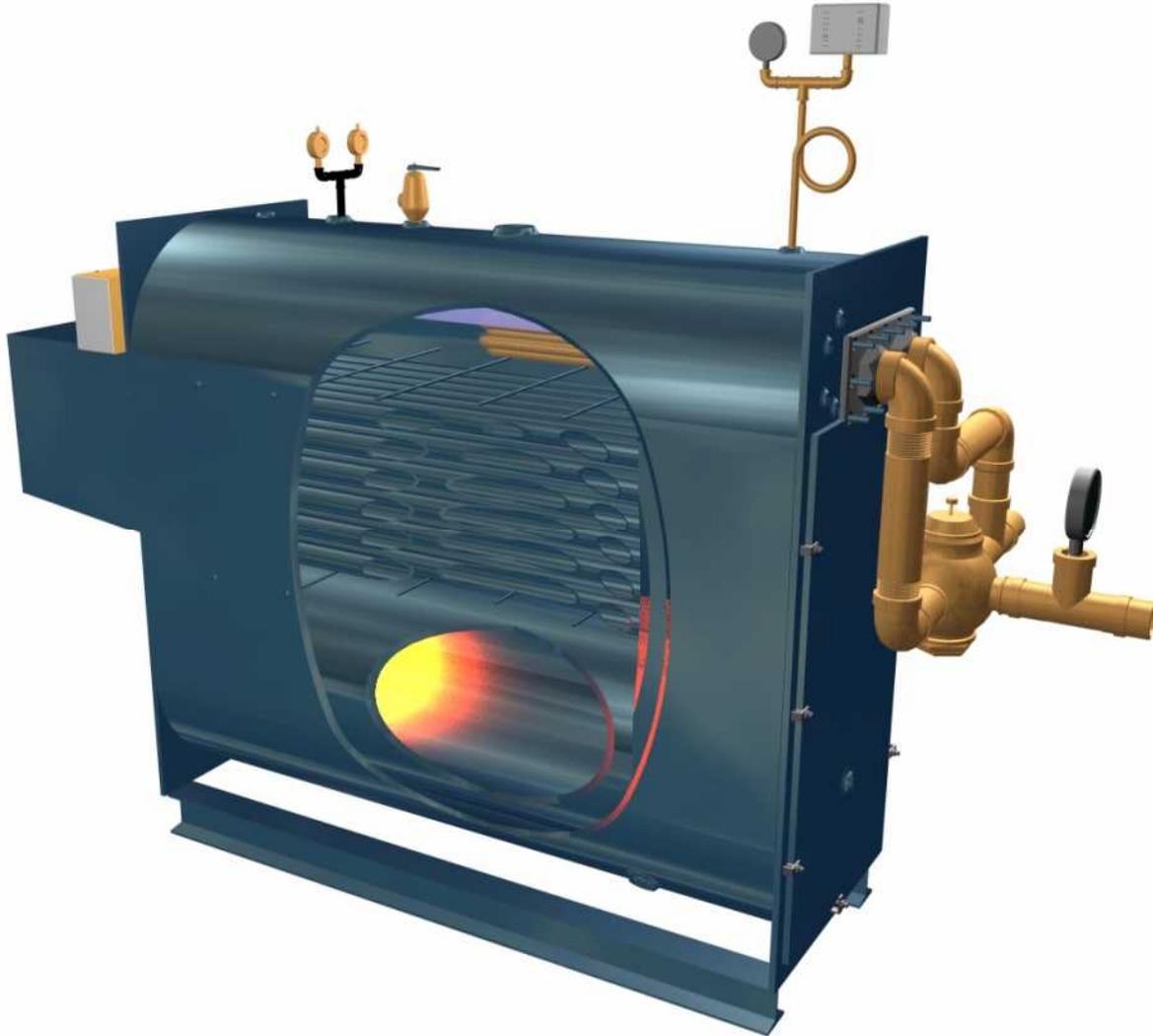




C-SERIES BOILER

INSTALLATION AND OPERATION MANUAL



MODEL #:

BURNER MODEL #:

SERIAL #:

BURNER SERIAL #:

NATIONAL BOARD #:

DISTRIBUTOR:

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C-SERIES BOILER

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WHAT IS A NATCO?

