

OIL FURNACE TROUBLESHOOTING TABLES



The customer's complaint will virtually always fall under one or more of the following headings. This provides the first clue. It narrows the area of trouble.

- I. NO HEAT
- II. NOT ENOUGH HEAT
- III. TOO MUCH HEAT
- IV. NOISE
- V. ODOR
- VI. COST OF OPERATION

From this knowledge the serviceman can further reduce the possibilities and begin to zero in on the problem with a few observations of his own. All it requires is for him to "turn up the thermostat and start the furnace." Simply by looking and listening he adds to his knowledge of the trouble and the outline expands as follows.

- I. NO HEAT
 - A. Burner fails to start.
 - B. Burner fails to ignite.
 - C. Burner starts and fires--locks out on safety while firing.
 - D. Burner starts and fires but then loses flame before locking out on safety.
- II. NOT ENOUGH HEAT
 - A. Burner cycles too often.
 - B. Burner runs continuously.
- III. TOO MUCH HEAT
 - A. Burner cycles are too long.
 - B. Burner runs continuously.
- IV. NOISE
 - A. Combustion noise.
 - B. Mechanical noise.
 - C. Air noise.
- V. ODOR
- VI. COST

Now between the customer's complaint and his own observation the serviceman has in a very few minutes classified the problem. At this point he is ready to take action within the specific problem area.

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I. COMPLAINT: NO HEAT

A. FAULT: BURNER FAILS TO START

SOURCE	PROCEDURE	CAUSES	CORRECTION
1 Thermostat	Check Thermostat Settings	a. Thermostat Switched to "Off" or "Cool"	Switch to "Heat"
		b. Thermostat Set Too Low	Turn Thermostat Up
2 Safety Overloads	Check Burner Motor and Primary Control Safety Switches	a. Burner Motor Overload Tripped	Push Overload Reset Button
		b. Primary Control Tripped on Safety	Reset Safety Switch Button
3 Power	Check Furnace Disconnect Switch And Main Disconnect Switch.	a. Switch Open	Close Switch
		b. Blown Fuse or Tripped Breaker	Replace Fuse or Reset Breaker Check For Cause of Overload
4 Thermostat	Touch Jumper Wire Across Thermostat Terminals On Primary Control. If Burner Starts Then Fault is in Thermostat Circuit. If burner does not start proceed to 5 or 6.	a. Broken or Loose Thermostat Wires	Repair or Replace Wires
		b. Loose Thermostat Screw Connection	Tighten Connection
		c. Dirty Thermostat Contacts	Clean Contacts
		d. Thermostat Not Level	Level Thermostat
		e. Faulty Thermostat	Replace Thermostat
5 Flame Detector (Cad Cell)	Disconnect Flame Detector Wires At Primary Control. If Burner Starts Fault is in Detector Circuit. Check Across Lead with Ohmmeter.	a. Flame Detector Leads Shorted	Separate Leads
		b. Flame Detector Exposed to Light	Seal Off False Source of Light
		c. Short Circuit in Flame Detector	Replace Detector
6 Flame Detector (Stack)	Place Control in Step. If Burner Does Not Start, Jumper Across Cold Contact Terminals. If Burner Starts The Problem is in Bi-Metal Actuated Contacts.	a. Cold Contacts Dirty	Clean Contacts
		b. Bi-Metal Carboned	Clean Bi-Metal
		c. Loose Connections or Broken Wire (2 Piece)	Tighten Connections or Replace Wires
		d. Friction Clutch Faulty	Replace Element or Control
		e. Hot Contacts Welded	Replace Element or Control
7 Primary Control (Cad Cell Or Stack)	Place a 120V Trouble Light or Voltmeter Between the Black and White Leads. No Light or Voltage Indicates No Power to the Control.	a. Limit Control Switch Open (Adjustable)	Check Dial Adjustment
		b. Limit Control Switch Faulty	Jumper Terminals. If Burner Starts Switch is Faulty. Replace Control
		c. Open Circuit Between Disconnect Switch and Limit Control	Trace Wiring and Repair or Replace
		d. Low Line Voltage (Less than 105 Volts) or Power Failure	Check for Line Drop or Call Power Company
8 Primary Control (Cad Cell)	Place a 120V Trouble Light or Voltmeter Between the Orange and White Leads. No Light or Voltage Indicates Control Fault.	a. Defective Internal Control Circuit	Replace Control
9 Primary Control (Stack)	Place a 120V Trouble Light or Voltmeter Across the Burner Terminals (Usually No. 2 & No. 3) of the Primary Control. No Light or Voltage Indicates A Control Fault.	a. Dirty Burner Relay Contacts	Clean Contacts
		b. Defective Internal Control Circuit	Replace Control
10 Burner	Place a 120V Trouble Light Between Black and White Leads to Burner Motor. Light Indicates Power to Motor and a Fault.	a. Binding Burner Blower Wheel	Turn off Power and Rotate Blower Wheel by Hand, if Seized
		b. Seized Fuel Pump	Free Wheel From Binding or Replace Fuel Pump.
		c. Defective Burner Motor	Replace Motor

