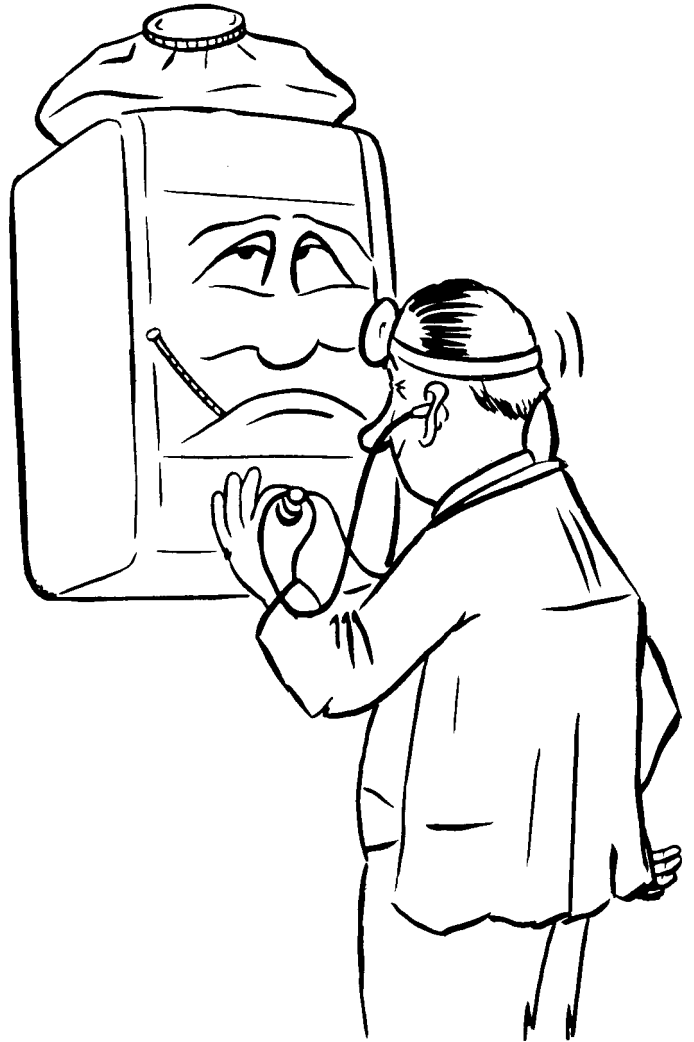


## SERVICE DIAGNOSIS

### Modine heating & ventilating equipment

#### A Problem/Remedy Guide for Modine:

- Gas-Fired Unit Heaters
- Gas-Fired Duct Furnaces
- Steam/Hot Water Unit Heaters
- Electric Unit Heaters
- Oil-Fired Unit Heaters
- Infra-Red Heaters



The Modine Service Diagnosis Guide was compiled as a trouble shooting guide intended to define the most common types of service problems found with heating equipment, the possible causes of these problems, and possible remedies. This trouble shooting guide, used in conjunction with the appropriate product Installation and Service Manual, should enable a serviceperson to identify, investigate and resolve most field service problems found with industrial/commercial unit heaters.

#### **Remember:**

When servicing any unit heater locate the rating plate and record the model number, power code number, control code number, and serial number shown. This information is required to identify components and date of manufacture.

If a service problem is encountered which can not be resolved with the use of this service guide, and the appropriate installation and service manual, further assistance can be obtained by contacting your local Modine factory representative.

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Problem	Possible Cause	Possible Remedy
<b>C. Pilot Flame is Not Normal</b> 1. Lazy yellow flame 2. Waving blue flame 3. Small blue flame 4. Flame being lifted off pilot burner 5. Hard sharp flame	1. Pilot orifice too large. 2. Excessive draft at pilot. 3. Low gas pressure. 4. Gas pressure too high. 5. Pilot orifice too small.	1. Check orifice size. 2. Either move or shield unit from draft. 3. Check gas pressure and adjust as per manufacturer's recommendations. 4. Check gas pressure and adjust as per manufacturer's recommendations. 5. Check orifice size.
<b>D. Burner Will Not Light or Stay Lit</b> <b>Gas-Fired Units and Infra-Red Heaters</b>	1. Electrical circuit in open position. 2. Main manual gas valve closed or inoperative. 3. Pilot extinguished. 4. Defective or incorrect wiring. 5. Pilot flame too low. 6. Inoperative or defective automatic controls. 7. Excessive draft blowing pilot away from thermocouple. 8. Loose or dirty thermocouple connections or defective thermocouple. 9. Defective or damaged burner. 10. Excessive primary air. 11. Carry-over ports on burner plugged. Lint or spider webs in venturi tubes or bugs or obstructions in main burner orifices. 12. Improper pilot location. 13. Mis-aligned burner. 14. Low gas pressure. 15. Unit Installed with pilot on low side of units mounted on an angle (infra-red only). 16. Low pilot gas pressure on milli-volt control system for infra-red unit.	1. Turn on power, turn up thermostat, or replace fuse(s) and reset disconnect switch. 2. Open valve or replace defective valve. 3. Relight pilot. 4. Check wiring and connections. If necessary rewire unit according to proper wiring diagram. 5. Adjust pilot per manufacturer's recommendations. 6. Check controls and replace if required. See "Control Failure," pages 6, 7, 8, 9. 7. Move or shield unit from draft. 8. Tighten or clean thermocouple connections. Replace defective thermocouple if necessary. 9. Replace burner. 10. Adjust primary air per manufacturer's recommendations. See Installation Manual. 11. Clean and replace if necessary. 12. Reposition pilot. 13. Align burner with main burner orifices. 14. Check gas pressure and adjust as per manufacturer's recommendations. 15. Reinstall unit with pilot on high side as per manufacturer's recommendations. 16. Check pilot gas pressure and adjust to recommended water column.

