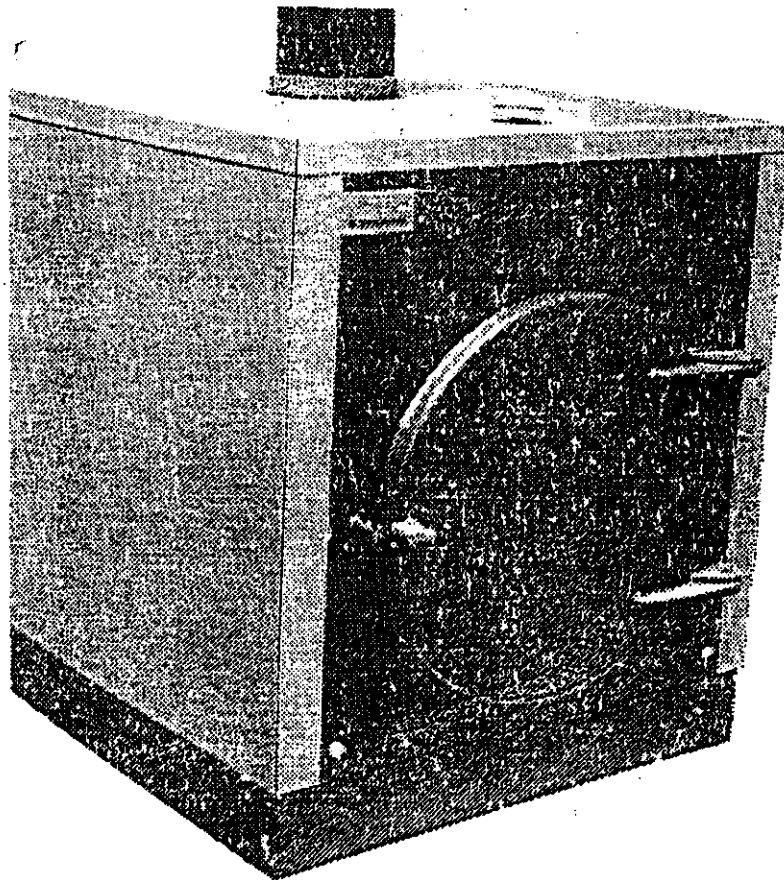


HS TARM

AD-24 WOOD BOILER

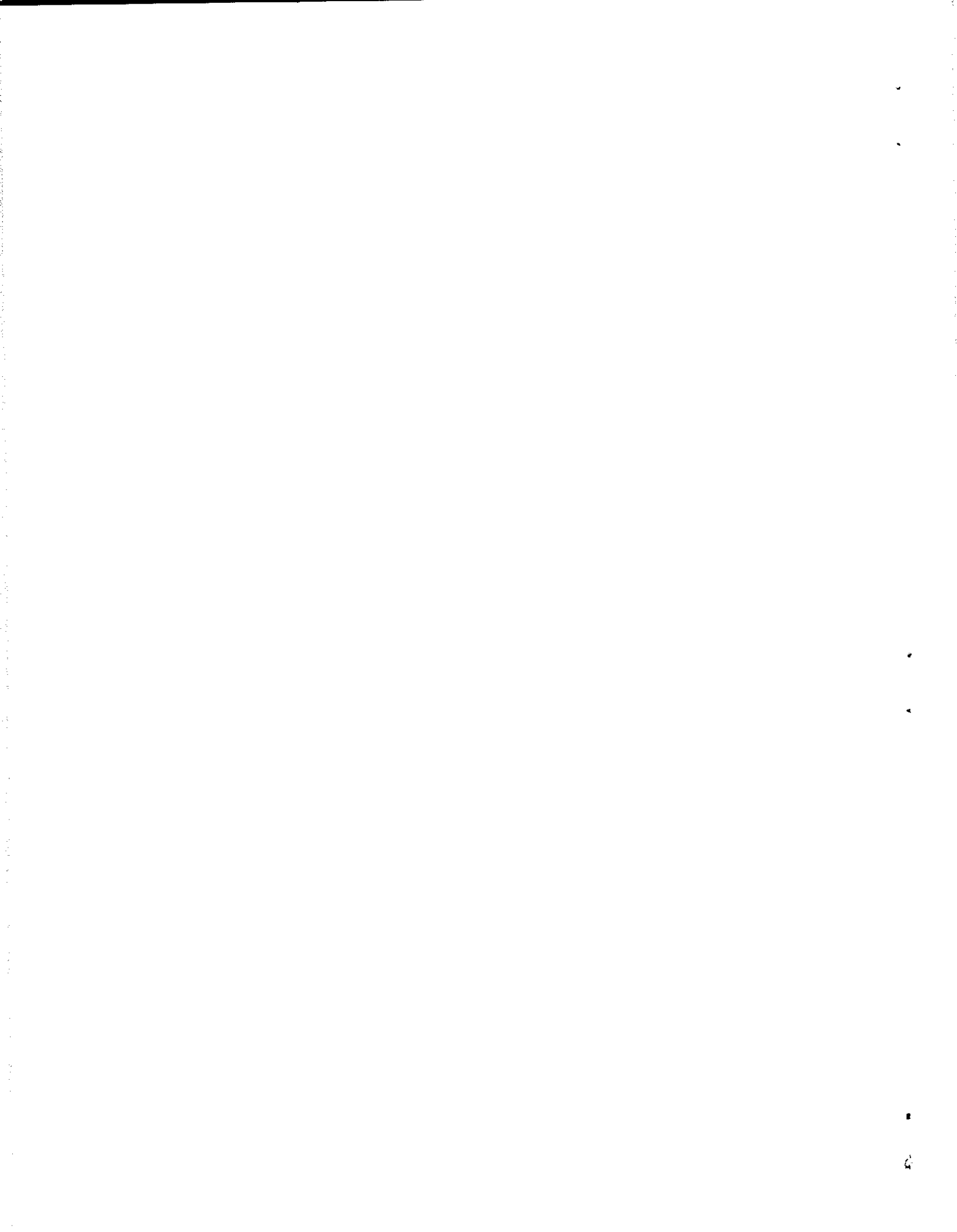


**ENHANCED COMBUSTION
WOOD BURNING SYSTEM**

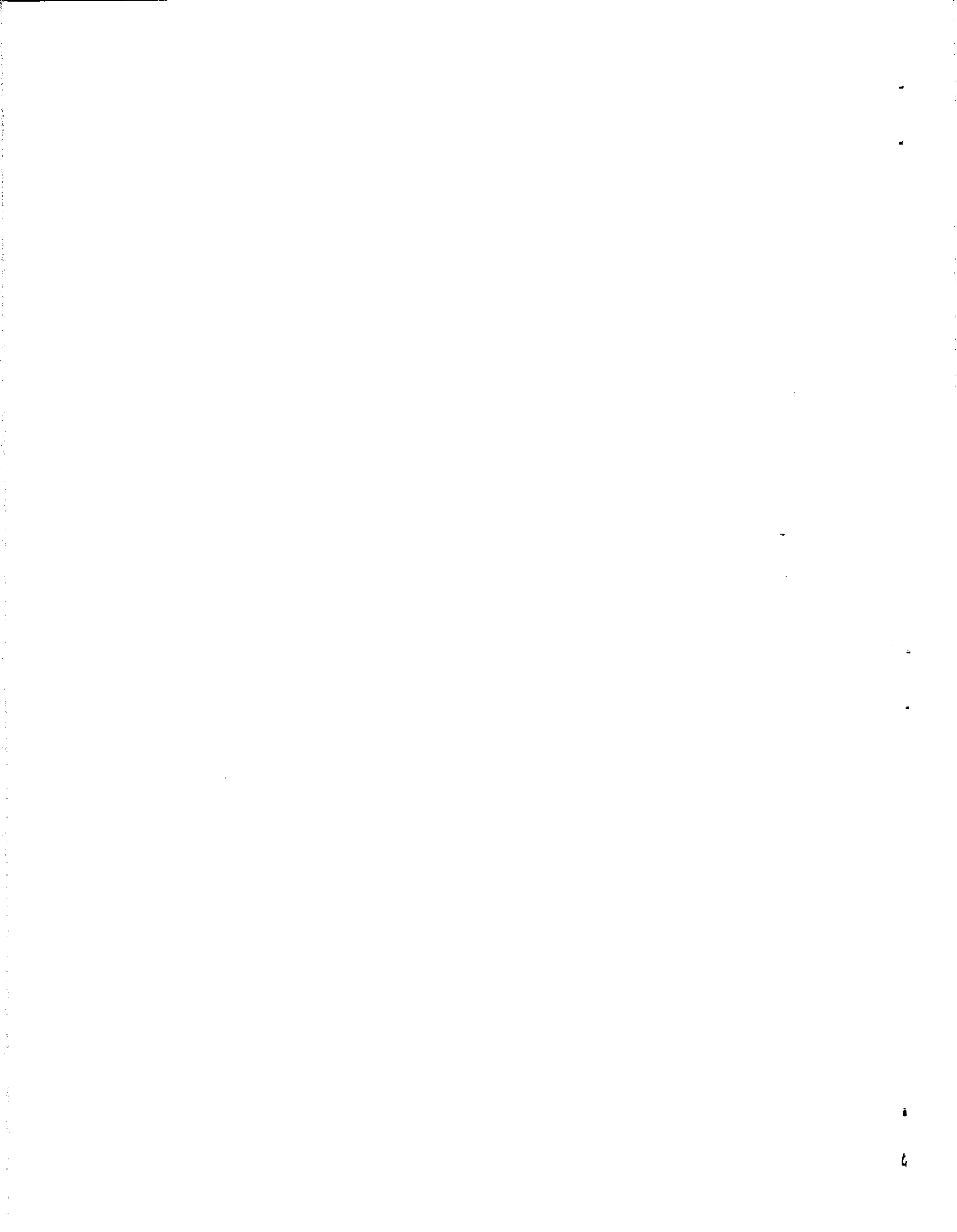
INSTALLATION AND OPERATION MANUAL

SAVE THESE INSTRUCTIONS!