I. COMPLAINT: NO HEAT B. FAULT: BURNER STARTS BUT FAILS TO IGNITE

SOURCE	PROCEDURE	CAUSES	CORRECTION
1 Oil Supply	Listen For Pump Whine Indicating Blockage in Oil Supply. Check Tank for Oil Level By Tank Gauge or Dip Stick. Coat End of Dip Stick with Litmus Paste and Insert to Bottom of Tank.	a. Tank Shutoff Valve Closed	Open Valve
		b. Outdoor Tank - Cold No. 2 Oil Congealed.	Switch to No. 1 Oil or Relocate Tank in Heated Area
		c. No Oil in Tank	Fill Tank
		d. Water in Tank - Exceeds 1" Depth	Drain or Pump out Water
2 Oil Filter & Oil Line	Listen for Pump Whine Indicating Blockage in Oil Supply Line. Open Bleed Valve or Disconnect Oil Line To Gun Assembly. Start Burner. No Oil or Milky Oil Indicates Loss of Prime.	a. Oil Line Filter Plugged	Replace Filter Cartridge.
		b. Kink in Oil Supply Line	Replace Oil Line
		c. Plugged Fuel Pump Strainer	Clean Strainer or Replace Pump
		d. Air Leak in Oil Supply Line	Locate & Correct Leak. Tighten All Connections
		e. Oil Pump Above Oil Level In Tank With Single Line System or Height Exceeds Lift Capacity of Pump	Install a Two Line System Preferably With A 2-Stage Fuel Pump
3 Burner Motor	If Motor Does Not Come Up To Speed and Trips out on Overload, Turn Off Power. Rotate Burner Blower Wheel by Hand. Connect a Voltmeter Across Black and White Burner Motor Leads.	a. Wheel Dragging Against Housing	Shift Wheel or Remove Cause of Drag
		b. Pump Coupling or Belt Binding or Misaligned	Free Binding or Realign.
		c. Faulty Pump Causing Drag	Replace Pump
		d. Low Voltage (Less Than 105V)	Check Voltage.
		e. Faulty Burner Motor	Replace Motor
4 Combustion	Check Combustion Air And Draft.	a. Excessive Combustion Air	Reduce Air and Check Comb
		b. Excessive Draft	Reduce Draft to 0.03 To 0.04 In
5 Oil Pump	Install Pressure Gauge On Pump and Read. Pressure Should be 100 PSI.	a. Fuel Pressure Too Low	Adjust Pressure to 100 PSI
		b. Belt or Coupling Disengaged or Broken—No Pressure	Re-engage or Replace Belt or Coupling
6 Nozzle	Disconnect Ignition Leads. Observe Oil Spray with Flame Mirror and Flashlight. Inspect Nozzle for Plugged Orifice or Carbon Build-up Around Orifice.	a. Nozzle Orifice Plugged	Replace Nozzle with Same Size, Spray Angle and Spray Type. (See Nozzle Interchange Chart)
		b. Nozzle Strainer Plugged	
		c. Poor or Offcenter Spray	
		d. Nozzle Loose	Tighten Nozzle
7 Ignition Electrodes	Remove Gun Assembly and inspect Electrodes and Leads.	a. Dirty Electrodes and Leads	Clean Electrodes and Leads
		b. Fouled or Shorted Electrodes	Remove Cause of Short and Clean
		c. Loose or Disconnected Leads	Reconnect, Tighten or Replace Leads
		d. Eroded Electrode Tips	Dress Up Electrode Tips and Reset Gap to 1/8" and Correctly
		e. Improper Electrode Gap Spacing	
		f. Improper Position of Electrode Tips	Position the Tips
		g. Cracked or Chipped Insulators	Replace Electrode
		h. Cracked or Burned Lead Insulation	Replace Electrode Leads
		j. Improperly Positioned Buss Bars (OHP)	Reposition Buss Bars
		8 Ignition Transformer	Connect Ignition Leads to Transformer. Start Burner and Observe Spark. Check Line Voltage to Transformer Primary.
b. Damaged or Burned Out Transformer Windings—No Spark or Weak Spark	Replace Transformer—Properly Ground Transformer Case.		