Problem	Possible Cause	Possible Remedy
<b>D. Burner Will Not Light or Stay Lit (continued)</b> <b>Oil-Fired Units</b>	1. Burner motor runs but no spark. 2. Primary control locked out on safety.  3. Defective cad cell. 4. Burner or fan motor out on overload.  5. Clogged nozzle. 6. Air leaks in suction line. 7. Faulty ignition.  8. High draft, too much air. 9. Improper oil pressure.	1. Check electrode spacing or replace ignition transformer. 2. Push reset button on primary control only if heat exchanger is cool. Try this only twice. See Control Service Instructions in Installation Manual. 3. Replace cad cell if necessary. Check continuity. 4. Check voltage, wiring and motor. Reset overload button on burner motor. Fan motor automatically resets. 5. Replace nozzle. Use only exact replacement. See Installation Manual for size and type. 6. Tighten all fittings. 7. a. Reset electrodes in burner assembly. Check insulators. b. Check wiring at primary control. c. Replace ignition transformer, if required. d. Check for proper contact between transformer springs and electrode bus bars. 8. Check draft regulator adjustment. Adjust combustion air openings on burner. 9. Adjust fuel pump using pressure gauge for proper setting.
<b>E. Burner Flame is Not Normal</b> <b>Gas-Fired Units</b>		
<b>1. Long yellow tipped flames.</b>	1a. Lack of combustion air in building. 1b. Insufficient primary air.  1c. Main burner orifices incorrectly sized. 1d. Clogged burner ports, damaged burner. 1e. Mis-aligned main burner orifice(s). 1f. Vent obstruction.	1a. Provide proper combustion air. 1b. Increase primary air by adjusting primary air shutters back, or adjusting burner manifold back. 1c. Check main burner orifice size against manufacturer's recommended sizes. 1d. Clean or replace burner if necessary. 1e. Re-align orifices with burner. 1f. Clean vent pipe.
<b>2. Flames lifting from burner.</b>	2a. Excessive gas pressure. 2b. Main burner orifices incorrectly sized. 2c. Defective regulator.	2a. Check gas pressure and adjust per manufacturer's recommendations. 2b. Check main burner orifices size against manufacturer's recommendations. 2c. Replace regulator.
<b>3. Flame unstable.</b>	3a. Excessive draft. 3b. Defective regulator.	3a. Move unit or shield unit so flames will not be affected by draft. 3b. Replace regulator.
<b>4. Flashback at extinction of burner flame.</b>	4a. Ports of burner too large. 4b. Excessive primary air.	4a. Repair or replace burner. 4b. Reduce primary air by moving primary air shutters forward, or adjusting burner manifold forward.
<b>5. Flashback on burner ignition.</b>	5. Excessive primary air.	5. Reduce primary air by moving primary air shutters forward.

<b>Problem</b>	<b>Possible Cause</b>	<b>Possible Remedy</b>
<b>E. Burner Flame is Not Normal (continued)</b> <b>Infra-Red Heaters</b> <b>1. Gas burning at orifice.</b>	1a. Loose screws holding ceramic mounting frames. 1b. Cracked ceramics. 1c. Loose or missing seal in ceramic mounting frames or under ceramics mounting frames. 1d. Warped burner or ceramic mounting frames.	1a. Tighten screws. 1b. Replace ceramics. 1c. Inspect and replace if necessary. 1d. Replace.
<b>2. Burner color appears dull red, not bright.</b>	2a. Low gas pressure. 2b. Mis-aligned main burner orifice. 2c. Incorrectly sized main burner orifice.	2a. Check gas pressure and adjust as per manufacturer's recommendations. 2b. Re-align burner orifice. 2c. Check main burner orifice size against manufacturer's recommended sizes.
<b>Oil-Fired Units</b>	1. Excessive combustion air. 2. Excessive draft. 3. Poor atomization of oil. 4. Uneven flame.	1. See start-up procedure in Installation Manual. 2. Adjust draft regulator. See Installation Manual. 3. Change nozzle with same type and capacity. 4. Change nozzle with same type and capacity.
<b>F. Burner Will Not Shut Off</b> <b>All Units</b>	1. Unit wired incorrectly. 2. Thermostat set too high. 3. Thermostat wire shorted. 4. Short circuit in wiring. 5. Thermostat out of calibration or defective.	1. Check wiring and rewire if necessary. 2. Reset thermostat. 3. Correct short. 4. Check wiring and correct. 5. Recalibrate or replace.
<b>Gas-Fired Units and Infra-Red Heaters</b>	1. Dirt under gas valve seat. 2. Ruptured gas valve.	1. Replace valve. 2. Turn off gas at manual valve. Check line pressure to gas controls and adjust per manufacturer's recommendation. Replace gas valve.
<b>G. Burner Shuts Off Too Soon</b> <b>All Units</b>	1. Thermostat out of calibration or defective. 2. Unit is cycling on overheat control. 3. Defective overheat control.	1. Recalibrate or replace thermostat. 2. See "Unit Cycles on Overheat," pages 16, 17. 3. Replace.
<b>H. Control Failure</b> <b>Gas-Fired Units</b> <b>Standing Pilot Systems</b> <b>1. Pilot Will Not Light or Stay Lit.</b>	1a. Defective thermocouple. 1b. Dirty thermocouple connections. 1c. Inoperative magnetic pilot valve operator. 1d. Gas valve turned to off position. 1e. Condensate in pilot line. 1f. Inoperative pressure sensing switch (power vented models only). aa. Defective switch. bb. Vacuum leaks at power venter housing connection. cc. Excessive static pressure in vent system.	1a. Check and replace if necessary. 1b. Clean. 1c. Replace. 1d. Turn to pilot position. 1e. Clean. aa. Replace switch. bb. Seal leaks. cc. Check venting for compliance with manufacturer's recommendations.

