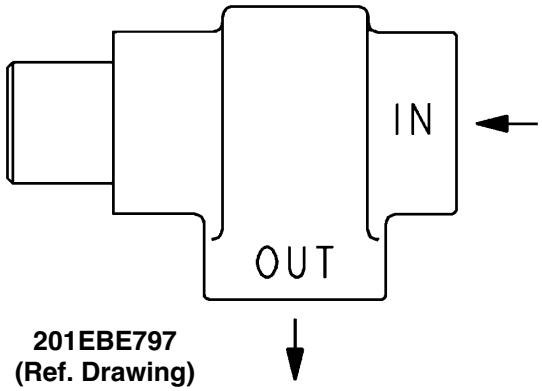


FIGURE 4–3 – MINIMUM PRESSURE/CHECK VALVE

See description under “Air Control Components,” below, for construction and operation information.

INSTRUMENTS – All units incorporate the following instruments and indicators:

Oil Sight Gauges (FIGURE 1–3, page 3) – These gauges indicate the level of the oil in the reservoir. See Section 5, page 26, “Lubrication, Oil Cooler, Oil Filter and Separator”, for information on how to correctly read these gauges. All other instruments are a part of the Auto–Sentry S controller. See “Air Control Components,” below.

AIR CONTROL COMPONENTS – All units incorporate the following air control components. See FIGURE 4–1, page 15, for schematic tubing diagram.

Inlet Valve (FIGURE 4–2, page 16) – The inlet valve is a pilot–actuated valve that restricts the inlet to control capacity and closes to unload the compressor. At shutdown the inlet valve closes to function as a check valve and prevent backflow of air.

As control pressure is increased the valve will begin to close, restricting the inlet and reducing compressor capacity. Approximately 18 psig (1.2 Bar) of control pressure is required to close the inlet valve completely. When closed, the inlet valve prevents the flow of air in either direction. With optional modulating control feature: when the control pressure is less than 18 psig (1.2 Bar), the inlet valve will modulate to match compressor capacity to system demand.

Blowdown Valve (FIGURE 4–2, page 16) – The blowdown valve is a two–way solenoid valve that is piped into the oil separator outlet, but ahead of the check valve. When the solenoid is de–energized, the blowdown valve opens, and the oil system is blown down. When the solenoid is energized, the blowdown valve closes, and allows the oil system to pressurize.

Minimum Pressure/Check Valve (FIGURE 4–3) – An internal spring–loaded minimum pressure valve is used in the final discharge line to provide a positive pressure on the oil system even when the air service valve is fully open. The valve senses upstream pressure. If demand for air exceeds the compressor capacity, the valve throttles the flow to maintain a minimum pressure on the upstream (oil reservoir) side of the valve. When pressure rises above the minimum pressure (standard setting 60 to 65 PSIG, 4.1 to 4.5 Bar) the valve reaches the full open position.

A check valve incorporated in the minimum pressure valve prevents backflow of air from the shop air line when the unit stops, unloads or is shut down.

The valve does not require maintenance or adjustment. If the valve fails to function, it must be replaced because it is not field adjustable or field repairable.

⚠ DANGER

Air/oil under pressure will cause severe personal injury or death. Shut down compressor, relieve system of all pressure, disconnect, tag and lockout power supply to the starter before removing valves, caps, plugs, fittings, bolts, and filters.

STARTER/CONTROL BOX (FIGURE 1–3, page 3) – The following control components are located on the combination starter/control box.

Hourmeter – A continuous reading (nonreset) type hourmeter displays the accumulated operating time of the unit and provides a convenient means for scheduling changes of oil and servicing of filters, separators and other devices.

Auto–Sentry S Controller With Keypad – Monitors and controls compressor operation.

Emergency Stop Pushbutton – Removes power from the microprocessor controller outputs to provide a positive means of stopping the unit in an emergency situation.

CONTROL SYSTEM OPERATION – See FIGURE 4–9, page 23. The following are operations of the Auto–Sentry S Controller.