I. COMPLAINT: NO HEAT C. FAULT: BURNER STARTS AND FIRES -- LOCKS OUT ON SAFETY WHILE FIRING.

SOURCE	PROCEDURE	CAUSES	CORRECTION
1 Poor Fire (Cad Cell Or Stack Control)	(Cad Cell) After Burner Fires Immediately Jumper Across Flame Detector Terminals At Primary Control. If Burner Continues To Run (Does Not Lock Out On Safety) Fault May Be Due to Poor Fire. Inspect Fire. Take CO ₂ , Smoke and Draft Readings. OR (Stack Control) Jumper Across Line Terminal, Usually No. 1 & No. 3. Burner Will Continue To Run. Inspect Fire. Take CO ₂ , Smoke And Draft Readings.	a. Unbalanced Fire	Replace Nozzle With Same Size, Spray Angle and Spray Type. (See Nozzle Interchange Chart When Substituting Nozzle Make.)
		b. Too Much Air--Lean, Burner Flame Impinging on Combustion Chamber	Reduce Combustion Air-- Check Combustion For CO ₂ and Smoke
		c. Too Little Air--Dirty Fire	Increase Combustion Air-- Check Combustion For CO ₂ and Smoke
		d. Excessive Draft	Adjust Barometric Damper for
		e. Too Little Draft	Correct Draft (0.03 To 0.04 In. W.G. In Flue Pipe)
		f. Heat Exchanger Or Flue Restricted or Blocked	Determine Cause and Clear Restriction
2 Flame Detector (Cad Cell)	If Fire is Good Fault is in Flame Detector Circuit. Disconnect Cad Cell Wires, Leaving Jumper Wire in Place with Burner Running. Connect Ohmmeter Across Cad Cell Leads. Resistance Should Not Exceed 1500 Ohms (Will Normally Run Less Than 1000 Ohms).	a. Dirty Cad Cell	Clean Cad Cell Lens
		b. Faulty Cad Cell	Replace Cad Cell
		c. Loose or Defective Cad Cell Wires, or Holder	Secure Connections or Replace Holder And Wires
		d. Twisted or Displaced Cad Cell Holder	Straighten and Secure Holder
		e. Blockage Between Cad Cell and Flame	Remove Cause of Blockage
3 Primary Control (Cad Cell)	If Burner Locks Out On Safety With The Jumper Wire in Place Then Fault is in the Primary Control.	a. Primary Control Defective	Replace Control
4 Flame Detector (Stack Control)	Remove Jumper From Line Terminals. Cycle Burner and Observe Movement of Contacts. If Cold Contacts Fail To "Break" within 30 Sec. After Burner Fires, Then Check the Detector.	a. Dirty Bi-Metal Element	Clean Bi-Metal with Care
		b. Air Leak Into Flue Pipe Or Around Detector Mount	Seal Air Leaks
		c. Detector Too Close To Barometric Damper	Relocate in Flue Pipe As Close To Furnace Flue Outlet As Possible
		d. Faulty Friction Clutch (Slips Before Cold Contacts Break)	Replace Detector
		e. Welded or Shorted Cold Contacts	Replace Detector
5 Primary Control (Stack Control)	If Cold Contacts "Break" and "Hot" Contacts "Make" But Then the Control Locks Out On Safety the Fault is in the Primary Control.	a. Primary Control Defective	Replace Control

I. COMPLAINT: NO HEAT D. FAULT: BURNER STARTS AND FIRES BUT THEN LOSES FLAME BEFORE LOCKING OUT ON SAFETY

SOURCE	PROCEDURE	CAUSES	CORRECTION
1 Poor Fire (Cad Cell Or Stack Control)	<p>(Cad Cell) After Burner Fires Immediately Jumper Across Flame Detector Terminals At Primary Control. If Burner Continues To Run (Does Not Lock Out on Safety) Fault May Be Due To Poor Fire. Inspect Fire. Take CO₂, Smoke and Draft Readings.</p> <p style="text-align: center;">OR</p> <p>(Stack Control) Jumper Across Line Terminal, Usually No. 1 & No. 3. Burner Will Continue To Run. Inspect Fire. Take CO₂, Smoke And Draft Readings.</p>	a. Unbalanced Fire	Replace Nozzle With Same Size, Spray Angle and Spray Type. (See Nozzle Interchange Chart When Substituting Nozzle Make.)
		b. Too Much Air—Lean, Burner Flame Impinging on Combustion Chamber	Reduce Combustion Air— Check Combustion For CO ₂ And Smoke
		c. Too Little Air—Dirty Fire	Increase Combustion Air— Check Combustion For CO ₂ And Smoke
		d. Excessive Draft	Adjust Barometric Damper For
		e. Too Little Draft	Correct Draft (0.03 To 0.04 In W.G. In Flue Pipe)
		f. Heat Exchanger or Flue Restricted or Blocked	Determine Cause and Clear Restriction
2 Flame Detector (Cad Cell)	<p>If Fire is Good Fault is in Flame Detector Circuit. Disconnect Cad Cell Wires, Leaving Jumper Wire in Place With Burner Running. Connect Ohmmeter Across Cad Cell Leads. Resistance Should Not Exceed 1500 Ohms (Will Normally Run Less Than 1000 Ohms).</p>	a. Dirty Cad Cell	Clean Cad Cell Lens
		b. Faulty Cad Cell	Replace Cad Cell
		c. Loose or Defective Cad Cell Wires, or Holder	Secure Connections Or Replace Holder and Wires
		d. Twisted or Displaced Cad Cell Holder	Straighten and Secure Holder
		e. Blockage Between Cad Cell and Flame	Remove Cause of Blockage
3 Flame Detector (Stack Control)	<p>Remove Jumper From Line Terminals. Cycle Burner and Observe Movement of Contacts. If "Open" But Hot Contacts Fail to "Close" or Hot Contacts "Close" and Then "Re-open" Then Check the Detector.</p>	a. Dirty Bi-Metal Element	Clean Bi-Metal with Care
		b. Air Leak into Flue Pipe Or Around Detector Mount	Seal Air Leaks
		c. Detector Too Close To Barometric Damper	Relocate in Flue Pipe As Close to Furnace Flue Outlet As Possible
		d. Faulty Friction Clutch (Slips Before Hot Contacts Make)	Replace Detector
4 Oil Supply	<p>If Burner Loses Flame (Does Not Lock Out on Safety) Fault is in the Fuel System.</p> <p><i>Listen For Pump Whine (Indicates High Suction and Restriction.)</i></p>	a. Pump Loses Prime—Air Slug	Prime Pump at Bleed Port
		b. Pump Loses Prime—Air Leak In Supply Line	Check Supply Line for Loose Connections & Tighten Fittings
		c. Water Slug in Line	Check Oil Tank for Water (Over 1 Inch) Pump Out Water or Drain
		d. Partially Plugged Nozzle or Nozzle Strainer	Replace Nozzle
		e. Restriction in Oil Supply Line	Clear Restriction
		f. Plugged Fuel Pump Strainer	Clean Strainer or Replace Fuel Pump
		g. Cold Oil—Outdoor Tank	Change to Number One Oil