TARM USA, INC., 5 Main St., Lyme, NH 03768
1-603-795-2214



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IMPORTANT INFORMATION -PLEASE READ THIS PAGE CAREFULLY !

This boiler has a limited warranty, which appears on the folder included with this manual. To validate your warranty, detach the prepaid postcard, fill in the information requested and return the card to TARM USA INC.. The serial number can be found on the boiler label.

General Information

Please read the literature enclosed by the manufacturer with the various accessory devices. These devices are warranted by the manufacturer, NOT by TARM USA. These accessory devices must be installed and used according to the recommendations of the manufacturer.

All boilers must be installed in accordance with national, state and local plumbing, heating and electrical codes and the regulations of the serving electric, water and gas utilities.

All systems should be designed by competent contractors, and only persons knowledgeable in the layout and installation of heating systems should attempt installation of any boiler.

It is the responsibility of the installing contractor to see that all controls are installed correctly and operating properly when installation is complete.

Please read carefully the Section on Maintenance. Failure to protect your boiler from condensation during the warmer months **MAY VOID YOUR WARRANTY!**

Homeowners should read and familiarize themselves with **BOILER OVERHEATING and PROCEDURES IN EVENT OF POWER FAILURE.**

Do not use gasoline, kerosene or other flammable liquids to start or maintain solid-fuel fires in your boiler, or serious burns and property damage may result.

Do not store any combustibles, including fuel for the boiler, within the fire clearances specified below in "Installation Information". Keep fuel clear of the fuel-loading and ash-removal access areas.

NOTE: Boiler Made by:
HS KEDLER TARM
DK-6880
TARM DENMARK

WARNING: This boiler is designed to burn wood. Both hard and soft woods may be used. Do not burn Coal in this boiler !

Installation Information

The boiler must be connected to a tile-lined masonry flue or other Class "A" HT approved chimney. No other appliance should be connected to this flue unless local codes allow this. Consult your local building inspector for the chimney requirements, and install the boiler in accordance with all applicable codes.

The boiler requires adequate fresh air supply for efficient and safe operation. For more information refer to NFPA standard #31.

Boiler must be positioned to provide minimum clearances from combustibles or combustible surfaces as follows: **LEFT AND RIGHT SIDE 10"; TOP 36"; FRONT- 36"; REAR & SMOKEPIPE 18".**

There must be a minimum clearance of 18" between smoke pipe and all combustible surfaces.

Clearance to hot water pipes is 1 inch.

Use 5 turns of TEFLON tape to seal all threaded connections.

When references are made to tapping numbers please refer to page 6.

Note: The proper boiler operating temperature for all TARM boilers is 180°F.

Installation must conform to ANSI / NFPA standard #211

MINIMUM REQUIRED FLUE SIZE--8" X 8" TILE OR 7" ROUND

MINIMUM DRAFT--.05 IN/WG DURING NORMAL OPERATION

I. INITIAL ASSEMBLY AND PLACEMENT

1. Unpack the items in the Boiler Body, Accessory box and Jacket Box and check off the items enclosed against the items listed below:

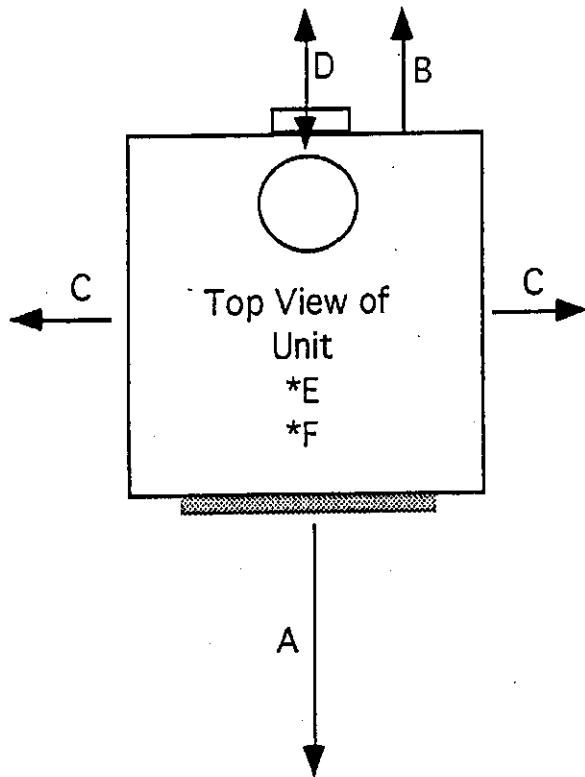
Boiler Body with Poker, Damper handle, Flue Sleeve

Jacket Box

Accessory Box with:

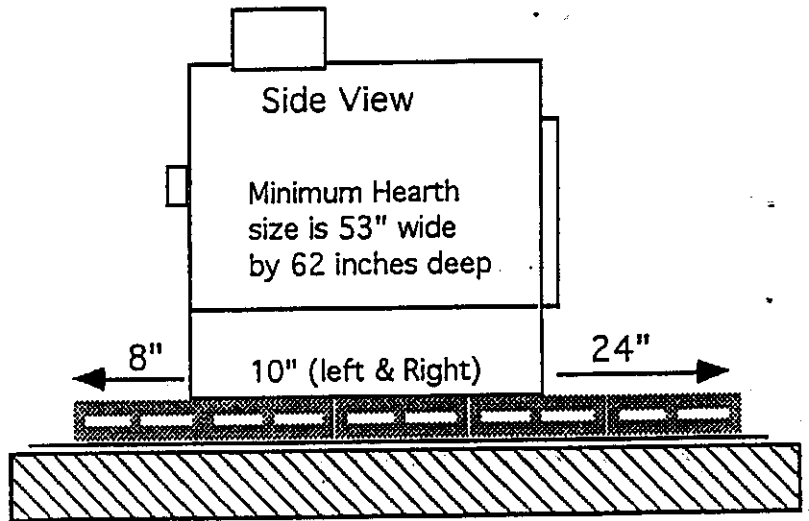
Aquastat (4006B)	Samson Control	3/4" Immersion Well	Boiler Relief Valve #10-407-05
Pressure/Temperature Gauge w/bushing	3/4" Service Elbow (Iron)	1"x1"x3/4" Tee (Iron)	1"x4" Steel Nipple
3/4" Close Nipple & Coupling	Coil Pressure Relief #17-402-02 (if optional coil is installed)		

2. Place the boiler on a level non-combustible surface as close to the chimney as possible. Please follow the minimum hearth size and clearances listed below.



Minimum clearances to combustible walls	
A-	36 inches (front)
B-	12 inches (rear)
C-	10 inches (sides)
D-	18 inches (smokepipe)
E-	36 inches (top of unit to ceiling)
F-	24 inches (top of pipe to ceiling)

Hearth Size and Construction

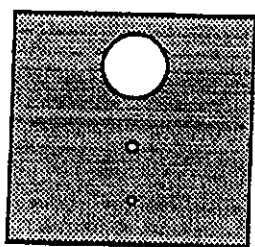


Floor material can be one of the following:

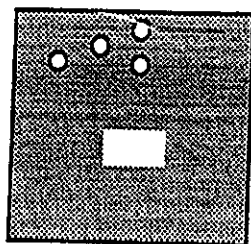
1. Concrete slab on grade
2. Bare earth with single layer of brick or 4 inch solid cement block
3. Frame floor with 24 ga sheet metal and 6 inch hollow cement block set with hollow spaces horizontal so as to allow air circulation under unit (shown above)—Note: Floor may have to be braced from below to handle weight of unit and water (approx 1200 Lbs)

A. Jacket Assembly

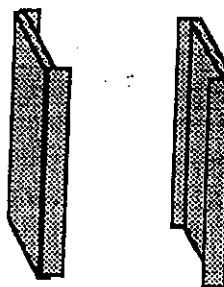
1. The boiler comes with a four (4) piece enameled jacket. Identify each jacket panel before starting the assembly.



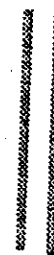
Top



Rear



Sides



formed
steel strips

2. Mount the rear panel by fitting the rectangular opening in the jacket panel over the air inlet damper on the rear of the boiler. Push the jacket panel tight against the boiler making sure the positioning tabs on the bottom of the panel are overlapping the steel boiler base.