“STOP/RESET” Button With LED – This button is used to stop the compressor under ordinary conditions. It is also used to extinguish any fault LED’s that are illuminated. In addition, it is used in the procedure to adjust operating pressure. See “Programming the Load–Unload Pressure Setpoints,” page 19. The LED is illuminated whenever the unit is stopped for any reason EXCEPT a normal stop in one of the “AUTO” modes. A flashing LED indicates that a reset is required.

⚠ CAUTION

Damage will occur to the machine if it is repeatedly restarted after any one of the shutdown modes stops operation of the unit. Find and correct the malfunction before resuming operation.

"CONSTANT RUN" Button With LED – This button is used to operate the unit in the constant run mode. In this mode, the compressor runs continuously, loading and unloading in response to air demand. It will continue to run until stopped, either manually or by a protective shutdown. The LED is illuminated at all times while running in this mode.

"AUTO LEAD" Button With LED – This button is used to operate the unit in "Auto–Start–Timed–Stop" mode, either by itself, or as the lead compressor in a Lead/Lag arrangement. Loading and unloading occurs as in the "CONSTANT RUN" mode, however, if the compressor runs unloaded for a period of 10 minutes, the unit is stopped. At this point, the compressor remains in the "AUTO LEAD" mode and will restart when the system pressure reaches the 'load' setpoint programmed into the controller. The LED will remain illuminated throughout the cycle.

⚠ WARNING

Automatic restarting or electrical shock can cause injury or death. Open, tag and lockout main disconnect and any other circuits before servicing the unit.

"AUTO LAG" Button With LED – This button is used to select the 'lag' unit in a lead–lag arrangement. Operation is identical to "AUTO LEAD" except that the start–load and unload setpoints are automatically 5 PSI (.3 Bar) lower than programmed.

NOTICE

Any mode may be selected at any time without stopping the compressor.

"HIGH AIR TEMPERATURE" LED – This LED is used to indicate an over temperature condition at either the compressor or oil separator discharge. At the time of a high temperature shutdown, the LED is illuminated and the temperature digital readout is locked on to the offending temperature. Illumination of the decimal point in the lower right hand corner of the digital readout indicates that the temperature displayed is at the oil separator. A non–illuminated decimal point indicates compressor discharge. Pressing "STOP/RESET" will extinguish the LED (if the temperature has lowered below 225° F, 107° C) and revert the digital readout to displaying actual discharge temperature.

"MOTOR OVERLOAD" LED – This LED indicates that one of the motor overload relays has tripped. The overload relay itself must be reset before pressing "STOP/RESET" will extinguish the LED.

"CHANGE SEPARATOR" LED – This LED flashes when the differential pressure across the oil separator reaches approximately 8 PSI (.6 Bar). At this point, schedule the separator element for service at the earliest opportunity. (See Section 5, page 31, for separator maintenance.)

Should the condition be ignored and allowed to further deteriorate, the compressor will be shutdown and the LED illuminated steadily when the differential pressure reaches 15 PSI (1.0 Bar).

⚠ CAUTION

Machine damage will occur if compressor is repeatedly restarted after any one of the shutdown modes stops operation of the unit. Find and correct the malfunction before resuming operation.

"CHANGE AIR FILTER" LED – This LED is used to signal when the air filter requires servicing or changing. It is a reminder only and will not stop or impede the operation of the unit. Operating the compressor with the LED illuminated risks collapse of the filter and ingestion into the compressor.

⚠ CAUTION

Machine damage can occur with extended operation after "Change Air Filter" LED illuminates. Service air filter as soon as possible.

Pressure And Temperature Digital Readouts – These readouts normally indicate pressure at the minimum pressure check valve and temperature at the air end discharge. See "High Air Temperature LED", page 18, for a description of readout action during a high temperature condition.

Alternately, these readouts can be selected to display oil reservoir pressure and separator air temperature. To obtain such display while the compressor is running, simply press the operating mode button that corresponds to the current operating mode of the unit. (For Example: If the unit is operating in "AUTO LEAD" mode, press the "AUTO LEAD" button.) This will cause the readout to display the alternate parameters. This alternate display mode is indicated by illuminated decimal points in the lower right hand corner of each display. After releasing the button, the display will revert to its normal mode in 5 seconds.