II. COMPLAINT: NOT ENOUGH HEAT A. FAULT: BURNER CYCLES TOO SHORT

SOURCE	PROCEDURE	CAUSES	CORRECTION
1 Thermostat	Check Thermostat	a. Heat Anticipator Set Too Low	Correct Heat Anticipator Setting
		b. Thermostat Not Level	Level Thermostat
		c. Vibration At Thermostat	Correct Source of Vibration
		d. Thermostat in Warm Air Draft	Shield Thermostat From Draft Or Relocate
		e. Thermostat on Warm Wall Or Near Heat Producing Appliance	Remove Cause of Heat Or Relocate Thermostat
2 Limit Control	<p>Connect Voltmeter Between Line Voltage Connections To Primary Control (Black And White Leads).</p> <p>OBSERVATIONS</p> <p><i>If Voltage Cycles Between Normal and Zero Due to Power Interruption it is Cycling Off Limit. Check Causes and Correction.</i></p> <p><i>If voltage is low (less than 105V) proceed to 3.</i></p> <p><i>If voltage is normal and constant proceed to 4.</i></p>	a. Dirty Air Filter	Replace Or Clean Filters
		b. Adjustable Limit Control Set Too Low.	Reset Limit Control
		c. Blower Running Too Slow	Speed Up Blower For B5 To 95° F Temperature Rise
		d. Restrictions In Return Air Or Supply Air System	Correct Cause of Restriction
		e. Blower Wheel Dirty	Clean Blower Wheel
		f. Blower Wheel In Backwards	Reverse Blower Wheel
		g. Wrong Motor Rotation	Reverse Motor Rotation Or Replace With Motor of Correct Rotation
		h. Blower Motor Seized or Burned Out	Replace Motor
		j. Blower Bearings Seized	Replace Bearings And Shaft
		k. Faulty Limit Control	Replace Limit Control
3 Power	If Voltage is Less Than 105 Volts Or Fluctuates Then Fault is in Power Source. Recheck Voltage at Power Source.	a. Loose Wiring Connection	Locate and Secure Connection
		b. Low or Fluctuating Line Voltage	Call Power Company
4 Flame Detector (Stack Control)	Cycle Burner and Observe Movement of Contacts. If Cold Contacts "Open" But Hot Contacts Fail to "Close" or They "Close" and "Re-open" Then Check the Detector.	a. Dirty Bi-Metal Element	Clean Bi-Metal With Care
		b. Air Leak Into Flue Pipe Or Around Detector Mount	Seal Air Leaks
		c. Detector Too Close To Barometric Damper	Relocate In Flue Pipe As Close To Furnace Flue Outlet As Possible
		d. Faulty Friction Clutch (Slips Before Hot Contacts Make)	Replace Detector