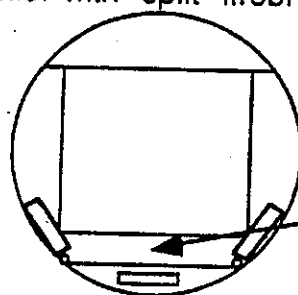
3. Place one side panel against the boiler and slide the preformed steel strips down over the folded vertical edges between the side and rear panels. Be sure that the positioning tabs on the bottom of the side jacket panel are overlapping the steel boiler base plate. This will assure that the bottom of the side panels are held tight against the boiler. Repeat for the other side panel.

4. Mount the top jacket panel over the top edges of the side and rear panels. Be sure to place the top edges of the side and rear panels into the formed slot which runs around the outside of the top panel.

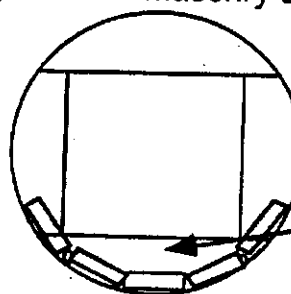
Your Jacket is now fully assembled.

B. Grates, Ash pan and Firebrick

Your AD-24 boiler is shipped with cast iron grates and ash pan installed. In colder weather, you may remove the grates and ash pan in order to increase the firebox size. To convert the firebox to this larger size, simply remove the grates and ashpan, and install the solid steel Ash Deflector as shown below. Line the bottom of the boiler with "split" firebricks (available at your local masonry supply).



With Ashpan

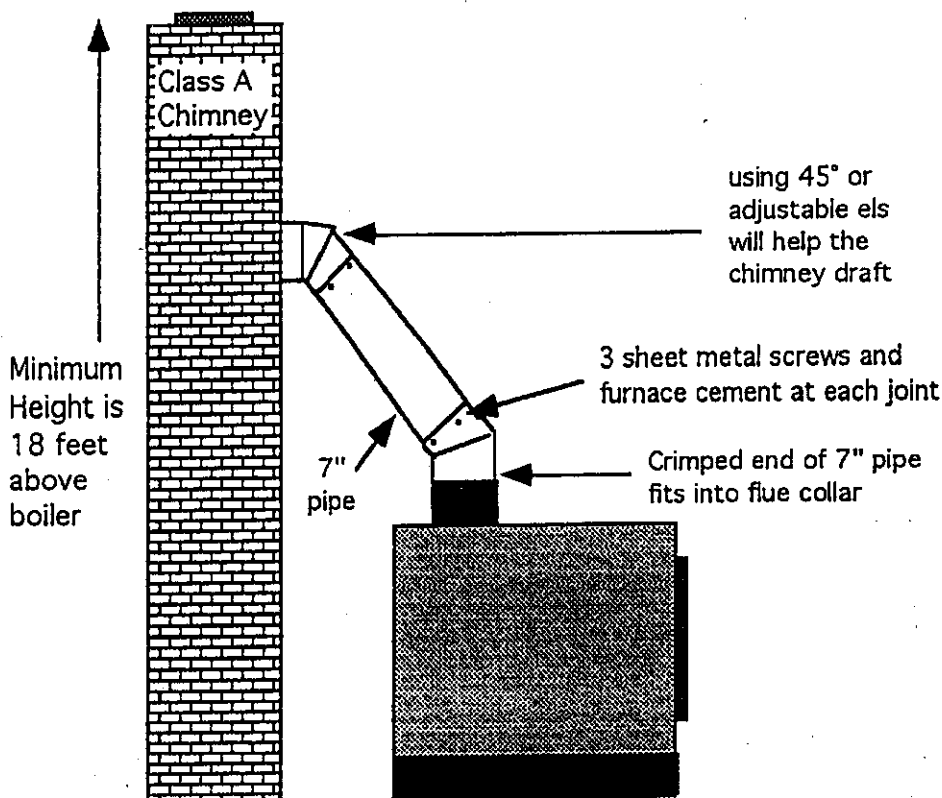


Without Ashpan

C. Chimney Connection

Note: The chimney is an important part of every installation as it provides the draft or "pull" needed for proper operation of the boiler. The proper attention to the chimney and chimney connection will assure your satisfaction and safety with the TARM boiler.

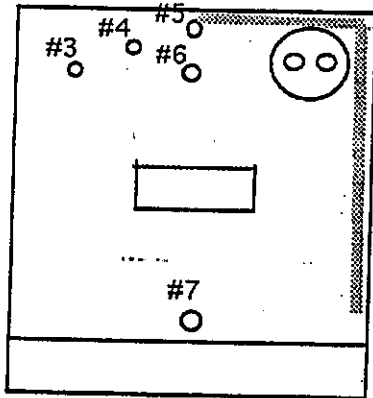
1. In some areas, building codes require that no other appliance be connected to the flue serving a wood burning appliance; consult your local building inspector for chimney requirements and install the boiler in accordance with all applicable codes.
2. The TARM boiler is designed for use with an approved class "A" chimney. The chimney can be either a masonry chimney (built to NFPA #211 code, minimum interior dimension 7"x7") or a prefabricated stainless steel chimney (Type HT 2100--7" round I.D. or larger). The TARM AD-24 must be connected to the chimney by an approved connector (stovepipe) with a minimum thickness of 24 Ga. This pipe must slope upwards at least 1/4" per foot on horizontal runs. Connect to the chimney using the shortest and most direct route available. Keep 90° smoke pipe turns to a minimum as they will reduce your chimney draft.



D. Control and Accessory Assembly

NOTE: Instructions given below are for use when the AD-24 is used as an add-on to an existing oil or gas boiler. Consult a heating expert or TARM USA for information on other control systems.

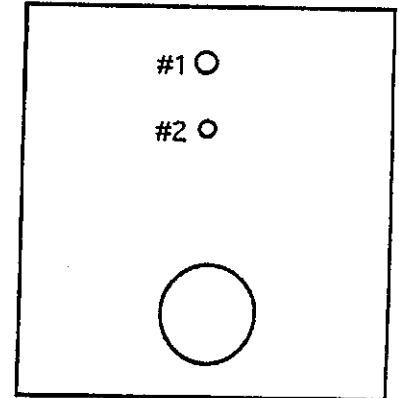
NOTE: All threaded piping connections must be made with at least 5 turns of Teflon tape



Rear View

Tappings

- #1- 1/2" Temp Gauge
- #2- 1/8" Air Vent
- #3- 3/4" Ammark Control
- #4- 1" Return
- #5- 3/4" Pressure Relief Valve
- #6- 1" Feed & Overheat
- #7- 1" Drain
- #8- 3/4" DHW
- #9- 3/4" DHW



Top View

1. Install temperature / pressure gauge in tapping #1 on top of boiler (use bushing provided).

2. Install approved float type air vent into tapping #2 on top of boiler.

3. Install the Samson draft regulator into tapping #3 on the rear of the boiler. The set screw should be facing up. Follow the instructions provided with the Samson regulator for setup and final assembly of this control.

NOTE: The TARM AD-24 is designed for an operating temperature of 180° F. Adjust the Samson control to setting 80 (on the red scale) after the boiler is heated to 185°F and adjust the chain so the draft door is fully closed at this setting.

4. Install the service elbow (provided) into tapping # 5 with the open end facing upwards. Install the approved Boiler Pressure Relief Valve (conbraco 10-407-05 or equiv) into this service elbow on the rear of the boiler. **THIS VALVE MUST BE INSTALLED TO INSURE SAFE OPERATION OF THE BOILER AND FOR PROTECTION OF THE HEATING SYSTEM.** The discharge of this valve should be piped as per the dotted line on the diagram above. Be sure that the piping does not interfere with the operation of the draft door. Pipe the discharge from this valve to within 6" of the floor with no reduction in pipe size.

5. Install the 4" steel nipple and the 1"X1"X3/4" iron Tee (included in the accessory package) onto tapping #6 Face the 3/4" end of the tee upward. Thread the 3/4 inch nipple, coupling and the 3/4 inch immersion well into the 3/4 inch tapping and install the supplied Overheat Aquastat (L4006B) into this well. The control setting shall be 210°F with a 10° differential. The 1" end of the tee is now ready for connection to the heating loop or other boiler (see section II).

6. Install a reducer and a 1/2" or 3/4" Boiler Drain in tapping #7.

E. Domestic Hot Water System

A tankless coil for heating domestic hot water is available as a factory installed option on the TARM AD-24 boiler or it may easily be added after the boiler is already installed. The cover plate on the jacket is removable to allow easy access to the coil.