The digital readouts are also used to display error messages. These error messages correspond to various indications concerning condition of pressure and temperature sensors and EMERGENCY STOP condition.

DEFINITIONS OF ERROR MESSAGES – Refer to the chart in FIGURE 4–4 below for definitions. An error message will stop the compressor, if running, and prevent it from restarting. The failed sensor must be replaced to clear the error.

Any condition requiring the control panel to be reset will be indicated by a flashing "STOP/RESET" LED. If all readouts and LED's are flashing, a power interruption has occurred, requiring the control panel to be reset.

Programming The Load–Unload Pressure Setpoints – Programming of the Load and Unload Pressure setpoints can only be accomplished with the unit not running.

Step 1: Stop the compressor and remove all power from the unit by opening main disconnect.

⚠ WARNING

Electrical shock can cause injury or death. Open main disconnect, tag and lockout power supply to the starter and any other circuits before working inside the control box.

Step 2: Turn the "Setup" switch located on the controller circuit board (inner side of control box panel) to the "+" position. Close the control box panel and restore power.

NOTICE

This switch is provided to prevent unauthorized programming of the setpoints. If this level of security is not required, the "Setup" switch can be left in the "+" position, eliminating Steps 1 and 2.

Step 3: With the unit already in the STOP/RESET condition, press the "STOP/RESET" button a second time. This puts the controller in program mode. The displays will read as follows:

Pressure: the current unload setpoint (adj. 58–175 psig, 4.0 to 12.1 Bar)

Temperature:  indicates that the pressure value is the "unload" value.

Pressure Readout		Temperature Readout	
Error #	**Meaning**	**Error #**	**Meaning**
E01	Failure of Final Discharge Pressure Sensor	E01	Failure of Compressor Temperature Sensor
E02	Failure of Oil Sump Pressure Sensor	E02	Failure of Separator Temperature Sensor
E03	Failure of Both Pressure Sensors	E03	Failure of Both Temperature Sensors
E04	EMERGENCY STOP		

FIGURE 4–4 – DEFINITION OF ERROR MESSAGES

Step 4: Press the “AUTO LEAD” button to raise the unload setpoint. Press “AUTO LAG” to lower the unload setpoint. See FIGURE 4–8, page 23.

⚠ WARNING

Operation at excessive discharge air pressure can cause personal injury or damage to equipment. Do not set unload pressure above the maximum stamped on the unit nameplate.

Step 5: When the desired unload setpoint is displayed in the pressure readout, press the “STOP/RESET” button. This will enter the desired unload setpoint and advance the programming function to the load setpoint. The displays will now read:

Pressure: the current load setpoint (adj. 50–167 psig, 3.4 to 11.5 Bars)

Temperature:  indicates that the pressure value is the “load” value.

Step 6: Raise or lower the load setpoint in the same manner as the unload setpoint in Step 4.

NOTICE

The load setpoint cannot be set within 8 PSI (.6 Bar) of the unload setpoint. See FIGURE 4–8, page 23.

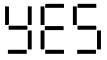
Step 7: When the desired load setpoint is displayed in the pressure readout, press the “STOP/RESET” button, entering the new load setpoint and completing the programming.

Step 8: The display now indicates: 

At this time, compressor rotation may be checked by pressing any of the three operating mode buttons. The correct rotation is clockwise when facing compressor sheave. The starter will be momentarily energized giving a slight rotation that is short enough in duration to prevent reverse oil flow in the event that rotation is reversed. Press “Stop/Reset” to exit jog mode.

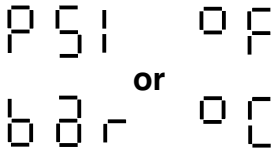
Step 9: The displays will now read:

Pressure 

Temperature  or 

If this compressor is equipped with the expansion board for the remote control option this must be set to “yes”. The standard setting is “no”. This value is toggled by pressing any mode switch. Press the “Stop/Reset” button to continue to the next step.

Step 10: The display now indicates either



Pressing any mode key will toggle the display from one set of units to the other. PSI/°F causes the controller to display pressures in pounds per square inch and temperatures in degrees Fahrenheit. bar/°C causes the controller to display parameters in bars and degrees Centigrade. Press “Stop/Reset” when the desired units are visible in the display to continue.