II. COMPLAINT: NOT ENOUGH HEAT B. FAULT: BURNER RUNS CONTINUOUSLY

SOURCE	PROCEDURE	CAUSES	CORRECTION
1 Combustion (CO ₂)	Check Burner Combustion For CO ₂ , Stack Temperature and Smoke. (OBSERVATION) <i>Low CO₂ (Less Than 8%)</i>	a. Too Much Combustion Air	Reduce Combustion Air
		b. Excessive Draft	Adjust Barometric Damper
		c. Air Leaks Into Heat Exchanger Around Inspection Door, Etc.	Correct Cause of Air Leak
		d. Incorrect Burner Head Adjustment	Correct Burner Head Setting
2 Combustion Smoke	High Smoke Reading (More than No. 1 Smoke).	a. Too Little Combustion Air	Increase Combustion Air
		b. Insufficient Draft	Increase Draft
		c. Dirty or Plugged Heat Exchanger	Clean Heat Exchanger and Readjust Burner
		d. Incorrect Burner Head Adjustment	Correct Burner Head Setting
3 Stack Temper- ature	<i>High Stack Temperature Resulting in Less Than 75% Efficiency.</i>	a. Too Little Blower Air	Speed Up Blower For 85° To 95° F Temperature Rise
		b. Blower Belt Too loose And Slipping	Tighten Blower Belt
		c. Dirty or Plugged Heat Exchanger	Clean Heat Exchanger
		d. Dirty Air Filters	Change or Clean Air Filters
		e. Dirty Blower Wheel	Clean Blower Wheel
		f. Restricted or Closed Registers or Dampers	Readjust Registers or Dampers
4 Nozzle And Oil Pressure	<i>Inspect Fire, Check Nozzle Size and Check Oil Pressure.</i>	a. Partially Plugged or Defective Nozzle	Replace Nozzle (See Nozzle Chart)
		b. Nozzle Too Small	Increase Nozzle Size (See Furnace Label for Maximum)
		c. Oil Pressure Too Low (Less Than 100 PSI)	Readjust Oil Pressure To 100 PSI

III. COMPLAINT: TOO MUCH HEAT A. FAULT: BURNER CYCLES ARE TOO LONG

SOURCE	PROCEDURE	CAUSES	CORRECTION
1 Thermostat	Check Thermostat	a. Heat Anticipator Set Too High	Correct Heat Anticipator Setting
		b. Thermostat Not Level	Level Thermostat
		c. Thermostat in Cold Draft	Correct Cause of Draft or Relocate Thermostat
		d. Thermostat on Cold Wall	Relocate Thermostat

III. COMPLAINT: TOO MUCH HEAT B. FAULT: BURNER RUNS CONTINUOUSLY

SOURCE	PROCEDURE	CAUSES	CORRECTION
1 Thermostat	Disconnect Thermostat Wires at Primary Control. If Burner Turns off, Fault is in Thermostat Circuit.	a. Shorted or Welded Thermostat Contacts	Repair or Replace Thermostat
		b. Stuck Thermostat Bi-Metal	Clear Obstruction or Replace Thermostat
		c. Thermostat Not Level	Level Thermostat
		d. Shorted Thermostat Wires	Repair Short or Replace Wires
		e. Thermostat out of Calibration	Replace Thermostat
		f. Thermostat in Cold Draft	Correct Cause of Draft or Relocate Thermostat
2 Primary Control (Cad Cell or Stack Control)	Disconnect Thermostat Wires at Primary Control. If Burner Continues to Run Fault is in Primary Control.	a. Defective Primary Control	Replace Primary Control