Pipe the cold water to tapping #8 , and hot water from tapping #9 (or vice versa) . It is desirable to install unions external to the boiler in both the cold and hot water lines. During the warmer months and when the TARM boiler is not in use for long periods of time, cold water must be piped separately to the separate Water heater, not through the coil in the TARM boiler. **COLD WATER MUST NOT FLOW THROUGH THE TARM DOMESTIC COIL IF THE TARM BOILER IS UNHEATED ! CONDENSATION AND CORROSION OF THE BOILER BODY CAN RESULT IF WATER FLOWS THROUGH THE UNHEATED BOILER.** Install the Pressure Relief Valve (Conbraco 17-402-02 100 psi) in a tee on the cold water supply to the tankless coil. There must be no shut-off valve or check valve between the relief valve and the tankless coil. The Relief VALVE DISCHARGE LINE MUST RE PIPED TO WITHIN 6" OF THE FLOOR NEAR A DRAIN, AND MUST BE 3/4"PIPE WITH NO REDUCTION. IF THIS VALVE OPERATES, HOT WATER WILL BE DISCHARGED. IT SHOULD BE PIPED TO AN OPEN DRAIN; SO THAT THIS WATER WILL NOT DAMAGE THE ROOM IN WHICH THE BOILER IS LOCATED. **NOTE: TO PREVENT THE POSSIBILITY OF A PERSON SUSTAINING SERIOUS BURNS FROM DOMESTIC HOT WATER, A TEMPERING VALVE (WATTS 70A OR EQUIV.) MUST BE INSTALLED TO PROTECT AGAINST DANGEROUSLY HIGH DOMESTIC WATER TEMPERATURES.**

NOTE: In certain areas, existing water supplies may have a high mineral content. This will lead to liming of the coil over time, depending on the mineral content of the water and the amount of water passing through the coil. Coils should be cleaned as soon as there is any indication that the hot water supply is being restricted. Coils are cleaned with hydrochloric acid-- **CLEANING THE COIL IS A DANGEROUS PROCEDURE THAT SHOULD BE ATTEMPTED ONLY BY A QUALIFIED AND EXPERIENCED PERSON.**

DOMESTIC HOT WATER PIPING WHEN A SEPARATE DHW HEATER IS USED IN THE SUMMER MONTHS

IN SUMMER: (or when TARM boiler is shut down) CLOSE Valve B and OPEN Valve A.

IN WINTER: (when TARM boiler is in operation) OPEN Valve B and CLOSE Valve A.

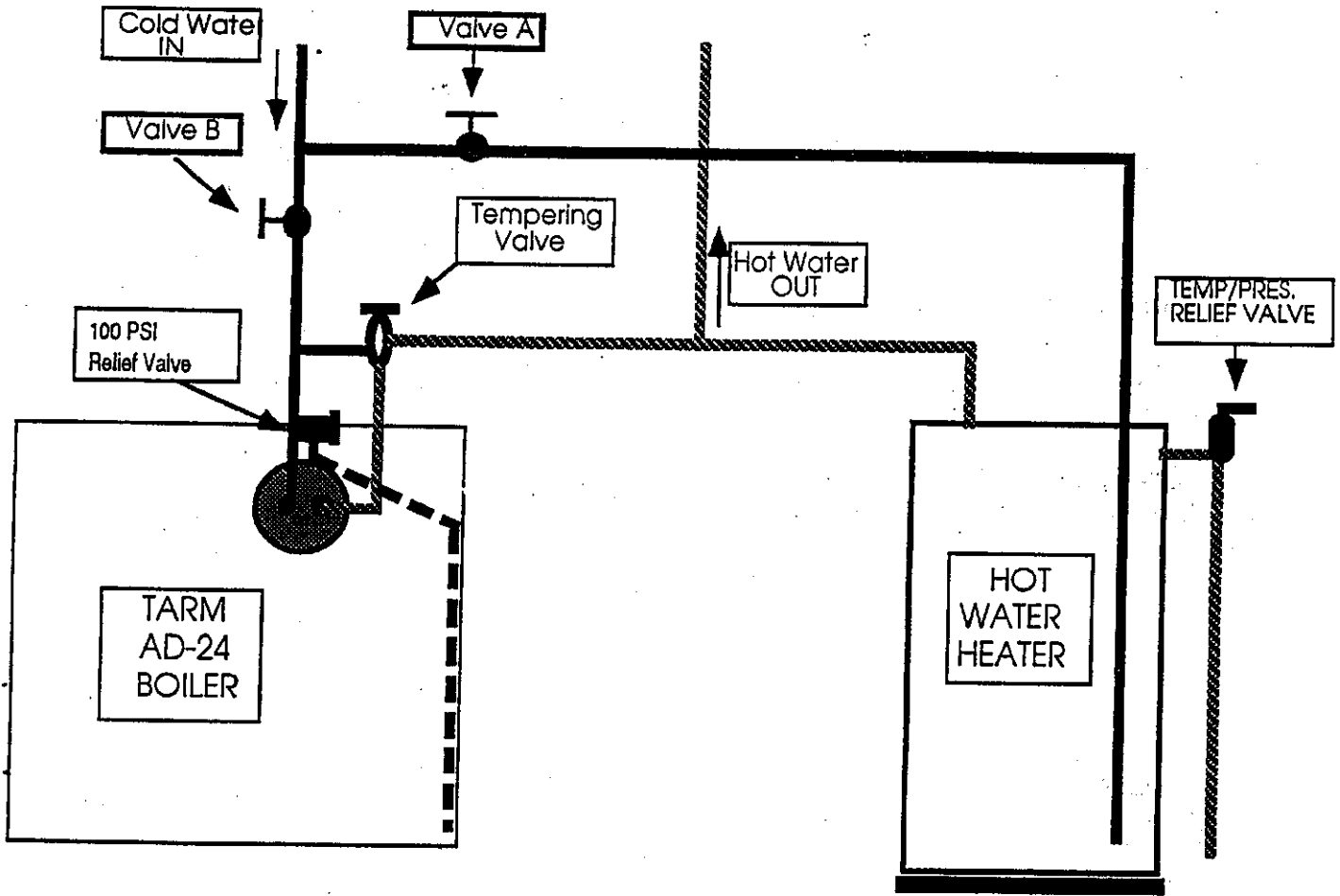


Diagram shows recommended piping for Domestic Hot Water Coil

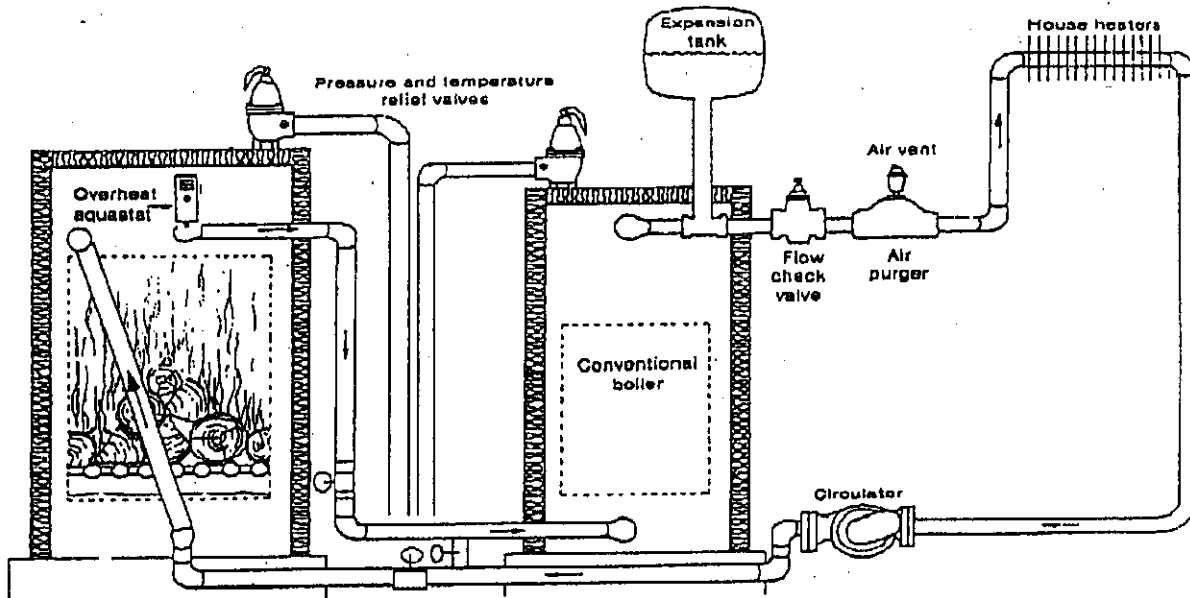
II. CONNECTION TO ANOTHER BOILER

A. Overheat Loop: the piping and controls must be connected to the boiler in such a way that in the event of a power failure there is one loop of radiation available for gravity circulation. This loop must not be obstructed by any valves or other accessories which would prevent gravity circulation during a power failure. The loop must be large enough to dissipate at least 15,000 BTU/Hr. The minimum pipe size for this loop is 3/4", and, if possible, the loop should be located and pitched to maximize natural thermal convection of the water. The design of the loop must be such that it can be made inoperative only by deliberate manual action. If large enough, an existing heating radiation zone may be used for the overheat loop. The supplied L4006B aquastat will be used to activate the primary overheat loop. This Aquastat shall be set at 210°F with a 10° F differential. A heating zone under circulator control may also provide enough overheat capacity.

B. Choosing the Right System

The TARM AD-24 is designed for use in conjunction with an existing oil-, gas- or electrically-fired boiler. The installation can consist of a series or a parallel hookup. Either installation can also be improved by the use of an AUTOMIX II 4-way mixing valve (See "AUTOMIX HOOKUP" pg 12) The type of installation chosen will depend upon the requirements of a given heating system. Please refer to the piping diagrams when reading the description of each system.