Step 11: When display shows dashes (—— ——): (The Following steps may be skipped by waiting until the display resumes its normal numbers.)

a) Press “Stop–Reset” – the pressure display now shows the current “zero” pressure for the final discharge transducer in the left window, and “P1” in the right window.

b) Press “Stop–Reset” again – this will zero the circuit board on the final discharge pressure transducer and move the display to the next step. The left window will read the current “zero” pressure for the oil reservoir transducer and the right window will now read “P2.”

c) Press “Stop–Reset” again – this will zero the circuit board on the oil reservoir pressure transducer and move the display program back to the normal setup mode. The display should read “0” pressure in the left window, and —— current sump temperature in the right window.

Step 12: Stop the compressor and disconnect, tag and lockout the power supply to the starter.

Step 13: Move the circuit board slide switch back to the “set” position (right). You may now proceed with normal start up procedure.

NOTICE

A. To readjust, the slide switch must be in the “+” position.

B. If procedure is repeated, the transducer zero operation may be bypassed by not pressing “Stop–Reset” while the dashes (—— ——) are displayed.

C. Transducer must be zeroed only while at zero “0” pressure, or invalid shutdowns may occur.

LEAD–LAG OPERATION OF TWO COMPRESSORS – The Auto–Sentry S controller provides the capability of true lead–lag operation without the need to purchase any additional equipment and without complicated interconnecting wiring.

Follow these steps to operate two compressors in a lead–lag arrangement:

Step 1: Program load and unload pressure setpoint on both units to the same value. For example: Compressor “A” load at 92 PSI (6.3 Bars); unload at 100 PSI (6.9 Bars). Compressor “B” load at 92 PSI (6.3 Bars); unload at 100 PSI (6.9 Bars). See page 19, this section, for complete information on programming the setpoints.

⚠ WARNING

Operation at excessive discharge air pressure can cause personal injury or damage to equipment. Do not set unload pressure above the maximum stamped on the unit nameplate.

Step 2: Operate one compressor in the “Auto Lead” mode. This compressor will now be the “Lead” or “Base Load” compressor.

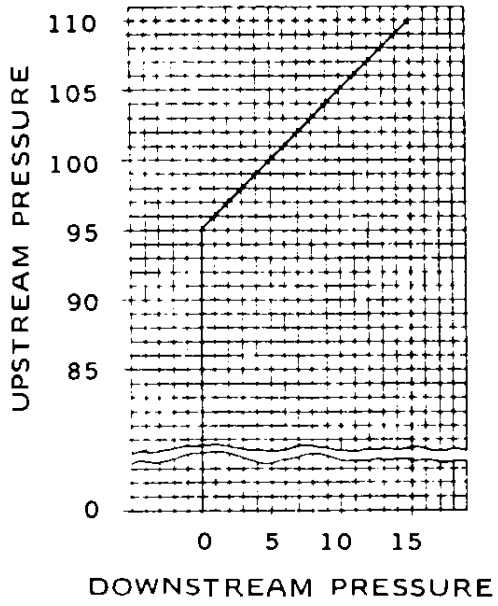


FIGURE 4–5 – PRESSURE CHART

Step 3: Operate the second compressor in the “Auto Lag” mode. This compressor will now be the “lag” or “trim” compressor. It will automatically be brought on line, if required, by a large air demand. After the demand is satisfied, the lag unit will unload, time out and stop, ready to start again when needed.

Step 4: Periodically reverse the roles of the units by changing each unit’s mode of operation from “Auto Lead” to “Auto Lag” and vice versa. By using the hourmeters on the control panel to schedule the mode changes, the operating hours can be kept as close as possible, equalizing machine wear and minimizing maintenance costs.

⚠ WARNING

Automatic restarting or electrical shock can cause injury or death. Open, tag and lockout main disconnect and any other circuits before servicing the unit.

Subtractive Pilot (Modulating Feature) – The subtractive pilot is an adjustable, spring–loaded diaphragm valve that controls pressure in relation to the upstream (discharge) pressure.