IV. COMPLAINT: NOISE A: FAULT: COMBUSTION NOISE

SOURCE	PROCEDURE	CAUSES	CORRECTION
1 Delayed Ignition	Run Burner Through Two or Three Cycles and Observe Type of Noise and When in the Cycle it Occurs. (OBSERVATION) <i>Hard Start at Beginning of Cycle.</i>	a. Too Much Combustion Air	Reduce Combustion Air And Check Combustion
		b. Excessive Draft	Adjust Barometric Damper For Correct Draft
		c. Poor or Offcenter Oil Spray	Replace Nozzle
		d. Eroded Electrode Tips	Dress Up Electrode Tips And
		e. Improper Electrode Gap Spacing	Reset Gap to 1/8" And
		f. Improper Position Of Electrode Tips	Correctly Position The Tips
		g. Dirty Electrodes and Leads	Clean Electrodes and Leads
		h. Loose Electrode Leads	Tighten or Replace Leads
		j. Cracked or Burned Lead Insulation	Replace Electrode Leads
		k. Cracked or Chipped Insulators	Replace Electrode
		l. Improperly Positioned Buss Bars (OHP)	Reposition Buss Bars
		m. Incorrect Burner Head Adjustment	Correct Burner Head Setting (See Burner Manual)
		n. Low Line Voltage - Less Than 105 Volts To Transformer Primary	Check Voltage At Power Source Correct Cause of Voltage Drop Or Call Power Company
		o. Defective Transformer - Weak Spark	Replace Transformer - Properly Ground Transformer Case
p. Air in Pump and Oil System	Purge System of Air and Check Supply Line Connections		
2 Noisy Flame	<i>Flame Roar (Continues When Inspection Door is Cracked Open)</i>	Too Much Combustion Air	Reduce Combustion Air & Check Combustion
3 Pulsation Or Resonance	Run Burner Through Two or Three Cycles and Observe Type of Noise and When in the Cycle it Occurs. (OBSERVATION) <i>Blubbing or High Frequency Resonance While Running (Disappears as Inspection Door is Cracked Open)</i>	a. Improper Combustion Air Setting	Check Combustion And Adjust Air
		b. Incorrect Nozzle Angle And Type	Change To Correct Nozzle (See Nozzle Table)
		c. Faulty or Poor Nozzle	Change Nozzle (See Nozzle Table)
		d. Draft Setting Incorrect	Readjust Barometric Damper Setting
		e. Pump Pressure	Sometimes Can Be Corrected By Increasing or Decreasing Pump Pressure Above or Below 100 PSI
		f. Damaged Combustion Chamber	Repair or Replace Combustion Chamber
		g. Dirty Combustion Air Blower Wheel	Clean Combustion Air Blower
		h. Incorrect Burner Head Adjustment	Correct Burner Head Setting See Burner Manual
		j. Dirty or Plugged Heat Exchanger	Clean Heat Exchanger
		4 Noisy Burner Shut Down	<i>Blubber When the Burner Stops.</i>
b. Dirty or Plugged Heat Exchanger	Clean Heat Exchanger		
c. Draft Setting Incorrect	Readjust Barometric Damper Setting		
d. Incorrect Nozzle Angle and Type	Change to Correct Nozzle		
e. Faulty Nozzle - Poor Fire	Change Nozzle (See Nozzle Table)		
f. Poor Oil Pump Cutoff	Replace Pump or Install Oil Valve In High Pressure (100 PSI) Oil Line		

IV. COMPLAINT: NOISE B. FAULT: MECHANICAL NOISE

SOURCE	PROCEDURE	CAUSES	CORRECTION
1 Burner	Use a Screwdriver as a Stethoscope by Placing the Handle Against the Ear and the Tip Against the Part in Question. Listen to Burner While it Starts, Runs and Stops Prior to the Furnace Blower Starting.	a. Pump Whine (Supply Line Restriction)	Correct Cause of Restriction
		b. Noisy Pump - Bearings, Gears, Etc.	Replace Pump
		c. Pump Coupling or Belt - Loose, Misaligned, Etc.	Readjust Coupling Or Belt Replace if Damaged
		d. Burner Blower Wheel - Loose or Rubbing Against Housing	Reposition Burner Blower Wheel
		e. Burner Motor Bearings Bad	Replace Burner Motor
		f. Burner Motor - AC Hum	Check Resilient Mountings and Experiment by Slightly Loosening or Tightening Them. Replace Mountings if Deteriorated.
		g. Burner Mounting Loose Allowing Metal to Metal Contact with Furnace Casing or Other Metal Part	Secure Mounting and Rope Packing in Receiving Tube and Isolate Point of Contact.
		h. Loose Fasteners in Burner	Tighten Fasteners & Set Screws
2 Fuel Piping	Inspect Supply and Return Lines for Loose Connections, Proper Support and Loose Contact with Other Solid Objects such as Metal or Concrete. Rattling of Line Will Transmit to Fuel Tank and Become Amplified.	a. Line Contacting Furnace Cabinet	Isolate Line From Contact
		b. Unsupported Line in Contact With Floor or Wall	Fasten Line With Supports
		c. Supply & Return Lines in Contact With Each Other	Separate Lines and Support
		d. Tank or Suction Line Hum	Install Anti-hum Valve or Needle Valve in Suction Line Near Pump.
3 Blower	<p>Remove Blower Compartment Door, Start Blower and Listen for Source of Noise. Stop Blower by Disconnecting Power and Check for Noise Source.</p> <p>(OBSERVATION)</p> <p>Inspect Blower and Check for End Play and Side Play of Shaft.</p>	a. Blower Bearing Loose Allowing Side Play	Secure Bearings
		b. Blower Thrust Collar Set Too Far Out on Shaft Allowing End Play	Reset Thrust Collar To Eliminate End Play of Blower Shaft
		c. Blower Bearing Dry & Squeaking	Inspect Bearing. If Bearing is Undamaged Then Add Lubrication
		d. Blower Bearing Damaged	Replace Bearings. Inspect Shaft For Scoring or Undercuts
		e. Blower Wheel Touching Scroll	Center Blower Wheel in Scroll
		f. Loose Blower Wheel	Check Alignment and Tighten Set Screws
		g. Loose Metal or Debris in Bottom of Blower Scroll	Remove Debris
		h. Cutoff Plate Loose	Tighten Cutoff Plate
		j. Blower Wheel out of Balance	Balance or Replace Wheel
		4 Running Gear	Inspect Running Gear and Move it Back and Forth by Hand to Check for Loose Connections.
b. Worn or Damaged Blower Belt	Replace Belt		
c. Belt Too Loose Causing Slippage	Correctly Tighten Belt		
d. Motor and Blower Pulleys Out Of Alignment	Align Pulleys		
e. Loose Blower and Motor Pulley	Tighten Set Screws		