1. Series

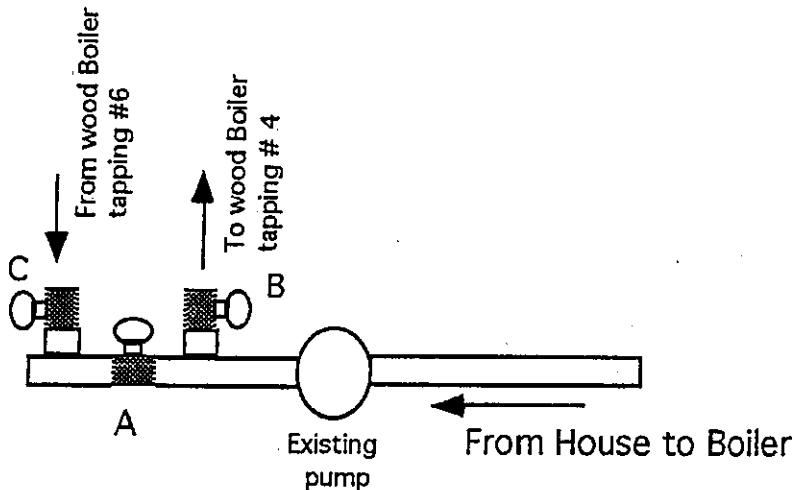


A series hookup is the most direct and simplest form of connection between the TARM AD-24 and an oil, gas or electrically fired boiler. A disadvantage of the series hookup is that if the domestic hot water coil is located in the other boiler, the TARM cannot produce domestic hot water unless the circulator is running. The use of the AUTOMIX II mixing valve with a series hookup will result in the best possible installation since it will provide constant circulation through both boilers and the home. For more information, see the AUTOMIX section of this manual.

NOTE: All wiring must be completed as per section III "Electrical Wiring".

Basic Theory: The series hookup involves cutting the existing boiler return pipe between the existing circulator and the boiler. Two tees and 3 valves are then installed so that by closing A and opening B & C all return water from the house can be directed through the TARM boiler previous to going through the oil or gas boiler. When it is desired to use the oil or gas boiler only, valves B and C can be closed and A opened in order to bypass the TARM boiler completely.

1) Cut the radiation return line and install two tees and three gate valves as shown below:

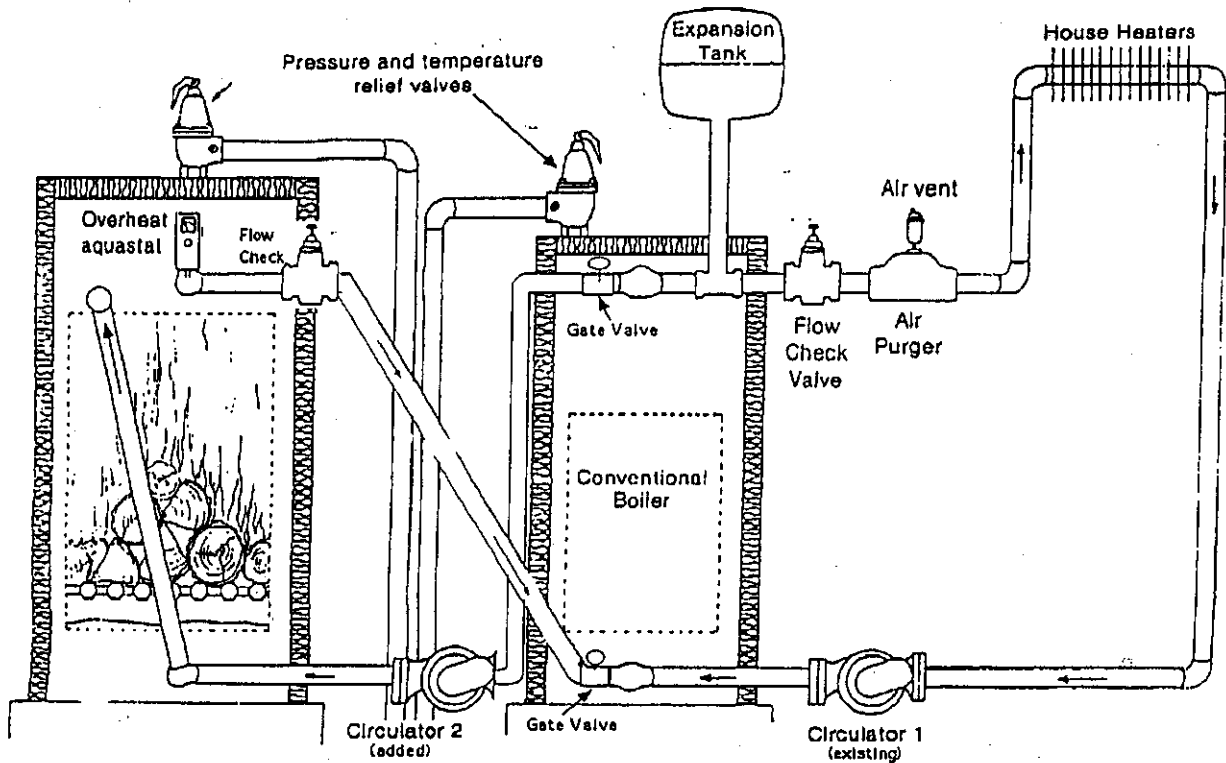


2) Using 1" pipe, connect valve B to return tapping of the TARM boiler (Tapping #4). Connect Valve C with Tapping #6 of the TARM boiler.

3) If the addition of the TARM AD-24 (40 US gal water) has increased the capacity of the heating system beyond the rating of the existing expansion tank, an additional tank should be added to the system. Consult your dealer if in doubt about the requirements of your heating system.

NOTE: It is desirable to reduce the existing boiler's aquastat settings if the TARM boiler is being operated much of the time. These controls should be set so that the existing oil or gas boiler maintains a temperature of 140 to 160° F. For further information on adjusting the oil- or gas-fired boiler's controls, consult your contractor.

2. Parallel Hookup



Basic Theory: The Parallel hookup involves the use of an additional circulator to pump water back and forth between the TARM and the existing boiler. This keeps both boilers fully heated and therefore gives the system a decent heat storage capability. We highly recommend the Parallel installation especially if you are not using the AUTO-MIX valve.

1) Cut the house return line between the existing circulator and the boiler and install a tee of the same diameter as the existing return. Using minimum 1" pipe, connect this tee to tapping #6 on the TARM boiler. Install a gate valve and a flow-check valve on this pipe run with the flow direction away from the TARM boiler. When the TARM is inactive, the flow-check valve installed between the TARM return and the oil- or gas-fired boiler supply prevents thermal siphoning and consequent standby loss from the TARM boiler.

NOTE : if the existing boiler has any extra tappings of min. 1" size near the bottom of the water vessel, you may use this tapping instead.

2) Wire the circulator in one of the following ways:

a. On a simple lighted switch which you will manually turn on whenever you start a wood fire.

b. If you like, you can wire the circulator through an additional "close on rise" aquastat installed into a tee on the 1" pipe from tapping #6 of the TARM boiler. Install this aquastat as close to TARM as possible and before the flow-check valve. This aquastat can be set to turn the circulator on when the TARM boiler exceeds 170° F. If your new aquastat has an adjustable differential, set it at 10° F.

3) Cut the Feed Pipe from the existing boiler to the house. This pipe must be cut as close to the boiler as possible and before any flow-check or other installed valves. Install a tee of the same diameter as the existing feed.

4) ~~Connect minimum 1" piping between this tee and tapping # 4 of the TARM boiler.~~ Install a gate valve and a circulator (flow direction toward the AD-24) on this line.

5) If the addition of the TARM has increased the water capacity of the heating system beyond the rating of the existing expansion system, an additional expansion tank should be added to the system. Consult your distributor if in doubt about the requirements of the heating system.