Problem	Possible Cause	Possible Remedy
<b>1. Pilot Will Not Light or Stay Lit (continued).</b>	dd. Unit over fired. ee. Negative pressure in building. ff. Blower drive not set correctly; blower running too slow.	dd. Adjust to proper input. ee. Correct building negative pressure conditions. ff. Adjust air blower per manufacturer's recommendations.
<b>2. Main Burner Will Not Light.</b>	2a. Defective electric operator. 2b. Gas valve turned to OFF or PILOT position. 2c. Unit mis-wired or loose connections. 2d. Loose connections on limit control or defective limit control. 2e. Defective or plugged gas valve regulator. 2f. Defective thermostat or thermostat out of calibration. 2g. Thermostat heat anticipator incorrectly set (low voltage controls). 2h. Power venter centrifugal switch not closing or wired incorrectly. 2i. On units equipped with energy cut-off (ECO) device fuse in energy cut-off may be blown or defective.	2a. Replace. 2b. Turn to ON position. 2c. Check all connections and rewire if necessary. 2d. Check wiring. Replace limit control if defective. 2e. Inspect gas valve regulator. Replace if defective. 2f. Calibrate thermostat or replace if necessary. 2g. Check anticipator setting and correct if necessary. 2h. Check centrifugal switch if unit is supplied with a power venter. Check wiring. Check power venter motor. 2i. If fuse is blown, replace fuse and determine reason for blown fuse. The ECO is an over heat protection control and the cause of overheating must be corrected before putting the equipment back into service. (See Section "AA").
<b>Gas-Fired Units Intermittent Pilot Ignition Systems</b>  <b>1. Pilot Will Not Light or Stay Lit.</b>	1a. No spark at ignitor. 1b. Defective flame sensor or loose connections to flame sensor. 1c. Pilot valve electrical connections loose. 1d. Defective pilot valve. 1e. Poor ground connections. 1f. No power from control transformer. 1g. Spark not located in pilot gas stream. 1h. Dirty or plugged pilot orifice. 1i. Pilot line kinked or obstructed. 1j. Pilot flame too low. 1k. Flame sensor out of position. 1l. Defective ignition controller. 1m. Dirty flame sensor.	1a. Check connections. Check for proper spark gap, cracked or broken electrode ceramic, blown controller fuse or brittle, cracked or loose high tension cable. 1b. Check milli-amps of sensor. Tighten loose connections. Replace flame sensor if necessary. 1c. Tighten connections. 1d. Replace. 1e. Check grounding means. 1f. Check transformer voltage on secondary side for 25V. 1g. Correct or replace pilot. 1h. Clean or replace. 1i. Correct or replace pilot line. 1j. Check pilot flame and adjust per manufacturer's recommendations. 1k. Reposition. 1l. Replace. 1m. Clean or replace.

Problem	Possible Cause	Possible Remedy
<b>Gas-Fired Units Intermittent Pilot Ignition Systems (continued)</b>  <b>2. Pilot Lights, Main Burner Will Not Light.</b>	2a. Gas valve in off position. 2b. System in lock-out mode. 2c. Cracked or broken sensor ceramic. 2d. Defective or loose connections to flame sensor or flame sensor lead. 2e. Incorrect gas pressure. 2f. Insufficient current signal from flame sensor. 2g. Incorrect or loose wiring. 2h. Poor ground to ignition controller. 2i. No power to ignition controller or gas valve. 2j. Loose limit control connections or defective limit. 2k. Defective or plugged gas valve regulator. 2l. Defective thermostat or out of calibration. 2m. Thermostat heat anticipator incorrectly set. 2n. Defective ignition controller. 2o. Dirty flame sensor. 2p. Power venter centrifugal switch or vacuum switch not closing or wired incorrectly.	2a. Turn to on position. 2b. Reset system. 2c. Replace sensor. 2d. Correct or replace. 2e. Check and adjust if necessary to manufacturer's recommendations. 2f. Check current according to manufacturer's recommendations and replace if necessary. 2g. Check wiring. 2h. Check grounding means. 2i. Check voltage to controller and gas valve. 2j. Check connections. Replace limit control if necessary. 2k. Inspect gas valve regulator. Replace if necessary. 2l. Calibrate thermostat or replace if necessary. 2m. Check anticipator setting and correct if necessary. 2n. Replace. 2o. Clean or replace. 2p. Check centrifugal switch or vacuum switch if unit is supplied with a power venter. Check wiring. Check power venter motor. Check vent pipe for obstructions.
<b>3. System Goes Into Lock-Out.</b>	3. Refer to "Pilot will not light or stay lit".	3. Reset system. If lock-out persists, check causes listed for "Pilot will not light or stay lit," page 3.
<b>4. System Shuts Down Before Thermostat is Satisfied.</b>	4a. Defective thermostat or incorrect heat anticipator setting. 4b. Defective ignition controller. 4c. Failure of flame sensing circuit. 4d. Insufficient current signal from flame sensor. 4e. System is in lock-out mode.	4a. Check heat anticipator setting. Replace defective thermostat. 4b. Replace. 4c. Check for cracked or broken ceramic of flame sensor, loose connections. Replace if defective. 4d. Check flame sensor location to be sure it is correctly located. 4e. Reset system.
<b>5. System Fails to Shut-Off after Thermostat is Satisfied.</b>	5a. Defective thermostat or incorrectly set heat anticipator. 5b. Defective ignition controller. 5c. Defective gas valve.	5a. Check heat anticipator setting. Replace defective thermostat. 5b. Replace. 5c. Replace.