IV. COMPLAINT: NOISE B. FAULT: MECHANICAL NOISE

SOURCE	PROCEDURE	CAUSES	CORRECTION
5 Blower Motor	Remove Blower Compartment Door, Start Blower and Listen for Source of Noise. Stop Blower by Disconnecting Power and Check for Noise Source. (OBSERVATION) <i>Inspect Blower Motor.</i>	a. Damaged and Noisy Motor Bearings	Replace Motor
		b. Loose or Defective Motor Cushion Mounts	Tighten Mounts or Replace
		c. Loose and Rattling Greenfield Leads to Motor	Isolate or Secure Greenfield Cable
		d. AC Motor Hum	Check Resilient Mountings
		e. Regenerative Motor Braking (Capacitor Motors).	Replace Capacitor or Replace Motor and Capacitor
6 Air Filter	Check Filter Assembly.	a. Filter Loose in Mounting Rails	Secure Filter Mounting
		b. Filter Screen Contacting Blower or Running Gear	Bend Screen or Reposition Filter to Clear Blower & Running Gear
7 Controls	Listen for Source of Noisy Control and Check Control. (OBSERVATION) <i>Solenoid Valves</i> <i>Relays</i> <i>Transformer</i>	a. Low Voltage to Relay Coil More Than 10% Below Rated Voltage	Correct Cause of Low Voltage
		b. Loose Relay Mounting	Tighten Mounting or Isolate Relay From Direct Metal to Metal Contact.
		c. Defective Relay	Replace Relay
		d. Low Voltage to Solenoid Coil More Than 10% Below Rated Voltage	Correct Cause of Low Voltage
		e. Stuck or Defective Valve	Replace Valve
		f. Noisy Solenoid	Replace Solenoid
		g. Loose Transformer Mounting	Tighten Mounting
		h. Noisy Humming Transformer (Loose Windings on Core)	Replace Transformer
8 Cabinet And Duct	Listen for Source of Noise and Relate it to Furnace Operation. (OBSERVATION) <i>Burner Running Only.</i>	a. Loose Access Door Panels Or Casing Panels	Properly Seat Panel, Secure at Point of Engagement or Provide a Pad at That Point
		b. Fuel Lines Rattling Against Cabinet	Isolate Line From Contact With Cabinet
		c. Burner Draft Tube Contacting Furnace Receiving Tube	Check Rope Packing and Gasketing And Repair or Replace
		d. Thermal Expansion of Metal Causing Oil Canning	Determine Point of Oil Canning And Stiffen or Upset or Fasten Panel at That Point to Prevent an Overcenter Popping
	<i>Blower Running Only</i>	e. Loose Blower or Running Gear Causing Noise Transmission To Cabinet or Duct	See B3, B4, B5 and B6
		f. Loose Access Door Panels Or Casing Panels	Properly Seat Panel, Secure at Point of Engagement or Provide A Pad at That Point
		g. Oil Canning of Metal Due To Air Pressure Change When Blower Starts. Either in Discharge Side or Return Air Side	Determine Point of Oil Canning And Stiffen or Upset or Fasten Panel at That Point to Prevent an Overcenter Popping
		h. Broken Spotwelded Joint	Secure Joint with Sheet Metal Screw

IV. COMPLAINT: NOISE C. FAULT: AIR NOISE

SOURCE	PROCEDURE	CAUSES	CORRECTION
1 Blower	Inspect Blower and Blower Compartment for Air Obstruction or Restriction. Turn Blower on and Listen for Source of Air Noise.	a. Loose or Improperly Positioned Blower Cutoff Plate	Secure or Reposition Cutoff Plate
		b. Blower Running Too Fast	Slow Blower Down for 85° To 95° Temperature Rise
		c. Extremely Dirty or Blocked Air Filters Causing Blower To Stall	Clean or Change Filters or Remove Source of Blockage
		d. Out of Center Blower Wheel— Too Close to Cutoff Plate	Check Blower Running Gear Mounts and Repair or Reposition Them to Bring Blower Wheel Back to Center
		e. Loose Debris in Blower Housing Causing Air Whistle	Remove Debris
2 Air Duct System	Turn Blower on and Listen for Source of Noise Along Duct System and at Registers.	a. Air Leaks in Cabinet Joint or Duct System	Secure Joint or Cover Opening in Ductwork
		b. Sharp Metal Obstruction in Air Stream Causing Whistling	Remove Obstruction
		c. Joint Edge Facing into Air Stream	Cover Edge of Joint
		d. Overly Restricted Discharge System from Dampers or Outlets Being Closed or Covered. Causes Blower to Stall	Remove Restrictions Check Temperature Rise
		e. Return Air Grille Close To Blower Compartment Inlet	Line Inlet Duct with Acoustical Material