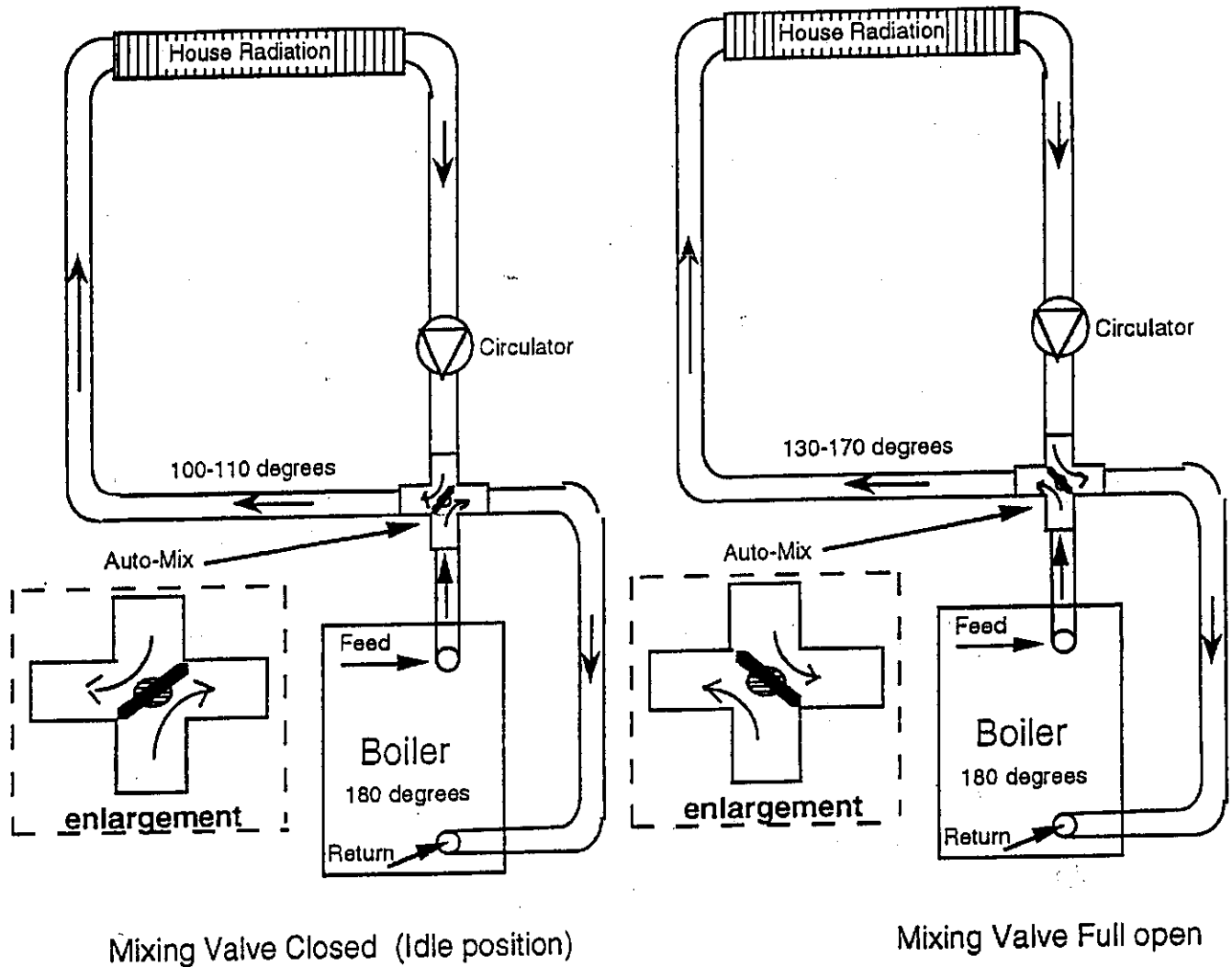
NOTE: The aquastat mentioned is a HONEYWELL L4006B "close-on-rise" type of control. This control is to be set at 170 deg. F. with a 10° F differential and is connected to the circulator installed between the TARM AD-24 boiler and the existing boiler. When the TARM is being fired and reaches 170°, this circulator will start and circulate water through both boilers. This allows the TARM to handle the domestic hot water and heating load on the other boiler. When the circulator in the piping to radiation is inactive, its resistance, plus that of the flow-check valve, will prevent circulation through radiation by the circulator between two boilers.

NOTE: It is desirable to reduce the settings on the aquastat of the existing boiler if the TARM boiler is being operated much of the time. These controls should be set so that the existing oil or gas boiler maintains a temperature of 140 to 160° F. For further information on adjusting the oil- or gas-fired boiler's controls, consult your contractor or distributor.

3. Auto-mix Hookup

The HS AutoMix, when piped as shown in the diagram, provides the most convenient and economical heating system possible using the TARM AD-24 boiler.

The HS AutoMix system is a method of controlling house temperature that is different from and more sophisticated than conventional systems. In the conventional hydronic system, the temperature in the house or zone is controlled by circulating or not circulating water of a fairly high and relatively constant temperature to radiation. The thermostat used in such a system is a simple temperature-actuated switch that turns a circulator on and off. In the HS Auto-Mix system, the circulator in the radiation loop runs continuously, and the temperature of the water flowing to the house is controlled by the mixing valve, which adds varying amounts of heated boiler water to the continuously circulating water in the radiation loop. The valve is controlled automatically by a thermostat.



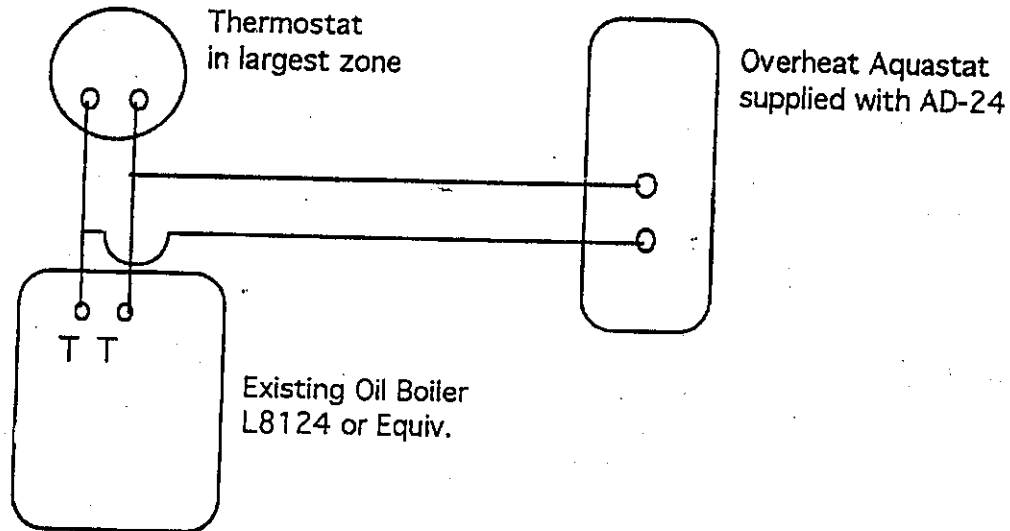
NOTE: In the diagram above, the automix is shown connected between the oil or gas boiler and the house radiation. Either a series or parallel installation can then be used to hook the AD-24 to the conventional boiler. In an Auto-Mix system, the circulator runs constantly. Heat is always being drawn from the boiler, thus minimizing the likelihood of boiler overheating and creosote and soot formation.

The HS Auto-Mix promotes safer, cleaner and more efficient burning of any solid fuel. The AutoMix is especially important in installations with cast-iron radiation. The large volume of returning cold water from cast-iron radiation causes boiler temperature to drop suddenly and often results in poor boiler performance on solid fuel unless a mixing valve is used to keep radiation warm at all times in proportion to heating demand. For complete instructions on an Automix installation, please call your dealer or TARM USA for a free copy of the Automix II installation manual.

III. ELECTRICAL WIRING

NOTE: All wiring must be completed as per the wiring diagram on this page. ALL WIRING MUST BE INSTALLED IN ACCORDANCE WITH NFPA STANDARD #70 AND THE NATIONAL ELECTRICAL CODE.

Overheat Control Hookup



Theory: The Overheat Aquastat is set at 210° F with a 10° F differential. Should the temperature in the wood boiler exceed this setting, the aquastat will then "jump" the thermostat for the main zone of the house. This will turn on the house circulator and dissipate the excess heat into the home.

Additional Electric Wiring:

For Parallel Installations:

The Overheat Control Wiring is the same for a series or parallel installation. However, in a parallel installation, an additional circulator needs to be installed and wired. This circulator's function is to pump water between the two boilers whenever the TARM AD-24 is heating water. This new circulator can be installed in one of two ways:

1. Install a lighted indicator switch on the 110V wiring for this pump. Turn the switch on whenever you are burning wood.

2. Install an additional Aquastat (Honeywell L4006B or Equiv.) on the feed line from the TARM boiler. Install this control as close as possible to the TARM AD-24. Wire the control so that it turns on the new pump whenever the temperature hits 170° F. If this aquastat is equipped with an adjustable differential, set it at 10° F.

For AUTOMIX II:

Please consult the AUTOMIX II manual for electrical information on this valve. A copy is available from TARM USA or your local dealer.

Other Wiring & Controls

If your existing boiler system uses different control methods than those shown and mentioned in this manual, you will have to do "in the field" wiring to achieve the proper Overheat results. This control and wiring work should only be designed and installed

by competent heating and electrical contractors. Please consult with your Dealer, Contractor or TARM USA. if you have any questions about the wiring and control of your AD-24 boiler.

IV. OPERATION OF YOUR TARM AD-24 WOOD BOILER

A. Chimney Draft

Before starting your first fire, check to see that the chimney is not blocked. If the chimney is very tall and there is too much draft, it may be necessary to install a barometric damper.

Your TARM AD-24 is designed to burn efficiently, but under certain conditions creosote deposits can form quickly in your chimney. Here are some of the conditions that lead to excessive creosote formation:

1. Chimney is too large as compared to boiler flue outlet
2. Chimney too short or too many bends
3. Exterior chimney
4. Operation of the boiler in weather that is too warm
5. Boiler is oversized for home
6. Wood is not seasoned or is very wet

B. Fuel

Your TARM AD-24 is designed to burn wood only. IT CANNOT BURN COAL. Both hard and soft woods may be used. The best log length is 22 to 24 inches, and logs should be split if they are over 6 inches in diameter. To obtain the best results, dry (seasoned) wood should be used. A moisture content of 20 to 25% is suitable. Wood with a moisture content over 25% will burn slower, give less heat, produce creosote and deliver inadequate performance.