Problem	Possible Cause	Possible Remedy
<b>Infra-Red Heaters Direct Spark Ignition Systems</b> <b>1. No Spark.</b>	1a. Thermostat defective or incorrectly set heat anticipator. 1b. Ignitor ceramic cracked or broken. 1c. Incorrect spark gap. 1d. Poor ground connection. 1e. Loose connections on ignition cable. 1f. Ignition cable deteriorated. 1g. Blown fuse on ignition controller. 1h. No power to controller.	1a. Check thermostat and anticipator setting. Replace thermostat if necessary. 1b. Replace. 1c. Check for proper spark gap or replace pilot ignitor. 1d. Correct. 1e. Tighten connections. 1f. Replace. 1g. Replace. 1h. Check for loose wires. Check voltage on secondary side of control transformer for 25V supply.
<b>2. Spark, but Main Burner Will Not Light.</b>	2a. No power to main gas valve. 2b. Defective main gas valve. 2c. Poor ground.	2a. Check voltage. 2b. Replace. 2c. Correct ground.
<b>3. Spark Stays on After Main Burner is Lit.</b>	3a. Loss of continuity of flame sensor wire. 3b. Ignition cable deteriorated. 3c. Insufficient current signal from flame sensor. 3d. Spark shorting out across protective screen. 3e. Faulty electrical connections.	3a. Check flame sensor wire continuity. 3b. Replace. 3c. Check flame sensor location to be sure it is correctly located. 3d. Check spark and ignitor position. Correct if necessary. 3e. Correct.
<b>I. Motor Failure</b>		
<b>1. Motor Will Not Run.</b>	1a. Electrical circuit in open position. 1b. Blown fuses. 1c. Defective or incorrect wiring. 1d. Defective fan time delay relay or fan switch. 1e. Incorrect voltage to motor. 1f. Defective or incorrectly calibrated thermostat. 1g. Bearings froze up. 1h. Defective or burned out thermal overload in motor. 1i. Defective motor.	1a. Turn up thermostat or close disconnect switch. 1b. Replace fuses. 1c. Check wiring. 1d. Check and replace if necessary. 1e. Check voltage. 1f. Recalibrate thermostat or replace if necessary. 1g. Lubricate and free bearings. 1h. Replace motor. 1i. Replace motor.
<b>2. Motor Runs Backward.</b>	2. Incorrect wiring to motor or motor supplied with wrong rotation.	2. Correct wiring to motor. Replace motor with one with correct rotation.
<b>3. Motor Overheats or Burns Out</b>	3a. Voltage too high or low. 3b. Motor not lubricated. 3c. Worn motor bearings. 3d. Insufficient air across motor due to obstructions around unit. 3e. Duct work attached to propeller unit heaters.	3a. Check voltage to motor. 3b. Lubricate. 3c. Replace bearings or motor. 3d. Clear obstructions so proper airflow across motor can be obtained. 3e. Remove duct work.

<b>Problem</b>	<b>Possible Cause</b>	<b>Possible Remedy</b>
<b>3. Motor Overheats or Burns Out. (continued)</b>	3f. Excessive static pressure on blower unit heaters (motor overload).	3f. Check motor amp draw against nameplate amps. If amp draw exceeds nameplate amps redesign of duct work may be necessary.
	3g. Incorrect blower rpm setting.	3g. Check blower rpm. Correct if necessary.
	3h. Belt tension too tight on blower units.	3h. Check belt tension.
	3i. Ambient temperature too high.	3i. Check air temperature near motor.
	3j. Clogged condenser (Steam/Hot Water Units).	3j. Clean condenser.
	<b>4. Motor bearing failure.</b>	4a. Motor not lubricated.
4b. Belt tension too tight on blower units.		4b. Reset belt tension. Replace bearings.
<b>5. Excessive belt wear on blower units.</b>	5a. Belt tension too tight, or too loose.	5a. Reset belt tension. Replace belt.
	5b. Motor and blower pulleys mis-aligned.	5b. Align pulleys. Replace belt.
<b>6. Motor operates but fan or blower won't turn.</b>	6a. Set screws loose on fan or on blower and motor pulley.	6a. Tighten set screws.
	6b. Broken drive belt on blower units.	6b. Replace belt.
	6c. Belt tension too loose on blower units.	6c. Adjust belt tension.
<b>J. Fan Operates but Burner Does Not Operate</b> <b>Gas-Fired Units</b>	1. Incorrect wiring or loose connections.	1. Check wiring and connections.
	2. Control failure.	2. See "Control Failure," pages 6, 7, 8, 9.
<b>Oil-Fired Units</b>	1. Manual fan switch is on. 2. See burner service diagnosis, L, M, N, P.	1. Turn off manual fan switch. 2. Pages 10, 11.
<b>K. Burner Operates but Fan Will Not Operate</b> <b>Gas-Fired Units</b>	1. Incorrect wiring or loose connections.	1. Check wiring and connections.
	2. Motor failure.	2. See "Motor Failure," pages 9, 10.
<b>Oil-Fired Units</b>	1. Fan motor failure. 2. Loose fan. 3. Defective fan switch in fan limit control. 4. Defective or incorrect wiring.	1. See "Motor Failure," pages 9, 10. 2. Tighten fan set screw. 3. Replace entire control. 4. Check all wiring and connections.
<b>L. Burner Motor Does Not Start</b> <b>Oil-Fired Units</b>	1. Incomplete electrical circuit. 2. Primary control locked out on safety. 3. Motor bearings frozen. 4. Motor on thermo-overload.	1. Check main disconnect switch, fuses, thermostat contracts, and operating and limit controls. 2. Wait five minutes and until heat exchanger is cool. Actuate external reset on relay. Determine cause for lock-out and correct. 3. Free shaft and lubricate. Replace motor if necessary. 4. Allow motor to cool and push reset button. If motor cuts out again, check wiring to locate cause, or replace burner motor.



