

## START-UP INSTRUCTIONS

### START-UP PROCEDURE

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After start-up, please complete and fax the S-Series Start Up Checklist to the Cambridge Customer Service Group. Receipt of a completed checklist will extend the start date for your warranty period to the date of the start-up but not to exceed six months from date of shipment.

#### IMPORTANT

*Read the following instructions carefully. Any unauthorized modifications to or deviations from these instructions will void the warranty.*

## VISUAL INSPECTION OF EQUIPMENT

1. Check for any physical damage from shipping or installation that could render the heater inoperable.
2. Verify that all heater accessories and filters (if applicable) have been properly installed.
3. Check for loose components (belts, plugs, screws, blower wheel lugs, etc.).
4. On units with external gas trains, verify that the distance from the last safety shut-off valve to the heater does not exceed four feet.
5. Verify that the field wiring, both primary and control, has been installed according to the Cambridge wiring diagram, National Electrical Code, and local electrical codes.
6. Verify that a sediment trap has been installed upstream of all gas controls.
7. Verify that the high pressure regulator, if applicable, has been vented to the outside.
8. Verify that the unions in the gas piping located at the burner and just external to the heater housing, are tight.

## ELECTRICAL SUPPLY VOLTAGE VERIFICATION

Check the electrical supply voltage at the disconnect switch.

#### IMPORTANT

*Do not proceed with start-up unless the supply voltage agrees with the nameplate voltage. If the supply voltage does not agree with the nameplate voltage, check with your local agent or Cambridge Engineering's Customer Service Group at 1-800-473-4569 to determine what changes are required.*

## GAS SUPPLY PRESSURE VERIFICATION

Check the gas supply pressure.

#### IMPORTANT

*Do not proceed with start-up unless the gas supply pressure agrees with nameplate pressure requirements. If the gas supply pressure is in excess of the maximum pressure indicated, a separate positive shut-off high pressure regulator must be added*

upstream of the heater's individual low pressure manual shut-off valve. If a high pressure regulator is needed and has not been installed, check with your local agent or Cambridge Engineering's Customer Service Group at 1-800-473-4569 to determine the size and capacity requirements.

**⚠WARNING:**

When disconnect switch is activated with enclosure open, live power is present. Only experienced technicians with knowledge and respect for live power should proceed beyond this point.

**BLOWER ROTATION CHECK**

1. Open the access door on the electrical control enclosure side and turn the disconnect switch to the "ON" position.
2. Turn the blower service switch to the "LOCAL" position. Blower motor will start after the motorized discharge damper opens. Then, turn the blower service switch to the "OFF" position and verify the blower is rotating clockwise from the control enclosure side.

**IMPORTANT**

On a three phase system, the rotation direction of the blower may be reversed by switching any two wires located on the downstream side of the service disconnect.

**IMPORTANT**

Indications of loose belts include barking or squealing when the blower starts. If these symptoms occur, please refer to the Belt Tensioning instructions (page 45).

**IMPORTANT**

The damper will remain in the open position as long as the blower service switch is not returned to the "REMOTE" position or the Low Temperature Cutout (LTC) function has not timed out.

**MOTOR AMP DRAW CHECK**

**IMPORTANT**

The heater access doors must be closed for this test.

1. Turn the blower service switch to the "LOCAL" position and let the motor warm up.

2. Check motor current at the overload on all three legs.
3. Turn the blower service switch to the "OFF" position.

**IMPORTANT**

The average amps must not exceed 103% of the Motor Nameplate FLA. High amperage may indicate excessive blower RPM.

**BURNER MANIFOLD PRESSURE ADJUSTMENT**

1. Turn the disconnect switch to the "OFF" position.
2. For EDL, EDR, EDSM, and EDSM/TP control systems, remove the wire from terminal #3 on the amplifier (see Figure 1). This will drive the modulating valve to full open.

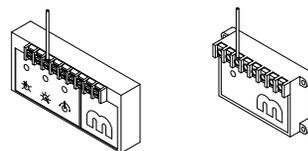


Figure 1

4. Remove the 1/8" plug from the manual shut-off valve located just prior to the burner, and connect a manometer for the purpose of measuring the manifold pressure.
5. Refer to the heater nameplate for the Manifold Differential Pressure (MDP) and record in step 8.
6. Turn the disconnect switch to the "ON" position.
7. Turn the blower service switch to the "LOCAL" position. The blower motor will start. Observe the pressure reading on the manometer and record in step 8. (Note whether the reading is positive or negative.)
8. Using the formula below, determine the required manifold pressure reading for the manometer.