To properly season wood, it must be cut, split and kept under cover for as least 8 months. Wood will take twice as long to season if left uncovered.

Scrap wood may also be used, but pieces should not be too small or they will burn too quickly and inefficiently. DO NOT BURN PAINTED, CREOSOSTED OR PRESSURE TREATED WOOD!

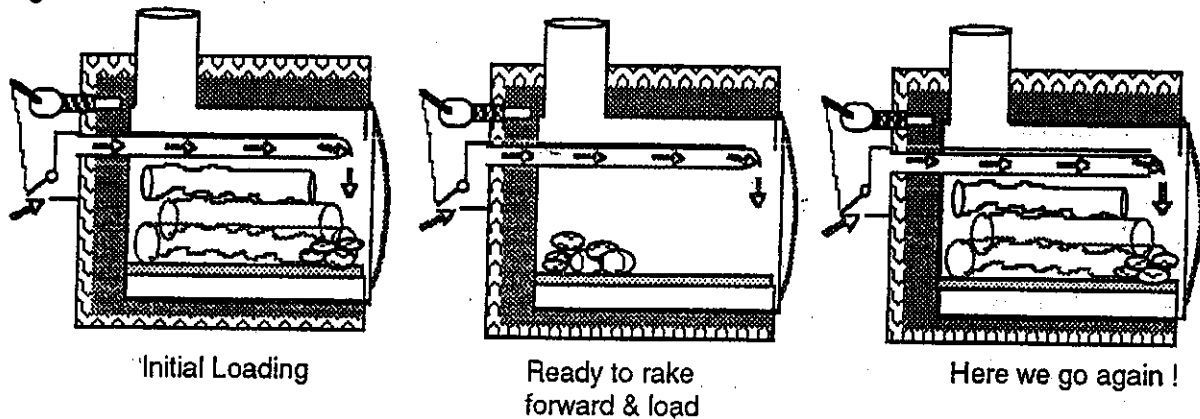
C. Starting up your TARM AD-24 Boiler

NEVER USE GASOLINE, KEROSENE OR OTHER FLAMMABLE LIQUIDS TO START OR MAINTAIN SOLID FUEL FIRES IN YOUR BOILER--SERIOUS BURNS OR PROPERTY DAMAGE MAY RESULT!

NOTE: Do not be alarmed if you smell an unusual odor the first few times you fire the boiler. This smell is due to the burning of oil residues in the paint on your boiler and smoke pipe.

BASIC BURNING THEORY: The TARM AD-24 combustion system is based on a tried and true system known as "front to back" burning. If you take a moment to understand

this concept, it will increase your satisfaction with this product. The boiler burns wood from the front to the rear. At the end of each burning cycle, the operator pulls the hot embers from the rear of the boiler to the front and reloads the wood, starting the cycle again.



NOTE: If possible, it is recommended that you bring the TARM boiler up to a temperature of 140° F with your back-up boiler before you start a wood fire.

1) TEST THE CHIMNEY FOR UPDRAFT-- Pull the bypass lever forward and open the loading door. This opens up a direct path up the flue. Place a small wad of paper in the rear of the boiler and light it with a long fireplace match. Watch the smoke and confirm that the chimney is drafting. Look at the draft door on the rear of the boiler and confirm that it is at least partially open. NOTE: if the boiler is already at full operating temperature, this draft door will be fully closed. You will have to then adjust the Samson draft control to a higher setting (#6) while you start the fire. Be sure to return it to it's normal setting (#5) after the fire is well established.

2) Crumple 5 or 6 sheets of newspaper into small balls and set them in the front 1/3 of the boiler. Place 10 to 15 small kindling sticks (1/2" or less in diameter) in a criss-cross fashion on top of this newspaper. Place larger sticks (up to 2" in diameter) on top of the kindling. Fill the rest of the firebox with dry, seasoned wood.

3) Light the newspaper and close the loading door to the first latch position (door is open approx 1"). Wait 2-5 minutes to confirm that the wood is burning briskly and then close the loading door to the fully closed latch position. You may now also close the bypass by pushing it inward with the bypass tool.

D. Reloading the Boiler

The boiler should burn from 5 to 12 hours on a full charge of hardwood. Try to time your reloading so that it occurs after all wood in the firebox has turned to red embers. Proceed as follows:

1. Open the bypass by pulling forward on the baffle rod.
2. Open the loading door to the first latch position for 20-30 seconds
3. Open the loading door fully and survey the state of the fire
4. Using a rake or long poker, pull the hot embers from the rear toward the front 1/2 of the boiler.
5. Reload with wood (if fire is not well established or almost out, you may have to add

- some smaller sticks or kindling to "freshen up" the fire).
- 6. Close door to full latched position
- 7. Close bypass by pushing rearward on the baffle rod.

NOTE: The bypass should always be pulled forward before opening the loading door. This will minimize smoking and puff-backs.

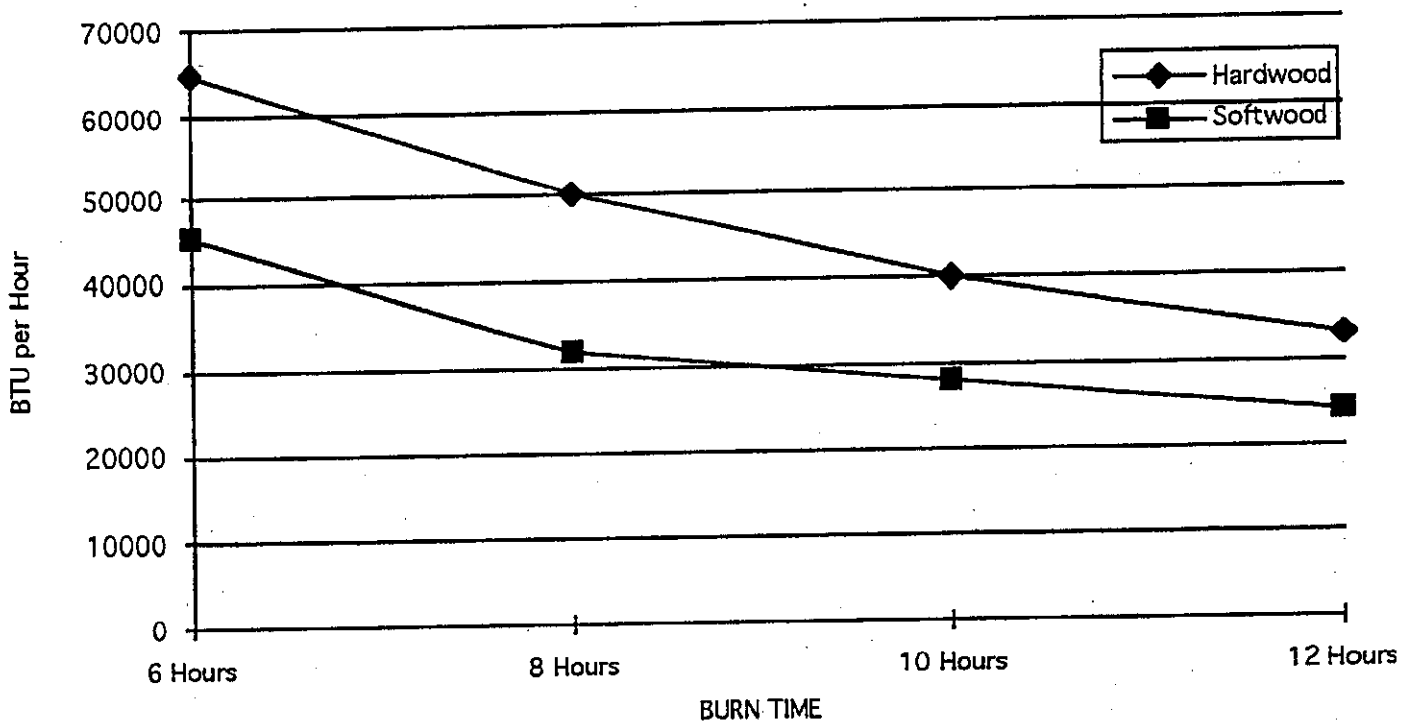
E. Output and Burn Time

The TARM AD-24 is designed to be an addition to your existing oil or gas boiler system. It can provide a good portion (up to 100%) of the heat for many homes, but this will depend on the size of the home, insulation, outdoor temperature and many other factors. An example of the heating ability of the boiler would be as follows:

Assume a single wood load of 90 pounds of oak firewood (with grates and ashpan removed) and a burn time of 8 hours.

Firewood contains approx. 7500 BTU per pound, so this load consists of 675,000 BTU (input to boiler). The boiler burns wood at approx. 60% efficiency, so the output to the house is 405,000 BTU. Divide this by the 8 hours and we have an output of 50,000 BTU per hour, enough to heat many modern homes. An output chart is given below for your reference.