<b>Problem</b>	<b>Possible Cause</b>	<b>Possible Remedy</b>
<b>P. No Gas or No Oil Oil-Fired Units (continued)</b>	<ol style="list-style-type: none"> <li>8. Slipping or broken coupling.</li> <li>9. Rotation of motor and fuel unit is not the same as indicated by arrow on pad at top of unit.</li> <li>10. Frozen fuel unit shaft.</li> </ol>	<ol style="list-style-type: none"> <li>8. Tighten or replace coupling.</li> <li>9. Install fuel unit with correct rotation.</li> <li>10. Return unit to approved service station or factory for repair. Check for water and dirt in tank.</li> </ol>
<b>Q. Oil Leak or Gas Leak Gas-Fired Units</b>	<ol style="list-style-type: none"> <li>1. Loose pipe connections.</li> <li>2. Ruptured gas valve.</li> <li>3. Excessive gas pressure.</li> <li>4. Cracked pressure regulator or gas valve body.</li> <li>5. Loose fittings on gas controls.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check for leaks with soap solution. Tighten connections.</li> <li>2. Replace.</li> <li>3. Check gas pressure and adjust.</li> <li>4. Replace.</li> <li>5. Tighten.</li> </ol>
<b>Oil-Fired Units</b>	<ol style="list-style-type: none"> <li>1. Loose plugs or fittings.</li> <li>2. Leak at pressure adj. screw or nozzle plug.</li> <li>3. Blown seal (single-pipe system).</li> <li>4. Blown seal (two-pipe system).</li> <li>5. Seal leaking.</li> <li>6. Cover loose.</li> </ol>	<ol style="list-style-type: none"> <li>1. Dope with good quality oil-resistant thread sealer. Retighten.</li> <li>2. Washer may be damaged. Replace washer or O-Ring.</li> <li>3. Check if by-pass plug has been left in unit. Replace fuel unit.</li> <li>4. Check for kinked tubing or other obstructions in return line. Replace fuel unit.</li> <li>5. Replace fuel unit.</li> <li>6. Tighten cover screws or replace damaged gasket.</li> </ol>
<b>R. Insufficient Heat All Units</b>	<ol style="list-style-type: none"> <li>1. Thermostat set too low.</li> <li>2. Thermostat being affected by heat source such as sun, steam pipes, hot air, etc.</li> <li>3. Thermostat improperly located.</li> <li>4. Thermostat out of calibration.</li> <li>5. Defective limit control.</li> <li>6. Heating equipment too small.</li> <li>7. Unit heater mounted too high.</li> </ol>	<ol style="list-style-type: none"> <li>1. Raise setting.</li> <li>2. Shield or move thermostat.</li> <li>3. Relocate thermostat.</li> <li>4. Recalibrate.</li> <li>5. Replace.</li> <li>6. Install larger equipment or add more units.</li> <li>7. Relocate unit or install larger unit.</li> </ol>
<b>Gas-Fired Units</b>	<ol style="list-style-type: none"> <li>1. Gas-pressure too low.</li> <li>2. Dirty air filters (blower units and duct furnaces).</li> <li>3. Broken drive belt (blower unit heater or duct furnace).</li> <li>4. Loose drive belt.</li> <li>5. Improperly set blower rpm.</li> <li>6. Improper ducting.</li> <li>7. Defective or incorrect wiring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check and adjust as per manufacturer's recommendations.</li> <li>2. Clean or replace.</li> <li>3. Replace belt.</li> <li>4. Tighten belt.</li> <li>5. Check and adjust.</li> <li>6. Size and install correctly.</li> <li>7. Check all wiring. If necessary, rewire unit according to wiring diagram.</li> </ol>