Nameplate MDP	_____ " WC
Manifold Static Pressure (Blower Only)	+ _____ " WC
Manifold Pressure Reading =	_____ " WC

### IMPORTANT

*A negative manifold static (blower only) will cause the manifold pressure reading to be lower than the nameplate manifold differential pressure.*

### IMPORTANT

*The high limit may trip on warm or mild temperature days. A jumper may be necessary to complete the control regulator pressure adjustment.*

9. Turn the burner service switch to the “LOCAL” position. After a delay for prepurge and igniter warm-up, the burner will light. Allow 15 seconds for the low fire start to time out.
10. Observe the manometer reading and compare to the manifold pressure determined above. If the manifold pressure reading does not equal this value, adjust the control regulator until the proper manifold pressure is obtained.
11. Turn the blower and burner service switches to the “OFF” position.
12. Reconnect the wire to terminal #3 on the amplifier.
13. When performing a start-up proceed to the next step, otherwise perform Final Heater Preparation (page 29).

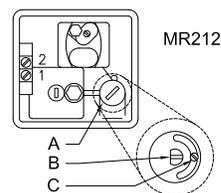
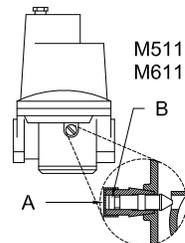
## MINIMUM FIRE ADJUSTMENT PROCEDURE

The minimum fire setting is preset at the factory at approximately 20°F rise. This minimum fire setting is not critical in space heating applications where the heater is cycled in response to the space temperature sensed by an operating thermostat. In this case, the heater should operate at the maximum discharge temperature, far from the minimum fire setpoint.

### IMPORTANT

*If a temperature rise of less than 15°F is desired, a DC microammeter is required to monitor flame signal during the adjustment procedure. Ensure the flame current remains steady and of sufficient strength to maintain burner operation for both consistent ignition at minimum fire and locking in the flame safeguard relay. Do not allow the flame signal to drop below 2.0 microamps DC.*

1. Turn the blower service switch to the “LOCAL” position and monitor the discharge temperature.
2. On EDL, EDR and EDSM applications, remove the wire from terminal #8 on the amplifier. This will cause the burner to light on low fire and then fall to minimum fire.
3. Turn the burner service switch to the “LOCAL” position. After a delay for prepurge and igniter warm-up, the burner will light. Allow 15 seconds for the low fire start to time out.
4. Monitor the discharge temperature. Subtract the temperature from step 1 above from this reading to determine the temperature rise. If the minimum fire does not require adjustment, proceed to step 8.
5. **On the MR212 modulating/regulating valve**, remove the housing cover and loosen the lock screw (C).
6. Remove the cap (A) exposing the minimum fire adjusting screw. Turn the adjusting screw (B) to obtain the desired minimum fire setting.



7. Replace the cap (A).

**On the MR212 modulating/regulating valve**, tighten the lock screw (C) and replace the housing cover.

8. Turn blower and burner service switches to the “OFF” position.
9. Reconnect the wire to terminal #8 on the amplifier.

10. When performing a start-up proceed to the next step, otherwise perform Final Heater Preparation (page 29).

## CALIBRATION CHECK

The discharge temperature control system has been calibrated at the factory to the specified airflow, static pressure, and temperature rise. The actual operating conditions may require minor adjustments to the control settings to ensure the heater functions within the operating parameters of its listing.

1. Remove the cover of the Discharge Air Temperature Sampling Box. Refer to the Heater Configuration (page 4) for the Discharge Air Temperature Box location, and the Individual Component Description Section (page 67) for additional information. Install a thermocouple in the grommet inside the Discharge Air Temperature Sampling Box, and then reinstall the cover. Route the thermocouple wire to a meter located outside of the unit.
2. **On EDL control systems**, the discharge temperature should match the temperature shown on the dial located on the amplifier. The dial should be set to 160°F.

**On EDSM and EDSM/TP control systems**, the discharge temperature should match the temperature shown on the MAX dial on the amplifier when the Space Temperature Selector (STS) is set to its highest setting. If the space temperature is warm, a test resistance of  $7,500 \pm 250 \Omega$  should be connected in the circuit in place of the STS. The MAX dial on the amplifier should be set to 160°F.

