Chapter 14
PREVENTATIVE MAINTENANCE TUNE-UPS

IN THIS CHAPTER
• The importance of preventative maintenance
• The tools you need to perform preventative maintenance
• A step-by-step procedure for performing a preventative maintenance tune-up
The preventive maintenance tune-up is the most important service our industry offers. A properly performed tune-up assures the customer that their heating system is operating at peak safety, reliability, and efficiency.

**Four key factors for a proper tune-up**

- Safety
- Efficiency
- Reliability
- Cleanliness

**Safety**

During the tune-up, you will check the system’s controls to be sure they work properly and shut the burner off if a problem develops. You will also adjust the burner to reduce the chances of a carbon monoxide build-up.

**Efficiency**

When you use your combustion analysis kit to adjust the system for maximum efficiency, you’re actually helping your customer to conserve oil and save money. The tune-up also gives you the opportunity to recommend new equipment to those customers whose systems are not as reliable or as efficient as today’s modern oilheat equipment.

Checking the system
Equipment integrity
Typically, you may replace certain failed parts (nozzles and filters); look for and correct potential problems; lubricate motors; and check controls.

Cleanliness
Unfortunately, most of the work you do during a tune-up is not visible to the customer. An important part of every tune-up is to make sure that what the customer does see—the outside of the unit and the area around it—are neat and clean when you’ve finished.

By focusing on these four factors during the tune-up, you will save your customer money by minimizing their fuel consumption and help to avoid the inconvenience of an oilburner breakdown during the heating season.

Tools of the trade
To successfully perform a tune-up, your truck must have certain tools, instruments, parts, and supplies. You need to have at least the following:

A complete set of hand tools including:

- Standard wrenches—depending on the type of burners you service, these can be standard, metric or both.
- At a minimum, you will want to have a set of 1/4” through 3/4” standard open and box wrenches.
- Adjustable wrenches—an eight-inch and a ten-inch handle adjustable wrench.
- Socket wrench kit—1/4” to 3/4”.
- Pliers—groove joint pliers (commonly called water-pumps or channel locks), linesman pliers, locking pliers (Vise Grips®) and needle nose pliers.
- Allen wrenches (hex keys)—a standard set.
- Screwdrivers—an assortment of slotted and phillips heads.
- Nut drivers—3/16”, 1/4”, 3/8” and 1/2”.
- Wire cutter and stripper.
- Tubing cutters—3/4” regular and mini.
- Flaring tool.
- Flash light with spare batteries.
- Drop light.
- Jumper leads with insulated alligator clips.
- Tape measure—12’ minimum.
- Drill and drill bits.
For Riello Burners you’ll also want to have:

- 10mm and 12mm wrenches
- #4 and #5 Torx screw drivers
- 4mm and 5mm Allen wrenches (long and short handle)

Test equipment—pressure gauge, vacuum gauge, electric meter, and complete efficiency kit.

Vacuum cleaner, assorted adaptors and flue brushes.

Supplies—furnace cement, rags, cleaner, drip tray, builder’s paper or other floor covering.

As a professional, you should keep your tools and supplies organized and in good condition. Not only will they serve you better, you will project the image of a professional.

Tune-up procedure

The following are the procedures for a typical tune-up. Individual companies often develop tune-up procedures that vary from these, so it is important that you follow your company’s policies and procedures.

This is an effective way to perform a tune-up in a thorough, systematic manner. Although there may be circumstances that make it impossible to do all the operations in the suggested sequence, we urge you to follow this outline whenever possible.

Step 1. Customer Interview: Give your customer a friendly and professional greeting. Courteously ask if they have experienced any problems or if they have any questions. Listen carefully and address their concerns.

Ask to see the thermostat and check for obvious problems. Check the heat anticipator setting, and make sure that it is level and set 10 degrees above the room temperature. Listen for the burner and/or circulator to start and then operate the emergency switch to be sure it works properly. Leave it in the off position.

Step 2. Visually inspect the unit:

Visually inspect the unit while you spread sheets of newspaper or clean drop cloths to protect the work area. Verify the heat anticipator setting is proper for the control and that limit controls are properly set with the correct differential. Note what kind of filter and pump are installed so you can bring the right replacement parts.

Check the flue pipe to be sure that it is properly screwed together and supported. If it is not, be sure to include a fix in your procedure.