<b>Problem</b>	<b>Possible Cause</b>	<b>Possible Remedy</b>
<b>R. Insufficient Heat (continued)</b> <b>Electrical Units</b>	<ol style="list-style-type: none"> <li>1. Blown fuses.</li> <li>2. Defective element.</li> <li>3. Burned out heating element.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace fuses. Check for cause of blown fuses.</li> <li>2. Replace element.</li> <li>3. Check element resistance with ohmmeter.</li> </ol>
	<b>Steam/Hot Water Units</b>	<ol style="list-style-type: none"> <li>1. Dirty or clogged condenser.</li> <li>2. Insufficient steam pressure or lack of hot water.</li> <li>3. Steam trap malfunctioning.</li> <li>4. Condensate not draining from condenser.</li> <li>5. Steam or water valve shut-off, stuck closed, or not functioning.</li> </ol>
<b>S. Too Much Heat</b> <b>All Units</b>	<ol style="list-style-type: none"> <li>1. Thermostat set too high.</li> <li>2. Thermostat out of calibration.</li> <li>3. Short in wiring.</li> <li>4. Thermostat located in draft.</li> <li>5. Defective thermostat.</li> <li>6. Unit heater oversized.</li> <li>7. Hot air aimed directly at occupants.</li> </ol>	<ol style="list-style-type: none"> <li>1. Lower setting.</li> <li>2. Recalibrate thermostat.</li> <li>3. Repair short.</li> <li>4. Shield or relocate thermostat.</li> <li>5. Replace.</li> <li>6. Install smaller unit or reduce water flow or steam pressure (steam/hot water units).</li> <li>7. Redirect air stream or relocate unit.</li> </ol>
	<b>Gas-Fired Units</b>	<ol style="list-style-type: none"> <li>1. Gas valve sticking.</li> <li>2. Excessive gas pressure or incorrect main burner orifice(s).</li> </ol>
<b>T. Fuel Odors</b> <b>Gas-Fired Units</b>	<ol style="list-style-type: none"> <li>1. Gas leak.</li> <li>2. Improper venting.</li> <li>3. Flash back on extinction of burner flame.</li> <li>4. Flash back on burner ignition.</li> <li>5. Cracked or damaged heat exchanger.</li> <li>6. Negative pressure in building.</li> <li>7. Obstruction in vent.</li> <li>8. Insufficient ventilation (Infra-Red Heaters).</li> <li>9. Insufficient combustion air.</li> </ol>	<ol style="list-style-type: none"> <li>1. See "Oil or Gas Leak," page 12.</li> <li>2. Re-install vent properly.</li> <li>3. Reduce primary air.</li> <li>4. Reduce primary air.</li> <li>5. Replace. Also see "Heat Exchanger Failure," pages 15, 16.</li> <li>6. Add make-up air or power vent unit heater.</li> <li>7. Clear obstruction.</li> <li>8. Provide required ventilation air per manufacturer's recommendation.</li> <li>9. Provide combustion air per manufacturer's recommendations.</li> </ol>
	<b>Oil-Fired Units</b>	<ol style="list-style-type: none"> <li>1. Oil or air leak in supply system.</li> <li>2. Down draft blowing out of barometric regulator.</li> <li>3. Improper flame adjustment.</li> <li>4. Delayed ignition.</li> <li>5. Inadequate combustion air/ventilation.</li> </ol>

<b>Problem</b>	<b>Possible Cause</b>	<b>Possible Remedy</b>
<b>U. Noisy Operation</b>		
<b>All Units</b>	<ol style="list-style-type: none"> <li>Loose screws or fasteners.</li> <li>Bent sheet metal.</li> <li>Fan bent or out of balance.</li> <li>Dirt on fan blades.</li> <li>Fan hub or blade rivets loose.</li> </ol>	<ol style="list-style-type: none"> <li>Tighten.</li> <li>Repair or replace.</li> <li>Replace.</li> <li>Clean fan.</li> <li>Replace fan.</li> </ol>
<b>Gas-Fired Units</b>		
<b>1. Noisy burner flame.</b>	<ol style="list-style-type: none"> <li>Too much primary air.</li> <li>Burr in orifice.</li> <li>Burning in venturi.</li> <li>Burner ribbon loose.</li> <li>Defective gas regulator.</li> <li>External gas regulator freeze-up (propane gas).</li> </ol>	<ol style="list-style-type: none"> <li>Adjust primary air.</li> <li>Remove burr or replace orifice.</li> <li>Adjust primary air and gas pressure or replace defective gas valve.</li> <li>Replace burner.</li> <li>Replace.</li> <li>Replace or thaw.</li> </ol>
<b>2. Noisy pilot flame.</b>	<ol style="list-style-type: none"> <li>Pilot too large.</li> </ol>	<ol style="list-style-type: none"> <li>Adjust pilot flame as per manufacturer's recommendations.</li> </ol>
<b>Oil-Fired Units</b>		
	<ol style="list-style-type: none"> <li>Bad coupling alignment.</li> <li>Air in inlet line.</li> <li>Tank hum on two-pipe system and inside tank.</li> </ol>	<ol style="list-style-type: none"> <li>Loosen fuel unit mounting screws slightly and shift unit in different positions until noise is eliminated. Retighten mounting screws.</li> <li>Check all connections. Use only good flare fittings.</li> <li>Install hum eliminator in return line.</li> </ol>
<b>V. Pulsating Pressure</b>		
<b>Gas-Fired Units</b>	<ol style="list-style-type: none"> <li>Defective gas regulator.</li> <li>Improper pipe sizing on multiple unit hook-ups.</li> <li>Improper tank size on propane systems.</li> </ol>	<ol style="list-style-type: none"> <li>Replace.</li> <li>Check piping and correct.</li> <li>Check tank size. Replace with larger tank or add vaporizer.</li> </ol>
<b>Oil-Fired Units</b>	<ol style="list-style-type: none"> <li>Partially clogged strainer or filter.</li> <li>Air leak in intake line.</li> <li>Air leaking around cover.</li> <li>High vacuum. Should not exceed 17 inches Hg. (Mercury).</li> </ol>	<ol style="list-style-type: none"> <li>Remove and clean strainer. Replace filter. Replace filter element.</li> <li>Tighten all fittings.</li> <li>Be sure strainer cover screws are tightened securely. Check for damaged cover gasket.</li> <li>Closed shut-off valve, clogged filter, kinked tubing, too small oil line.</li> </ol>
<b>W. Low Oil or Gas Pressure</b>		
<b>Gas-Fired Units</b>	<ol style="list-style-type: none"> <li>Defective gas regulator.</li> <li>Improper pipe sizing.</li> <li>Improper tank size on propane systems.</li> <li>Regulator freeze-up on propane systems.</li> <li>Defective gas valve regulator.</li> <li>Improperly set main regulator or gas valve regulator.</li> </ol>	<ol style="list-style-type: none"> <li>Replace.</li> <li>Check piping and correct.</li> <li>Check tank size. Replace with larger tank or add vaporizer.</li> <li>Replace or thaw.</li> <li>Replace.</li> <li>Adjust per manufacturer's recommendations.</li> </ol>
<b>Oil-Fired Units</b>	<ol style="list-style-type: none"> <li>Defective gauge.</li> </ol>	<ol style="list-style-type: none"> <li>Check gauge against master gauge, or other gauge.</li> </ol>

