

## 402M • Series 14 Remote Panel with On/Auto Switch, Lights & 40-80°F Dial & Room Override



### Description of Temperature Control

- 402M-Maxitrol Series 14 Electronic Modulating Discharge Temperature Control with Remote Panel and Room Override Thermostat
- Single Range - 40°F to 80°F Discharge Temperature Set-Point Mounted in Remote Panel, Room Override Mounted in Separate Remote Panel
- Discharge Sensor Mounted in Blower
- Discharge Remote Panel Includes ON/AUTO Switch, and Indicator Lights

### Applications

Where tempered make-up air is required upon activation of an external signal.

### Heater Type

100% Outside Air Single Speed or Variable Air Volume (VAV) Industrial Unit

### Sequence of Operations

With the disconnect in ON position the unit is energized through an ON/AUTO switch (SW-02) either manually in 'ON' mode or by contact closure from an external source in 'AUTO' mode (CI-10), power is supplied to the damper motor (MT-02), if equipped.

When the damper motor approaches the OPEN position (approximately 70%), the damper-end switch (SW-07) closes energizing the blower motor starter contactor (ST-01) and powering the blower motor (MT-01). The blower motor can also be energized from the service switch (SW-05). After the blower is energized the "Blower On" light (LI-01) will illuminate on the remote panel.

*If the unit is equipped with the low-temperature limit control (TS-07), after ten minutes, the low-temperature limit control shuts down the unit if the discharge temperature does not reach the minimum set-point on the low-temperature limit control. Upon shutdown TS-07 will energize the "Low Temperature" light on the remote panel (LI-03) and the damper will close.*

*If the unit is equipped with a smoke detector (AL-02), the smoke detector will shut down the unit if smoke is detected.*

*If an exhaust fan starter coil is tied into the exhaust fan interlock (C1-01), the exhaust fan will turn on.*

*If the unit is equipped with a firestat (TS-22), the unit will shut down if the temperature exceeds the control's setting.*

*If the unit is equipped with a clogged filter switch (PS-02), the pressure drop across the filters will be monitored. If the pressure drop exceeds the set-point, PS-02 will illuminate the "Clogged Filter" light on the remote panel (LI-05).*

When the low airflow switch (PS-01) is proven, the high temperature limit control (TS-04) is energized. The high temperature limit control will monitor the air temperature and shut down the burner if the temperature set point is exceeded. The high temperature limit will require a manual reset.

*If equipped, the optional low and high gas pressure switches (PS-03 & PS-04) will be energized. If the gas pressure is not between the set-points the burner will turn off and require a manual reset.*

The flame relay (RE-07) is energized when the burner ON/OFF intake air stat (TS-06) calls for heat. The pilot valve (VA-03) opens, and the ignition transformer (TR-03) energizes, providing a signal to spark the spark rod.

After the flame rod (SN-02) proves flame, the main valves (VA-01 & VA-02) open, and the ignition transformer de-energizes. The burner can also be energized from the service switch (SW-06). After the main gas valves open the "Burner On" light (LI-02) will illuminate on the remote panel. If the flame rod does not prove after 3 ignition cycles, the burner will shut off and the "Flame Failure Light" (LI-04) will illuminate on the remote panel. The pilot valve (VA-03) stays energized.

*If the unit is equipped with dual flame rods (SN-03), timer (T1-11) is energized. After the timer's set point is exceeded, the flame sensing is switched from SN-02 to SN-03 (SN-03 is located at the opposite end of the burner) for continual flame monitoring during unit operation.*

The temperature control system's amplifier (AM-01) receives two signals, one from the discharge sensor and one from the remote panel. The remote panel sends a signal based either on the set point from the remote panel or from the room thermostat (TS-11). The amplifier continually compares the signals from the remote panel and discharge sensor and when heat is required the amplifier will send a DC voltage to the modulating valve (VA-05). As the DC voltage from the amplifier increases, the modulating valve will open, allowing more gas to flow. If the room thermostat is not satisfied, a high fire signal overrides the remote panel set point forcing the unit into high fire until the space temperature thermostat is satisfied.

## **Additional Sequence of Operation for VAV units**

### **VAV with Static Pressure Control**

The VFD will be energized in place of the blower motor starter contactor (ST-01) listed above.

The photohelic, used to monitor the indoor air pressure, sends a signal to the VFD proving that the indoor pressure is either satisfied, positive, or negative. Based on this signal, the VFD alters the HZ to the blower and sends an output signal to the VAV damper motor (MT-08), which is used to control the pressure drop across the burner for the entire airflow range. Depending on the signal from the photohelic, the VFD will do the following:

- If the space is satisfied, the VFD will maintain current operation

- If the space is negative, the VFD will ramp up to rebuild the pressure in the space
- If the space is positive, the VFD will modulate down to reduce the pressure in the space

The high airflow switch (PS-10) is energized at the same time the low airflow switch (PS-01) is energized above. The high airflow switch will ensure that the pressure drop across the burner does not exceed 0.65" w.c.

The flame limiting potentiometer (PO-02) is energized with the modulating gas valve (VA-05) listed in the sequence above. The flame limiting potentiometer limits the voltage to the modulating gas valve to prevent over-firing in low speed.

### **VAV with Manual Potentiometer**

The VFD will be energized in place of the blower motor starter contactor (ST-01) listed above.

The manual potentiometer alters the speed of the VFD. The VFD controls the HZ to the blower and sends an output signal to the VAV damper motor (MT-08), which is used to control the pressure drop across the burner for the entire airflow range.

The high airflow switch (PS-10) is energized at the same time the low airflow switch (PS-01) is energized above. The high airflow switch will ensure that the pressure drop across the burner does not exceed 0.65" w.c.

The flame limiting potentiometer (PO-02) is energized with the modulating gas valve (VA-05) listed in the sequence above. The flame limiting potentiometer limits the voltage to the modulating gas valve to prevent over-firing in low speed.

### **VAV with Constant Speed Control or Analog Input Control**

The VFD will be energized in place of the blower motor starter contactor (ST-01) listed above.

The VFD can operate by either an analog input or preset speeds.

If analog input is required, an analog input signal is sent to the VFD by an external source, which will directly control the signal to the blower and VAV damper motor (MT-08). The VAV damper motor is used to control the pressure drop across the burner for the entire airflow range.

If preset speeds are required, an external switch can be used to manually adjust between programmed speeds in the VFD. The VFD will send a signal to the blower and VAV damper motor (MT-08) based on the selected speed. The VAV damper motor is used to control the pressure drop across the burner for the entire airflow range.

The high airflow switch (PS-10) is energized at the same time the low airflow switch (PS-01) is energized above. The high airflow switch will ensure that the pressure drop across the burner does not exceed 0.65" w.c.

The flame limiting potentiometer (PO-02) is energized with the modulating gas valve (VA-05) listed in the sequence above. The flame limiting potentiometer limits the voltage to the modulating gas valve to prevent over-firing in low speed.