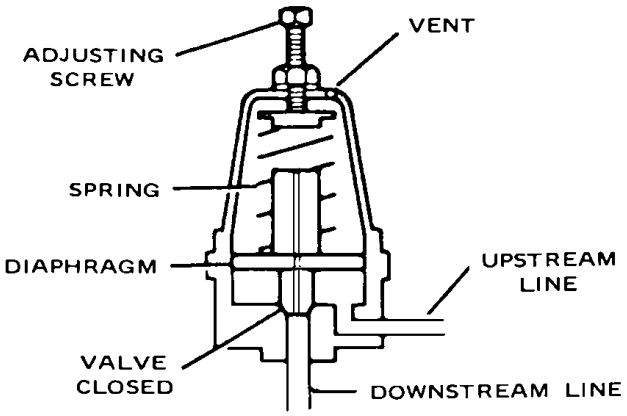


FIGURE 4–6 – SUBTRACTIVE PILOT (CLOSED)

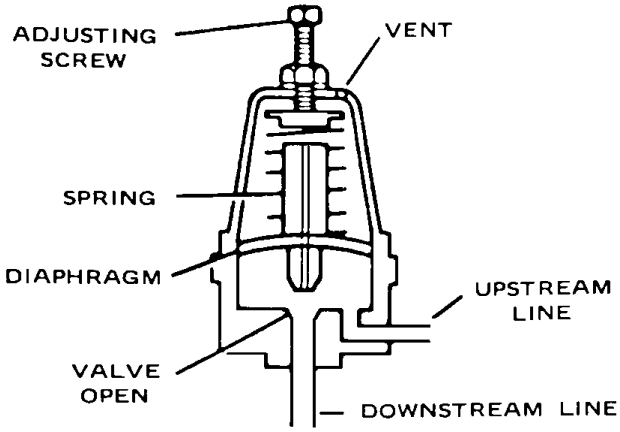


FIGURE 4–7 – SUBTRACTIVE PILOT (OPENED)

The downstream pressure is maintained equal to the upstream pressure minus a constant which is adjustable. In the example shown in FIGURE 4–5, page 21, the downstream pressure equals the upstream pressure minus 95 psi (6.6 Bars). When the upstream pressure rises to 100 psig (6.9 Bars), the downstream pressure rises to 5 psig (.3 Bar). This 1 to 1 psi (Bar) rise is constant above the set point.

Below the set point, the valve seat is closed and the downstream pressure is vented. In the example of FIGURE 4–5, page 21, downstream pressure is vented below 95 psig (6.6 Bars).

FIGURE 4–6, shows a schematic cross section of the subtractive pilot with the valve seat closed and downstream line vented.

FIGURE 4–7 shows the pilot with valve seat open, holding a downstream pressure which is adjustable with the screw. In this position it is normal for the valve to continually bleed air through the small vent hole in the bowl.

Moisture, oil and dirt in the control system lines and components can cause the set point of the subtractive pilot to shift or be erratic. The subtractive pilot can be disassembled and the diaphragm and ports cleaned when necessary.

Operating Air Pressure Adjustment – The Auto–Sentry S controller load and unload pressure setpoints should already be programmed. See page 19, and FIGURE 4–8, page 23.

⚠ WARNING

Operation at excessive discharge air pressure can cause personal injury or damage to equipment. Do not set unload pressure above the maximum stamped on the unit nameplate.

To adjust the subtractive pilot:

1. With the unit off, loosen the locknut and back out the adjusting screw several turns so the subtractive pilot will fully unload the compressor before the unload pressure setpoint of the microprocessor controller is reached.
2. Close the air service valve and start the unit in the “CONSTANT RUN” mode. Allow unit to reach the pressure at which the subtractive pilot fully unloads the compressor.
3. Turn–in the adjusting screw until the unload pressure setpoint is reached and the microprocessor controller allows the unit to blow down.
4. Turn–in the adjusting screw an additional one–eighth (1/8) turn and tighten the locknut. As a result, the subtractive pilot will not fully unload the compressor before the microprocessor controller’s unload pressure setpoint is reached.
5. Using the air service valve, cycle the unit between load and unload several times to be certain that the unit will reach the microprocessor controller’s unload pressure setpoint and blow down.