Problem	Possible Cause	Possible Remedy
<b>X. Noise of Ignition or Extinction</b> <b>Gas-Fired Units</b>  <b>Oil-Fired Units</b>	1. Improper burner adjustment, damaged burner or obstruction.	1. See "Burner Flame is Not Normal," pages 5, 6.
	1. Water in oil.  2. Delayed ignition.	1. Bleed line at fuel unit. Replace supply if necessary. 2a. Reset electrode gaps. 2b. Nozzle worn or dirty. Replace nozzle. 2c. Check voltage drop when burner motor starts. High current draw can result in weak spark from transformer. 2d. Inspect ignition transformer and wiring.
<b>Y. Condensation Problems</b> <b>Gas-Fired Units</b>  <b>Infra-Red Heaters</b>	1. Improper venting. 2. Unit under-fired.  3. No drip pockets in piping or vent system. 4. Conditioned air over heat exchanger too cold (duct furnaces).	1. Check vent and correct. 2. Check main burner orifices, gas pressure and piping for correct sizing and adjustment. 3. Add drip pockets. 4. Add drain pan with drain connector to collect and remove condensate.
<b>Z. Heat Exchanger Failure</b> <b>Gas-Fired Units</b> <b>1. Complete burn-out of lower portion of heat exchanger.</b>	1a. Gas pressure too high. 1b. Main burner orifices too large. 1c. Defective automatic controls. 1d. Unit not hung level. 1e. Fan operating backwards. 1f. Excessive drafts. 1g. Insufficient air across heat exchanger caused by: - Duct work attached to propeller units. - Improperly set blower rpm (blower units). - Excessive external static pressure in duct system (blower units and duct furnaces). - Dirty filters. - Defective motor or fan relay. - Broken drive belt. - Drive belt too loose. - Improper duct design to and from unit. - Blockage in duct system. 1h. Improper air distribution over heat exchanger (duct furnaces).	1a. Adjust per manufacturer's recommendations. 1b. Check orifice size and replace with proper orifices. 1c. See "Control Failure," pages 6, 7, 8, 9. 1d. Level unit. 1e. Check rotation of fan. Replace motor if required. 1f. Move or shield unit. 1g. - Remove duct work or polytubes. - Adjust to proper setting. - Check duct design and correct. - Clean or replace. - Replace. - Replace. - Adjust to proper tension. - Check duct design and correct. - Remove blockage. 1h. Check duct design and correct.