**On EDR control systems**, jumper terminals 20 and 22 and turn the dial on the RHA to its highest setting to utilize the full temperature range of the control system. On heaters with a single temperature selection dial on the face of the control (Maxitrol part number TD114), set the dial to 90°F and verify that the override temperature selector dial, which is visible from the top of the control, is set at 40°F. The combination of these two settings should control the discharge temperature to 130°F. On heaters with dual temperature selection dials on the face of the control, set the Space Heat dial to 160°F.

## IMPORTANT

*The heater access doors must be closed for the remaining portion of this test.*

3. Turn the burner service switch to the “LOCAL” position. After a delay for prepurge and igniter warm-up, the burner will light. Allow 15 seconds for the low fire start to time out.
4. Monitor the discharge temperature until it stabilizes. Do not rush through this step.
5. The discharge temperature should be  $130 \pm 3^\circ\text{F}$  for heaters setup for 130°F, or  $160 +0/-5^\circ\text{F}$  for heaters setup for 160°F. If the discharge temperature complies with this requirement, no calibration is required. If the discharge temperature does not equal the expected value, proceed to Calibration Procedures (page 29).
6. Remove any jumpers that were installed previously.
7. When performing a start-up proceed to the next step, otherwise perform Final Heater Preparation (page 29).

## GAS TRAIN LEAK CHECK

1. For EDL, EDR, EDSM, and EDSM/TP control systems, remove the wire from terminal #3 on the amplifier. This will drive the modulating valve to full open.
2. Turn the blower service switch to the “LOCAL” position. Blower motor will start after the motorized discharge damper opens.

## IMPORTANT

*The high limit may trip on warm or mild temperature days. A jumper may be necessary to complete the control regulator pressure adjustment.*

3. Turn the burner service switch to the “LOCAL” position. After a delay for prepurge and igniter warm-up, the burner will light. Allow 15 seconds for the low fire start to time out.
4. With the burner operating, spray the complete gas train with leak detector solution, checking all pipe connections and plugs.

## **⚠WARNING:**

Any gas leak detected must be repaired before unit is placed into service.

5. Turn the blower and burner service switches to the “OFF” position.
6. Reconnect the wire to terminal #3 on the amplifier
7. When performing a start-up proceed to the next step, otherwise perform Final Heater Preparation (page 29).

## **GAS VALVE LEAK CHECK**

All heaters should be evaluated for the gas tightness of the gas valve seat. Heaters rated over 400,000 Btu/hr are equipped with a leak test facility to assist in checking this seal. A momentary switch and a gas port for measuring pressure between the valves are provided for leak testing. Refer to the Individual Component Description Section for more information regarding the leak test switch.

1. Connect a 0-10" WC manometer to the 1/8" NPT fitting on the manual shut-off valve located just prior to the burner and verify the manometer is properly zeroed.
2. **On single redundant valve applications** (heaters rated less than 400,000 Btu/hr), close the manual burner shut-off valve and wait 30 seconds to read the manometer. If the reading is greater than 0" WC, replace the gas valve and retest. If the reading is 0" WC, remove the manometer and reinstall the pipe plug.

**On separate redundant valve applications**, close the manual burner shut-off valve, hold the momentary leak test switch in the closed position and wait 30 seconds to read the manometer. If the reading is greater than 0" WC, refer to the Maintenance Instruction Section for information on Gas Valve Cleaning for the second gas valve (SSV) and retest. If the reading is 0" WC, remove the manometer and reinstall the pipe plug.

To check the gas tightness of the first valve in the gas train, connect the manometer to the leak test port between the valves and wait 30 seconds to

read the manometer. If the reading is greater than 0" WC, refer to the Maintenance Instruction Section for information on Gas Valve Cleaning for the first gas valve and retest. If the reading is 0" WC, remove the manometer and reinstall the pipe plug.

3. When performing a start-up proceed to the next step, otherwise perform Final Heater Preparation (page 29).

## **REMOTE CONTROL STATION CHECK**

1. Turn the mode selector switch on the remote control station to the “OFF” position
2. If the ambient temperature is at or above the Entering Air Thermostat (EAT) setpoint, note the setpoint position. Pull the jumper off the temperature setpoint (Normal Mode) and reinstall it sideways on the terminal block (Bypass Mode) as shown in Figure 1. Refer to the Individual Component Description section for additional information.