NAMEPLATE FULL LOAD OPERATING PRESSURE	CONTROL SYSTEM PRESSURE	
	LOAD	UNLOAD
100 PSI (6.9 Bars) 125 PSI (8.6 Bars) 150 PSI (10.4 Bars) 175 PSI (12.1) Bars)	100 PSI (6.9 Bars) 125 PSI (8.6 Bars) 150 PSI (10.4 Bars) 167 PSI (11.5 Bars)	108 PSI (7.5 Bars) 133 PSI (9.2 Bars) 158 PSI (10.9 Bars) 175 PSI (12.1 Bars)

NOTICE

Load setpoint cannot be set within 8 psi (.6 Bar) of the unload setpoint.

Minimum operating pressure is 60 to 65 PSIG (4.1 to 4.5 Bars).

FIGURE 4–8 – MAXIMUM SETPOINTS FOR AUTO SENTRY "S" CONTROLLER, PSIG

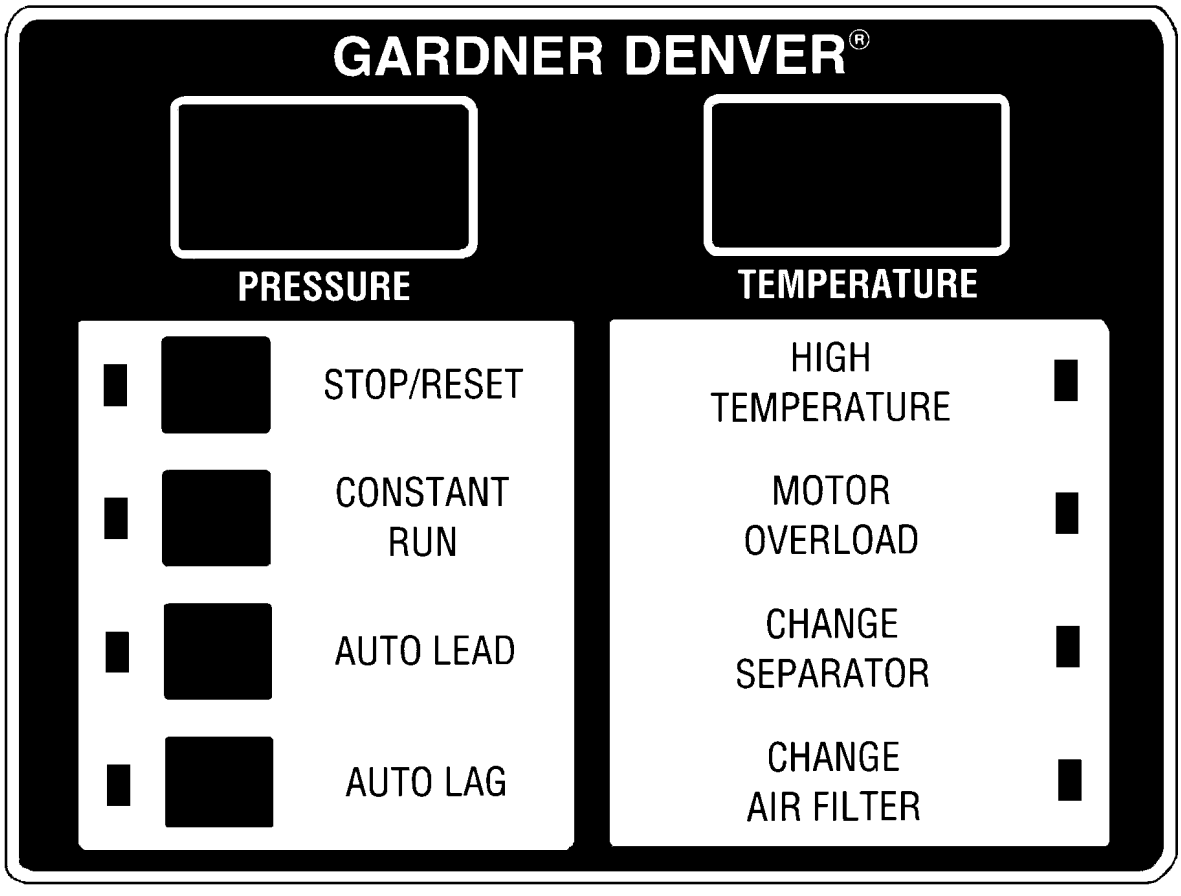
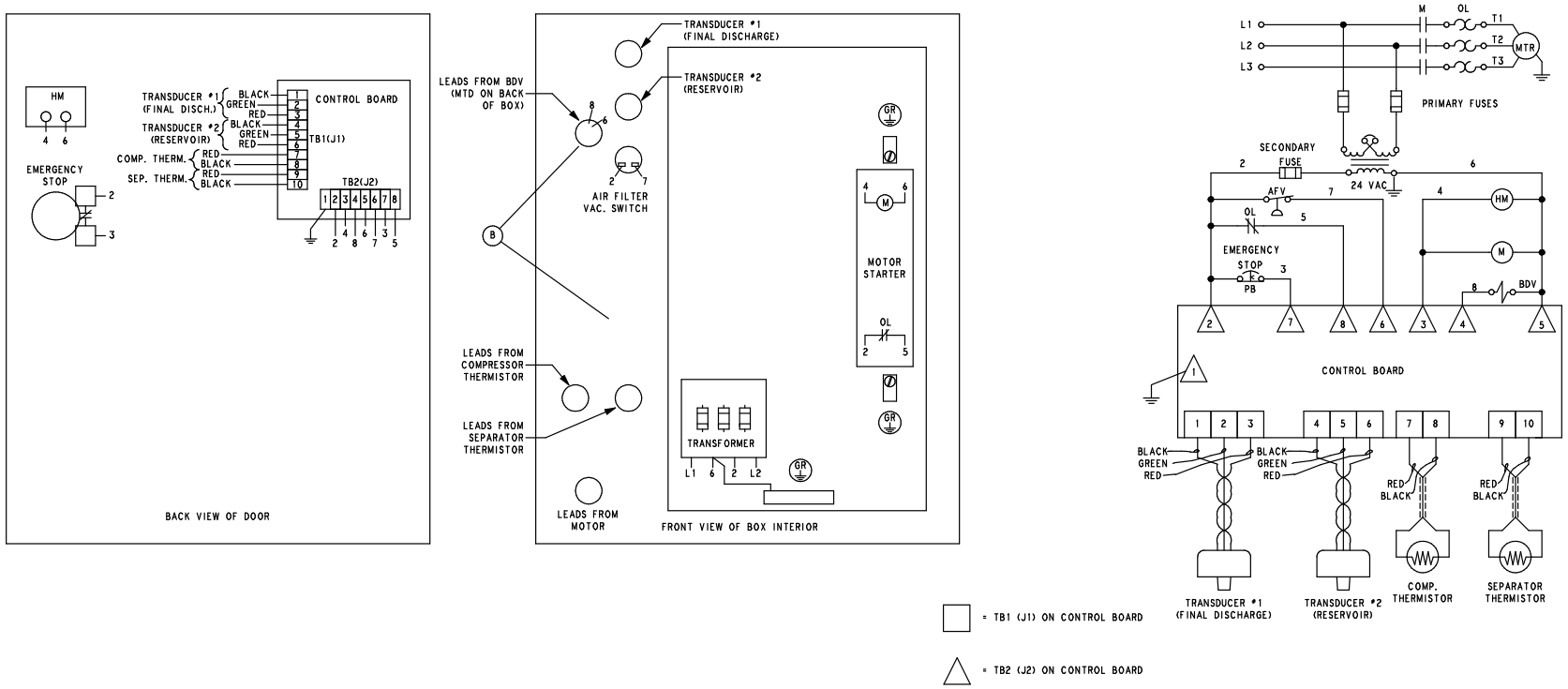