Problem	Possible Cause	Possible Remedy
<p><b>Z. Heat Exchanger Failure (continued)</b></p> <p><b>Gas-Fired Units</b></p> <p><b>2. Localized burn-out of heat exchanger.</b></p>	<p>2a. Damaged burner.</p> <p>2b. Mis-aligned burner.</p> <p>2c. Improper air distribution over heat exchanger.</p> <p>2d. Air leaks from connecting duct work disturbing burner flames.</p> <p>2e. Pilot flame too high and impinges on heat exchanger.</p>	<p>2a. Replace.</p> <p>2b. Check burner alignment and correct.</p> <p>2c. Check duct design and correct.</p> <p>2d. Check for leaks. Tighten sheet metal screws. Seal with heat resistant caulking or straighten sheet metal.</p> <p>2e. Adjust pilot flame per manufacturer's recommendations.</p>
<p><b>Oil-Fired Units</b></p>	<p>1. Improper nozzle size and/or type.</p> <p>2. Oil pressure too high.</p> <p>3. Damaged fire pot.</p> <p>4. Improper burner adjustment.</p> <p>5. Insufficient circulating air.</p>	<p>1. See rating plate for correct nozzle size and type.</p> <p>2. Set at 100 PSIG maximum.</p> <p>3. Replace.</p> <p>4. Use instruments to set over fire draft, CO<sub>2</sub> and smoke levels.</p> <p>5. Remove any obstructions on or near fan. Clean fan blades. Absolutely no duct work should be attached to Oil-Fired Units.</p>
<p><b>Steam/Hot Water Units</b></p> <p><b>Leaking condenser</b></p>	<p>1. Internal corrosion.</p> <p>2. External corrosion.</p> <p>3. Ruptured tube(s).</p> <p>4. Joint leaking.</p>	<p>1. Check type and frequency of boiler water treatment. Check traps for proper condensate removal. Send sample of condensate to Modine for analysis.</p> <p>2. Check for corrosive fumes and vapors.</p> <p>3. Water hammer/excessive steam pressure (above 150#).</p> <p>4. Check for internal or external corrosion, water hammer or excessive steam pressure (above 150#).</p>
<p><b>AA. Unit Cycles on Overheat (high limit cycles)</b></p>	<p>1. Gas (oil) pressure too high.</p> <p>2. Main burner orifices (nozzle) too large.</p> <p>3. Defective automatic controls.</p> <p>4. Defective limit control.</p> <p>5. Fan operating backwards.</p> <p>6. Defective motor or fan relay.</p> <p>7. Insufficient air across heat exchanger caused by:</p> <ul style="list-style-type: none"> <li>- Duct work attached to propeller units.</li> <li>- Improperly set blower rpm.</li> <li>- Excessive external static pressure in duct system.</li> <li>- Dirty filters.</li> <li>- Improper duct design to and from unit.</li> <li>- Broken drive belt.</li> <li>- Drive belt too loose.</li> <li>- Blockage in duct system.</li> </ul>	<p>1. Check pressure and adjust per manufacturer's recommendations.</p> <p>2. Check orifice (nozzle) size and replace with proper orifices (nozzle).</p> <p>3. See "Control Failure," pages 6, 7, 8, 9.</p> <p>4. Replace.</p> <p>5. Check rotation of fan. Replace motor if required.</p> <p>6. Replace.</p> <p>7.</p> <ul style="list-style-type: none"> <li>- Remove duct work or polytube.</li> <li>- Adjust to proper setting.</li> <li>- Check duct design and correct.</li> <li>- Clean or replace.</li> <li>- Check duct design and correct.</li> <li>- Replace.</li> <li>- Adjust to proper tension.</li> <li>- Remove blockage.</li> </ul>

Problem	Possible Cause	Possible Remedy
<b>AA. Unit Cycles on Overheat (high limit cycles) (continued)</b>	8. Improper duct design to and from unit (duct furnaces). 9. Air distribution baffle not in place on duct furnaces.	8. Check duct design and correct. 9. Check if baffle is required and install if necessary.
<b>BB. Corrosive Damage Gas-Fired Units and Oil-Fired Units</b>	1. Conditioned air or make-up air over heat exchanger too cold resulting in high condensation rates. (Blower units or duct furnaces.) 2. Unit is installed in an atmosphere with chlorinated or acidic contaminants.	1. Replace aluminized steel burner and heat exchanger with stainless steel burner and heat exchanger. 2. Remove unit from contaminated area or find source of contaminants and eliminate from atmosphere. Stainless steel burners and heat exchangers <b>will not</b> solve problem.
<b>Steam/Hot Water Units</b>	See Section Z.	
<b>CC. Thermostat Problems</b>		
<b>1. System operates only when thermostat is jumpered.</b>	1a. Thermostat contacts dirty. 1b. Thermostat defective.	1a. Clean. 1b. Replace.
<b>2. Room temperature is higher than thermostat setting.</b>	2a. Thermostat mounted on cold wall or surface. 2b. Thermostat is exposed drafts. 2c. Thermostat not level (Mercury switch type). 2d. Thermostat incorrectly calibrated. 2e. Heat anticipator set too high (low voltage controls). 2f. Thermostat does not have heat anticipator (low voltage controls).	2a. Relocate thermostat. 2b. Shield or move thermostat. 2c. Level thermostat. 2d. Recalibrate. 2e. Reset to match current draw of equipment being controlled. 2f. Replace with thermostat with anticipator.
<b>3. Room temperature does not reach thermostat setting.</b>	3a. Thermostat incorrectly calibrated. 3b. Thermostat not level (Mercury switch type). 3c. Thermostat mounted in sun or near heat source. 3d. Dirty thermostat contacts. 3e. Bad thermostat connections.	3a. Recalibrate. 3b. Level thermostat. 3c. Shield or move thermostat. 3d. Clean. 3e. Check connections and correct.
<b>4. Thermostat cycles too often.</b>	4. Heat anticipator set too low (low voltage controls).	4. Reset to match current draw of equipment being controlled.

Problem	Possible Cause	Possible Remedy
<b>5. Thermostat does not cycle often enough.</b>	5a. Thermostat is not exposed to circulated air. 5b. Heat anticipator is set too high (low voltage controls). 5c. Thermostat does not have a heat anticipator (low voltage controls). 5d. Dirty thermostat contacts.	5a. Relocate thermostat. 5b. Reset to match current draw of equipment being controlled. 5c. Replace with thermostat with a heat anticipator. 5d. Clean.
<b>6. Thermostat appears to be out of calibration.</b>	6a. Thermostat not level (Mercury switch type). 6b. Thermostat improperly calibrated. 6c. Poor connections.	6a. Level thermostat. 6b. Recalibrate. 6c. Check connections and correct.
<b>7. Room temperature swings excessively.</b>	7a. Thermostat not exposed to circulated air. 7b. Heat anticipator set too high (low voltage controls). 7c. Thermostat does not have a heat anticipator (low voltage controls).	7a. Relocate thermostat. 7b. Reset to match current draw of equipment being controlled. 7c. Replace with thermostat with a heat anticipator.





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