Estimated AD-24 Burn Time and Output



F. Ash Removal

IMPORTANT: WOOD ASHES CONTAIN HOT COALS WHICH CAN REMAIN HOT FOR 48 HOURS OR LONGER. PLACE ALL ASH IN METAL CONTAINERS WITH TIGHT FITTING LIDS AND LET STAND FOR AT LEAST ONE WEEK BEFORE DISPOSAL. PLACE ASH CONTAINERS ON NON-COMBUSTIBLE FLOORS !

The AD-24 boiler can be used with or without the ashpan option (see "B", Page 4). Ashes should be removed from the boiler when the fire is low or when the fire is out. First thing in the morning is usually the best time. Follow the steps below:

1) **BOILER WITHOUT ASHPAN:** Push the hot embers toward the rear of the firebox. Use a steel ash shovel, scoop the ashes from the front of the boiler and place them in a metal container with a tight fitting lid. Rake the hot embers toward the front of the boiler and stoke the fire if desired.

2) **Boiler with Ashpan:** Using a stove glove or welder glove, pull the ash pan straight out until it is clear of the boiler. Empty it carefully into a metal container with a tight fitting lid. Place ashpan back into the boiler. Stoke the fire if desired.

V. TROUBLESHOOTING

This section is designed to assist the homeowner and the installing contractor in the care of the heating system as well as in the correction of some of the more common problems encountered in the operation of the TARM 2000 boiler. It is not possible within the scope of this manual to cover all possible service aspects of hydronic heating systems. Your HS TARM dealer is your best source of information on all questions regarding your heating system.

A. Boiler overheating

NOTE: The wood fire in the TARM AD-24 will always produce a certain amount of heat, even when there is no heating demand on the system. This fact makes the behavior of such a system quite different from an oil- or gas-fired boiler, which produces heat on demand. The "baseline" heat output that is continuously generated by a wood fire must be absorbed by the boiler itself when there is no circulation of water through the system. If the boiler temperature rises excessively in order to absorb this heat, the overheat control will cause circulation of heated water to the house, even with no call for heat. Such potentially wasteful overheating is most likely to occur during the spring and fall. Before choosing a particular system for your installation, the possibility of using a mixing valve system to avoid such problems should be considered. Such an arrangement (one of the most sophisticated methods of heating system regulation available) can be added to any heating system. We recommend the use of a mixing valve (Automix II) with all TARM solid fuel boilers.. Overheating in the TARM AD-24 is an occurrence that all homeowners must be familiar with so that it can be corrected when it occurs.

When the boiler temperature rises above a preset limit (usually 200-210 deg F.), causing the overheat control to operate and, perhaps eventually, the pressure relief valve to open, the boiler is overheated.

The most common causes of overheating are;

- overfiring the boiler (i.e., putting in too much wood for the heating needs of the house at a given time).
- Improper setting on temperature controls (see instruction sheet packaged with Samson Control).
- Electrical power failure. See page 21.
- Air leaks into the boiler (worn door gaskets, worn door latch).

Following the recommendations in this manual will minimize the possibility of overheating, but even the most experienced person will occasionally overheat his boiler. To cope with this problem, the boiler is equipped with two safety devices--the Overheat Control and the Pressure Relief Valve.

The overheat control is wired to circulate excess boiler heat to the house when the boiler reaches a preset temperature of 210 deg F. This control turns on the circulator and opens either the mixing valve or any zone valves in the largest heating zone. Generally, the overheated boiler can be cooled within 10 minutes.

If the overheating condition is more severe, the temperature will continue to rise. At about 250 deg .F., the pressure in the boiler will have reached 30 psi; and the pressure relief valve will open, discharging steam. For your information; all TARM AD-24 boilers are pressure-tested to 60 psi at the factory.

TO PREVENT THE POSSIBILITY OF SERIOUS BURNS OR PROPERTY DAMAGE FROM THIS STEAM, THE DISCHARGE TUBE MUST BE PIPED TO A POINT 6" FROM THE FLOOR, OR TO A DRAIN!

The reason that steam rather than water is discharged is due to the fact that water under pressure can reach temperatures above 212 deg.F. without boiling (as in a boiler), but, when released to the atmosphere by the relief valve, water turns immediately to steam if it is over 212 deg. F.

TO COOL A SEVERELY OVERHEATED BOILER (relief valve discharging, or temperature rising over 230 deg F.) follow these steps:

- 1) Be sure the loading door is tightly closed.
- 2) Close the draft door on the rear by rotating the black knob or unhooking the draft chain
- 3) Be sure the by-pass is in the closed (pushed in) position.
- 4) Open all hot water faucets in the house if the boiler has a domestic hot water coil.
- 5) Turn all thermostats up to their highest setting.
- 6) Open windows as necessary to keep the house cool.

When the boiler has cooled to normal operating temperature, resume normal operation.

B. Procedure in Event of Power Failure

Should your electricity go off during the heating season, there are several procedures that should be followed. Depending on your system layout, you may be able to continue firing the boiler at a reduced output during the power failure.

1) Locate any "Flo-check" valves in the system, and unscrew completely the knob on top of each valve. (This will allow a certain amount of heated water to circulate by convection throughout the house, preventing the pipes from freezing and keeping the house partially heated.) If you have a mixing valve, open it to the highest setting, then lock it into position.

2) It is important to remember that the heating system cannot safely use the heat from a great deal of wood without the circulators running. Under such conditions, extreme caution must be used to avoid overfiring. **DO NOT ADD LARGE AMOUNTS OF WOOD INTO THE BOILER!** Fire the boiler cautiously until you are able to determine how quickly the boiler can consume fuel without overheating

3) When the power has returned, reset all flow-check and zone valves and resume normal operation of the system. **NOTE:** This does not apply to gravity systems, as they have no flow-check valve and will continue to operate normally without electricity.

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C. Troubleshooting

This section of the manual is designed to help you isolate and correct problems that may occur during the operation of your TARM AD-24 BOILER.

SYMPTOM	CAUSE	SOLUTION
NO HEAT IN HOUSE		
Boiler temperature is below 140 degrees F	No Fuel in boiler	Restart new fire
	Improper setting or adjustment of Samson Draft regulator	Reset as per instruction sheet supplied with Samson Control
	Inadequate combustion air.	Increase fresh air to boiler room.
	Wood is unsplit or unseasoned.	Split wood and season.
	Excessive ash or creosote buildup inside boiler	Clean inside of boiler and remove ash
	Chimney is plugged with creosote or soot	Clean chimney
Boiler temperature is above 140 degrees F	Air in pipes	Call Serviceman
	Circulator or zone valves not operating.	Call Serviceman
	Not Enough Radiation in house	Add radiation as needed.
OTHER PROBLEMS		
Boiler functions well with good burn times but inadequate on coldest days	Boiler Temperature is set too low	Increase boiler temperature by setting the Samson control to #6 (190° to 200°).
Excessive heat dumped into overheat zone	Overheat control set too low, or Samson set too high	Set Honeywell control at 210°-230° F. Check operation and setting of Samson
Short Burn Times	Wood not seasoned	Season wood for at least 8 months under cover
	Firebox is not filled adequately	Cut wood to full length of firebox
	Boiler is undersized for home	Supplement heat with your oil or gas boiler
Wood fire goes out before being burned completely	Inadequate Draft	Increase chimney draft (call your dealer or TARM USA for suggestions)
	No demand on boiler for extended period of time	Burn oil or gas until temperature outdoors is colder

VI. PERIODIC MAINTENANCE

A. Cleaning

The efficiency of the TARM AD-24 boiler is affected by the amount of creosote and soot

coating the inside of the boiler. Layers of these materials act as an insulator, preventing the wood fire from heating the water, and allowing valuable heat to escape up the flue.

The inside of the firebox should be cleaned periodically during the heating season.

- a) Allow the fire to die out.
- b) **BE SURE THE BOILER AND ANY ASHES HAVE COOLED THOROUGHLY BEFORE PROCEEDING FURTHER.**
- c) Remove all ash and unburned wood from the firebox.
- d) Next, disassemble the smoke pipe connecting the boiler and chimney. Clean and inspect for corrosion, if any section of the pipe is seriously corroded (for example, if a screwdriver can easily be poked through the metal), this section must be replaced.
- e) Replace the smoke pipe.
- f) Remove the faceplate (smoke shield) from the boiler front. Remove the cast-iron grates (if installed) and the firebrick and ashpan from the inside of the boiler. Slide the stainless steel baffle out of its position on top of the air tube.
- g) Use a scraper to clean off any deposits of creosote and fly ash.
- h) Place the baffle, smoke shield and ashpan-grates (if installed) back into the boiler.

B. Service and Maintenance

As with any central heating system, you should have your HS TARM boiler inspected on a yearly basis by a qualified heating contractor. Leaks could develop from defective or worn-out air vents; pipe joints, coil gaskets, etc. If they should remain undetected, leaks can corrode the boiler body, top and/or sides.

For summer operation it is very important to follow certain precautions. If your boiler has a domestic hot water coil installed, be sure to bypass this coil at any time when the TARM boiler is not heated (see Section I, "E"). It may also be prudent to drain the TARM boiler if it is not in use during the summer. This will avoid possible corrosive action by condensation which may form inside the boiler firebox.

FAILURE TO FOLLOW THESE RECOMMENDATIONS MAY VOID YOUR WARRANTY!