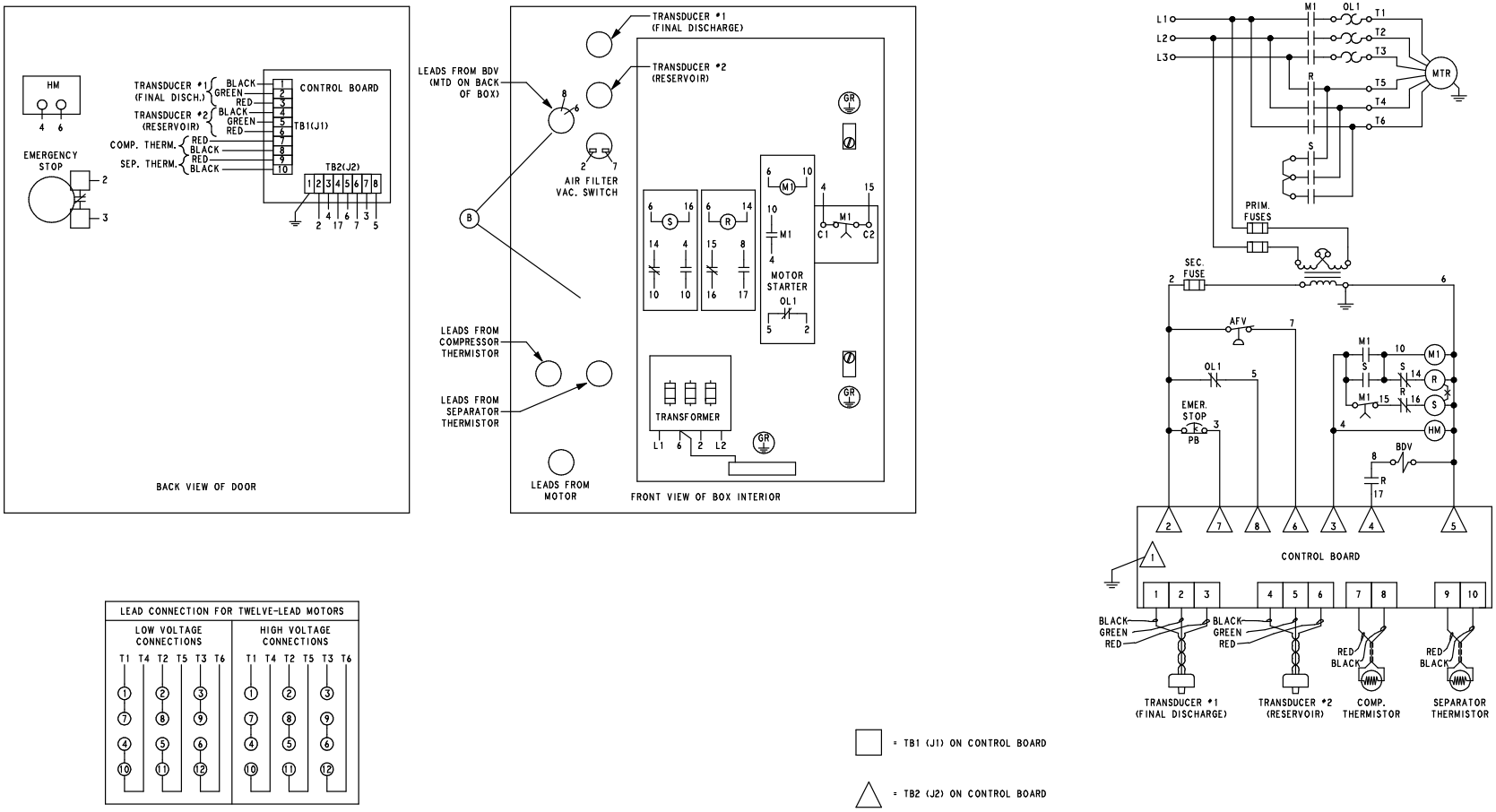


FIGURE 4–9 – AUTO SENTRY "S" SOLID STATE CONTROL TOUCH PAD



218EBE546
(Ref. Drawing)

FIGURE 4–10 – WIRING DIAGRAM – DUAL CONTROL



= TB1 (J1) ON CONTROL BOARD

= TB2 (J2) ON CONTROL BOARD

220EBE546
(Ref. Drawing)

FIGURE 4–11 – WIRING DIAGRAM – WYE DELTA