V. COMPLAINT: ODOR

SOURCE	PROCEDURE	CAUSES	CORRECTION
1 Fuel Oil	Inspect Storage Tank, Fuel Piping System and Burner For Signs of Oil.	a. Leak in Supply or Return Oil Line System	Tighten or Replace Connection Or Replace Ruptured Line
		b. Oil Tank Improperly Vented To Outdoors (Basement Tank)	Correct Venting and Secure Vent Connections
		c. Seepage Around Fill or Vent Connections Causing Oil Film On Tank Especially After An Overfill. (Basement Tank)	Wipe Tank Clean. Secure Fill, Vent and Gauge Connections
		d. Seepage Through Oil Pump Cover Gasket or Pump Shaft Bearing	Replace Oil Pump
		e. Loose High Pressure Oil Line Connection to Gun Assembly	Tighten Connections or Replace Oil Line
		f. Fuel Oil Filter Leakage	Correct Cause of Leakage or Replace Filter
2 Combustion	Check Combustion for CO ₂ , Smoke and Stack Temperature with Blower Off and with Blower Running. Inspect all joints in Flue System for Loose or Open Connections.	a. Too Low Draft or Pressure in Flue	Locate and Correct Cause for Low Draft. Set Draft for 0.03 To 0.04 Inch in Flue
		b. Dirty or Restricted Heat Exchanger	Clean Heat Exchanger
		c. Loose or Damaged Heat Exchanger Gasket. CO ₂ Less With Blower Running Than with Blower Off	Replace Gasket and Tighten Gasket Cover Plate Fasteners
		d. Loose or Open Inspection Door	Close Inspection Door and Secure Hinged Mounting Connections

(Continued)

V. COMPLAINT: ODOR

SOURCE	PROCEDURE	CAUSES	CORRECTION
2 (Continued) Combustion		e. Loose or Open Flue Pipe Joints	Secure Joints and Seal with Asbestos Tape
		f. Loose or Open Flue Pipe Thimble Connection Into Chimney	Secure and Seal Thimble Connection
		g. Damaged, Restricted or Blocked Chimney	Repair Chimney or Remove Restriction
		h. Delayed Ignition or Hard Burner Starts	See Section IV A1
		j. Burner Pulsation	See Section IV A3
		k. Down Drafts Due to Insufficient Chimney Height	Check Chimney for Proper Height Above Roof Line and Correct
3 Air System	Check Furnace Compartments, Filters and Duct System for Dirt, Oily Films, Debris and Moisture.	a. Accumulated Dirt and Debris	Clear Debris and Vacuum Duct System
		b. Oily Film in and Around Blower Or in Duct System	Remove Film and Locate and Correct Cause of Film
		c. Water or Moisture	Dry and Locate and Correct Cause of Water or Moisture
		d. Humidifier Stagnant Water Or Sludge	Clean Humidifier and Check Operation
		e. Dirty Filters	Clean or Replace Filters
		f. Outdoor Odors Entering Fresh Air Intake	Remove Source of Odor or Relocate Intake

VI. COMPLAINT: COST OF OPERATION

SOURCE	PROCEDURE	CAUSES	CORRECTION
1 Fuel	Check Combustion for CO ₂ , Smoke and Stack Temperature. Determine Combustion Efficiency. Check Temperature Rise. Check for Causes of Excessive Negative Pressure in House From Exhaust Fans, Fireplaces, Etc. Check Building Insulation Check for Abnormal Air Infiltration	a. Dirty Filter	Replace Filter
		b. Low Combustion Efficiency - Less Than 75%	Determine Cause and Correct
		c. Too High Temperature Rise	Correct Cause of High Temperature Rise
		d. Excessive Negative Pressure in Building	Correct Cause of Excessive Negative Pressure or Provide for Outside Makeup Air
		e. Insufficient Insulation or Excessive Air Infiltration	Advise Homeowner and Recommend That it be Corrected
		f. Too Large Nozzle Causing Short on Cycles at Design Temperature	Reduce Nozzle Size to Match Heat Loss Requirements (See Nozzle Chart)
		g. Excessive Flue Draft	Adjust Barometric Damper To 0.03 To 0.04 In.
2 Electrical	Check Motors and Transformers for Excessive Current Draw, Above Nameplate Rating. Check for Low Voltage.	a. Low Voltage - Less Than 105 Volts.	Correct Cause or Call Power Company
		b. Too Low Temperature Rise High Blower Motor Load	Slow Down Blower for 85° To 95° Rise
		c. Faulty Blower Motor - High Amp. Draw	Replace Blower Motor
		d. Faulty Burner Motor - High Amp Draw	Replace Burner Motor
		e. Faulty Ignition Transformer High Amp Draw	Replace Ignition Transformer
		f. Blower Belt too Tight	Loosen Belt