If the unit has not been in operation for some time, turn the burner on for about 5 minutes to dry the heat exchanger surfaces. Check the draft drop by testing at the breech and over-the-fire. If the drop is greater than -.04 inches, there is probably a build up of soot and scale, or you may have air leaks in the unit. Note any problems so that you can repair them during the tune-up and turn the unit off before proceeding.

NOTE: If you run the burner, or if it was operating when you arrived, be extremely careful when vacuuming the unit. Allow it to cool enough to prevent hot embers from entering the vacuum.

Step 3. Inspect the oil tank: NORA recommends that if possible, technicians
check the oil tank for water during tune-up. If you find water in the tank report it to your supervisor so arrangements can be made for it to be removed and an investigation made as to the source. Be sure to tighten any tank plugs you may have removed while checking the tank for water when you are finished. See Chapter 3 for tank inspection procedures and more information on tank maintenance.

**Step 4. Oil lines, valves, and filters:**
Shut off the oil valve and remove the filter canister—use a pan to collect the extra oil. Clean and check the filter canister and replace the cartridge and gaskets. If you find evidence of excessive sludge or water, notify your supervisor so corrective action can be scheduled.

Inspect the oil line for leaks, kinks or dents. If the line is run underground check to be sure it is made of coated copper or run in protective tubing; if bare copper is run underground, report it to your office. Make sure there are no compression fittings. If you find any, replace them with flare fittings.

**Step 5. Fuel unit:** Clean or replace the pump strainer, carefully scraping off the old gasket before installing a new one.

Open the valve, turn the switch on and bleed the unit. Run oil through a clear tube into a container until there are no visible air bubbles. Check for leaks at the valve stem, filter, and the pump gasket.

Disconnect the nozzle line from the drawer assembly and install your pressure gauge on the nozzle line. Operate the unit until the pressure holds steady and increase the pressure 40-50 PSI above the recommended setting. Check that the pressure reading changes smoothly as you turn the adjustment screw. A pulsating or bouncing needle could indicate a leaking oil line or a bad pump. After adjusting the pump back to its proper setting, wait until the unit shuts off on safety and verify the primary control’s safety timing. When the unit shuts off, the pump pressure should drop no more than 15 to 20% and then hold steady. If the pressure continues to drop, the pump has a bad cut-off and requires replacement.

**Step 6. Nozzle or firing assembly:**
Mark the position of the firing assembly on the burner housing—remove it and note the nozzle type, size and spray angle. Verify that these match the unit data plate or the listing in your manufacturer’s OEM guide.

Remove the nozzle and carefully drain the oil into a container. Inspect the nozzle adapter. Replace it if it’s stripped, cracked, or if the seat is worn. Flush out the assembly, fill it with clean oil and install a new nozzle.

Clean, inspect and adjust the electrodes using the appropriate gauge.

Clean and inspect the air tube, including
the end cone slots and holes. Verify that the air tube is inserted to the correct position.

Reinsert the nozzle assembly into the air tube and secure it in place, making sure it is in the same position that you marked earlier.

**Step 7. Burner motor, housing and fan:** Remove the burner motor and check the burner housing for oil that could indicate a loose fitting, cracked flare or leaking fuel pump seal.

If there are oiling points on the motor; lubricate each with 3-4 drops of SAE 20 non-detergent oil. Cooling slots should be clear. Check the motor shaft for end play; if it is excessive, replace the motor. Inspect the burner coupling to be sure it is not worn or stripped. Clean the air inlets and fan using a small brush. After you reinstall the motor, spin the fan a few times to make sure that the motor, fan and pump are moving freely and that everything is properly connected. Check all wires and connections at the burner.

**Step 8. Transformer and cad cell:** 
Clean and check the transformer bushings and springs. Inspect the ignition wires. Clean the cad cell eye and wires. Make sure the bracket is positioned correctly for good flame sighting.

As you close the transformer, be sure the electrodes are making solid contact with the transformer springs and that no wires are being cramped.

**Step 9. Clean the flue pipe:** Remove the flue pipe and brush it out, inspect the pipe’s condition, replace it if necessary.

Check the draft regulator to be sure it swings freely.

If the unit has a stack relay, inspect and clean the helix and the relay contacts.

Clean out the chimney base and check the chimney for blockages. If there’s an accumulation of broken brick or liner, advise the customer to contact a chimney professional and note this information on your service ticket.