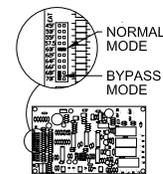


Figure 1

3. Turn the blower and burner service switches to the “REMOTE” position.
4. Turn the mode selector switch to the “HEATING” position.
5. Set the operating thermostat, if applicable, to its highest setting or activate that part of the control system which will initiate blower and burner operation

**For Remote Control Station - Security (RCS-S)**, refer to the Operating Instructions for the Operating Electronic Thermostat (OET) (page 33).

**For Temperature Setback System (TSS)**, refer to the Operating and Programming Instructions for the TSS Controller (page 35).

If another interlock device controls the operation of the heater, activate this device.

6. After the motorized discharge damper opens, the blower motor will start.
7. After a delay for prepurge and igniter warmup, the burner will ignite.
8. Adjust the temperature control system and verify the heater output changes correspondingly.

**For EDSM**, adjust the Space Temperature Selector.

**For EDR**, adjust the Remote Heat Adjust.

9. Reset the operating thermostat, if applicable, and the temperature control system, if applicable, to the desired temperature. If the Entering Air Thermostat was adjusted, reset to its previous setting.
10. Turn the mode selector switch to the “SUMMER VENTILATION” position. Verify the blower operates. In TSS applications, the override timer may need to be activated to initiate operation.

## FINAL HEATER PREPARATION

1. Reset the jumper for the EAT on the multi-functional PC board to the desired setpoint.
2. Remove jumper wire from the high limit, if one was used.

### **⚠ WARNING:**

All safety controls must be returned to normal operating conditions.

3. Ensure the discharge temperature setting(s) comply(ies) with the application specifications.
4. If inlet ducting is utilized, determine the time required to purge it with four (4) air changes and select a prepurge time that will accommodate this time. Refer to Individual Component Description for additional information on the multi-functional PC board.
5. Perform a visual inspection of all wiring and gas valve plugs to ensure they have been properly replaced.
6. Return the Technical Manual and the Wiring Diagram to the manual holder.

## IMPORTANT

*Turn the disconnect handle to the “OFF” position before closing the control enclosure door.*

7. Replace and fasten all covers and panels. Close the control enclosure and latch the door.
8. Turn the disconnect switch to the “ON” position.

## IMPORTANT

*If technical assistance is needed, call the Cambridge Customer Service Group at 1-800-473-4569 during the hours of 8:00 a.m. to 5:00 p.m. Central Time, Monday through Friday.*

## CALIBRATION PROCEDURES

### EDL CONTROL SYSTEMS (MAXITROL SERIES 14)

1. Turn the burner service switch to the “OFF” position and allow the Discharge Air Temperature Sampling Box time to cool.
2. Turn the blower service switch to the “OFF” position.
3. Open the unit access door on the control enclosure side.
4. Remove the access cover from the Discharge Air Temperature Sampling Box and remove the two mounting screws from the DTS. Refer to the Individual Component Description Section (pages 67-72) for additional information.
5. Carefully remove the DTS from the sampling box, turn it over and adjust the DTS calibration potentiometer shown in the drawing. To raise the discharge temperature, adjust the potentiometer 90° counterclockwise.



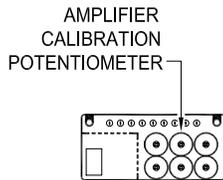
DTS CALIBRATION  
POTENTIOMETER

6. Carefully reinstall the DTS. Replace the Discharge Air Temperature Sampling Box cover, and close the unit access doors.

7. Turn the blower and burner service switches to the “LOCAL” position. After a delay for the prepurge and igniter warm-up, the burner will light.
8. Wait for the discharge temperature and manifold pressure to stabilize, and then return to step 3.b. Do not rush this step.
9. Repeat steps 2. through 4 until the manifold pressure and discharge temperature comply with the guidelines of the Calibration Check procedure step 5 (page 27).
10. Reinstall the amplifier that was removed in step 1.

### EDSM AND EDSM/TP CONTROL SYSTEMS (MAXITROL SERIES 44)

1. Remove the two mounting screws from the Maxitrol A1044 Amplifier located in the Electrical Control Enclosure. Refer to the Electrical Control Enclosure Isometric Drawing (page 56) for additional information.
2. Turn the amplifier over and adjust the amplifier calibration potentiometer shown in the drawing. To raise the discharge temperature, use a Phillips screwdriver to adjust the potentiometer counterclockwise. To lower the discharge temperature, adjust the potentiometer clockwise.



