. If a call for heat occurs, circulating fan continues to run at heat speed.  
   3. If a call for cool occurs, circulating fan switches to cool speed after four-second delay.  
   **NOTE:** Circulating fan can be switched off for several seconds during the transition between fan speeds. |
| Thermostat ends call for fan. (Terminal G is de-energized.) | Circulating fan is de-energized. |
| Limit switch string opens.             | 1. Thermostat and ignition system are de-energized and gas valve closes.  
   2. Combustion air blower and circulating fan heat speed are energized. |
| Limit switch string remakes.          | 1. Combustion air blower remains energized for postpurge timing.  
   2. The circulating fan remains energized for the selected delay-off timing.  
   3. Normal operation resumes. |
| Continuous circulating fan is connected. (Optional connection to circulating fan low speed tap.) | 1. Circulating fan low speed is energized when there is no call for heat, cool, or fan.  
   2. If fan operation is required by a call for heat, cool, or fan, ST9120 switches circulating fan to appropriate speed. |
| Electronic air cleaner is connected. (Optional connection to 120 Vac electronic air cleaner.) | 1. In two-speed systems, the electronic air cleaner is energized when the heat or cool speed of the circulating fan is energized.  
   2. If continuous fan option is used, connect EAC to line voltage input S1. Line voltage hot lead is also connected in input S1. |
| Humidity control is connected. (Optional connection to 120 Vac humidifier.) | Humidifier is energized when combustion air blower is energized. |