If the unit is equipped for power venting, clean and check the fan blower wheel. Oil the motor and check the draft-proving switch. Remember to check and clean the outside hood and exterior mechanism.

**Step 10. Clean the heat exchanger and combustion area:** Remove any baffles and scrub the flue passages, keeping your vacuum hose close to the brush to avoid spreading soot. Look for signs of air or water leaks.

Use a soot snorkel to clean the combustion area, being careful not to damage the chamber or target wall. Inspect the condition of the refractory material and repair or replace it as necessary.

**Step 11. Replace, seal and fasten:** 
Reassemble the unit using furnace cement if necessary to seal any air leaks. Double-check
14-8 Preventative Maintenance Tune-ups

Chapter 14
Preventative Maint./Tuneups

to be sure the flue pipe is connected with sheet metal screws and is supported.

Step 12. Fire the unit and check operation: Start the burner, check the appearance of the flame and make sure that there is no impingement. Cycle the burner to check for prompt ignition, smooth operation and clean cut-off.

Disconnect the thermostat leads and install a jumper across the T-T terminals to keep the burner running. Check the operation of the high limit control.

Step 13. Efficiency test and adjustments: Perform a complete efficiency test and record the readings. The readings should be:

- Smoke: zero to a trace
- Draft: Unless the unit is designed for positive pressure, draft over-the-fire should be approximately -.02wc (negative point zero two inches)
- CO₂: 10½ to 12%
- Net stack temperature: over 350°F

When you have finished adjusting the burner, remember to remove the jumper from the T-T terminals and replace the thermostat wiring.

Step 14. The heating system: The following steps will vary depending on the type of heating system you are working on. If there is more than one thermostat, ask the customer to set each one 10 degrees above room temperature.

Hot water system
Check the zone valves and/or circulators to be sure each operates properly. If applicable, lubricate the circulator motor and bearing assembly. Check the circulator couplings and motor mounts. Check the control settings to be sure they’ll provide for proper heating, hot water, and circulator operation.

Check the system pressure and the expansion tank.

If there is an indirect water heater, check the circulator and control.

Warm air system
Open the blower compartment to clean, check and lubricate the blower if applicable.

Check the air filters and clean or replace them. Note the filter size on your service ticket and remind the customer to check and clean/replace the filter regularly.

Check the condition and tension of the fan belt, replace, and adjust as required.

Check the blower mountings and bearings for excessive wear. Then properly reinstall the blower compartment door.

Check the blower limit settings.

If there is a humidifier, check it for proper operation, water leaks and mineral build up.

Steam boiler
Check the low water cutoff by draining water from the system until the burner shuts off. Check the automatic water feeder.

Clean the sight glass and replace it and the washers if necessary. If the glass fills with dirty, oily water, skim the boiler until it clears up.
Check the main vents and look for evidence of leaks.

When you have completed these steps, be sure to return all controls to their proper settings and double check to be sure that you removed any jumpers you may have used.

Ask the customer to reset all thermostats to their normal settings.

**Step 15. Cleanup the work area:** Once you’re satisfied that everything is working properly, use a garbage bag to remove old parts, oil absorbent and newspaper or drop cloths so that nothing can fall out on your way back to your truck. Use your vacuum cleaner to clean the area around the system. Return your tools to their proper places in your truck and clean your hands.

**Step 16. Double-check your work:** Check your work area one last time. Pay particular attention to potential sources of oil leaks such as the filter canister, pump, burner housing and oil valve.

**Step 17. Make it shine:** Spend a few more minutes cleaning up. Wipe and clean all of the external surfaces of the boiler or furnace and work area. Use only clean rags so you do not leave an odor behind.

**Step 18. Reset and record:** Verify that thermostats and controls have been returned to their proper settings. Fill out the service card with the work you have performed, the parts you have replaced, the efficiency readings, the nozzle size, and the safety timing.

Fill out your company’s required paperwork completely, including all of the information on the service card plus the oil level and anything that needs to be followed-up on.

**Step 19. Report to the customer:** Before you leave, explain what you have done and be sure to follow-up on any concerns discussed during the initial interview. Explain the efficiency test results and advise them about potential energy saving improvements.

If follow up work is required, explain what and why.

Have the customer sign the work order, give them the appropriate copy and thank them for their business.