3. Wait for the discharge temperature and manifold pressure to stabilize after making adjustments. Do not rush this step.
4. In rare cases, the amplifier calibration potentiometer will reach its adjustment limit before the proper discharge temperature is achieved. If this occurs, the Discharge Temperature Sensor (DTS) will need to be adjusted:
  - a. Turn the burner service switch to the “OFF” position and allow the Discharge Air Temperature Sampling Box time to cool.
  - b. Turn the blower service switch to the “OFF” position.

- c. Open the unit access door on the control enclosure side.
- d. Remove the access cover from the Discharge Air Temperature Sampling Box and remove the two mounting screws from the DTS. Refer to the Individual Component Description Section (pages 67-72) for additional information.
- e. Carefully remove the DTS from the sampling box, turn it over and adjust the DTS calibration potentiometer shown in the drawing. To raise the discharge temperature, adjust the potentiometer 90° counterclockwise.



- f. Carefully reinstall the DTS. Replace the Discharge Air Temperature Sampling Box cover, and close the unit access doors.
- g. Turn the blower and burner service switches to the “LOCAL” position. After a delay for the prepurge and igniter warm-up, the burner will light.
- h. Wait for the discharge temperature and manifold pressure to stabilize, and then return to step 3.b. Do not rush this step.
- i. Repeat steps 2 through 4 until the manifold pressure and discharge temperature comply with the guidelines of the Calibration Check procedure step 5 (page 27).
- j. Reinstall the amplifier that was removed in step 1.

### EDR CONTROL SYSTEMS (MAXITROL SERIES 14)

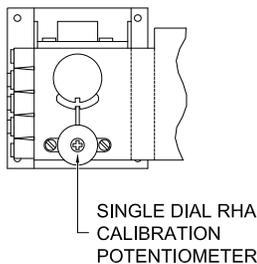
1. Turn the burner and blower service switches to the “OFF” position.
2. Label and then remove the wires from terminals 1 through 3 of the Remote Heat Adjustment (RHA) in the remote control station.
3. Remove the RHA from the remote control station. Take the RHA to the unit control enclosure. See

Individual Component Description (page 70) for RHA details, and Heater Configuration (page 4) for control enclosure location.

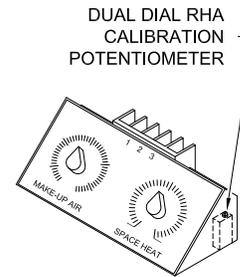
4. Remove the wires from terminals 21 and 22 of the right-hand side of Terminal Block #1 in the unit control enclosure. Connect these wires to terminals 1 and 3 of the RHA.
5. Place a jumper between terminals 2 and 3 of the RHA.
6. **For the single dial RHA**, the jumper activates the 0 to 40°F override dial. Verify the override temperature selector dial is set to 40°. Verify the dial on the face of the RHA is set to 90° to obtain a set-point of 130°.

**For the dual dial RHA**, the jumper activates the Space Heat selector dial. Verify the Space Heat dial is set to 160°.

7. Turn the blower and burner service switches to the “LOCAL” position. After a delay for the prepurge and igniter warm-up, the burner will light.
8. Wait for the discharge temperature and manifold pressure to stabilize. Do not rush this step. Allow 15 seconds for the low fire start to time out.
9. **For the single dial RHA**, adjust the calibration potentiometer shown in the drawing. To raise the discharge temperature, adjust the potentiometer clockwise. To lower the discharge temperature, adjust the potentiometer counterclockwise.



**For the dual dial RHA**, adjust the calibration potentiometer shown in the drawing. To raise the discharge temperature, adjust the potentiometer clockwise. To lower the discharge temperature, adjust the potentiometer counterclockwise.



10. Allow the discharge temperature and manifold pressure to stabilize between adjustments until the manifold pressure and discharge temperature comply with the guidelines of the Calibration Check procedure step 5 (page 27).
11. Turn the burner and blower service switches to the “OFF” position. Remove the wires from terminals 1 and 3 of the RHA that were connected in step 4. Reconnect the wires to terminal 21 and 22 of Terminal Block #1 in the unit control enclosure. Leave the jumper in place that was applied in step 5.
12. Return the RHA to the Remote Control Station. Reconnect the wires that were removed in step 2.
13. With the RHA reconnected in the Remote Control Station, repeat steps 7 through 10. A second technician and two-way communication may be required.
14. Turn the burner and blower service switches to the “OFF” position. Remove the jumper from terminals 2 and 3 of the RHA if one was added during step 5.