The NATCO is a modified Scotch Marine boiler that is specifically designed to be used as a large volume water heater. The heat is transferred to the processed water through a large copper heat exchanger that is submerged in the prime boiler water. The heating surface of the heat exchanger is far greater than the heating surface required to meet the hourly recovery rate so as to allow for high peak load capabilities. It operates as a low pressure steam boiler and steam may be taken from the NATCO for various process applications. The NATCO is not a converted heating boiler

Steam can be taken from the NATCO for low pressure process and heating application. The hot water is heated through a submerged tankless coil and its outlet temperature is controlled by an optional thermostatic tempering valve.

In examining our specifications, you will note the large prime water content of the NATCO. This huge amount of prime water, when heated, constitutes a vast internal reserve of stored heat capacity.

This is why the NATCO can produce hot water at such a high per minute rate without the use of a storage tank. The NATCO is an ASME boiler, and is National Board approved. The burner and all controls are U.L. approved.

LOCAL RULES:

Before installation, check with building department and any other city or government agencies having jurisdiction; such as Fire Dept., Smoke Abatement Commission, Building Inspector, etc., and follow all rules. The fire-proofing of the boiler room must be done in strict accordance with local ordinances and Underwriter's Code. The wiring must be done in strict compliance with Underwriter's Codes. If there is conflict between our instructions and any codes, the codes take precedence.

INSTALLATION CONTRACTORS:

The installation of the NATCO must be handled by qualified and competent steam fitters and plumbers and burner installation personnel. Many localities require a license to practice plumbing and install burners. The electrician must not only be licensed, but must be fully equipped with the proper testing equipment. All lines and all circuits should be tested before the NATCO is placed in operation. Particular attention must be given to safety devices such

as low-water cutoffs, pressure controls, the safety relief valve, and the flame safety.

BOILER ROOM:

Erect the boiler on a level floor with the burner end of the NATCO as close to the chimney as is feasible. Perfect installation would require a minimum of 3 ft. from the end of the smoke box to the back wall. This will provide adequate room to properly adjust and service the burner. It is advisable to have an opening at the front of the boiler, so that the coils can be changed. Many contractors find it convenient to install the entrance door immediately in front of the NATCO, so the changing or removal of the water coil is no problem.

The boiler room must be constructed air tight with a tight fitting door and its own ventilation. The air tight room is necessary so if for any reason the products of combustion go into the boiler room, the fumes cannot affect the occupants of the building.

CHIMNEY:

The chimney must be constructed in accordance with all local codes and if Smoke Abatement rules are applicable, the chimney must be filed with the proper authorities. Forced draft burners require a chimney of the specified diameter. Refer to the specification sheets for the internal diameter required.

The chimney must be high enough to prevent the products of combustion from entering adjacent windows or creating a nuisance for neighbors. It must be higher than adjacent buildings and located where a down draft due to wind direction will not occur.

The vent pipe or breaching must be as short as possible and properly connected to the NATCO and the chimney. It must be checked periodically to make certain that it is tight and has no evidence of any corrosion. If Perchloroethylene is stored or used in the building, the fumes must be prevented from entering the boiler room, for when Perc is burned, very corrosive and toxic gases are formed which in addition to being dangerous to human life, quickly attack the burner, the boiler and particularly the vent pipe or breaching. The heavier the vent pipe or breaching, the longer it will last under normal use and we recommend a minimum of 16 gauge galvanized smoke pipe.

BAROMETRIC DAMPERS:

Barometric Dampers are helpful for fuel economy when there is negative pressure in the chimney. Forced draft gas burners and oil burners can operate with a positive pressure in the boilers and unless the chimney is large and tall, negative pressure may not be attained in the breaching. When positive pressure exists in the breaching, a barometric damper does not have any effect of the efficiency. and if a barometric damper is used under these conditions with an oil burner, it may interfere with the start up operation of the oil burner. Barometric dampers used for gas burners must be of the double swing type and a spill switch must be provided. This is necessary so that if the products of combustion spill into the boiler room, a spill will shut the burner off. Oil burners when used with barometric dampers are equipped with single swing blades and therefore require no spill switch.

A barometric damper is not provided with the NATCO and its use, and installation must be done under the supervision of a qualified burner professional.

FRESH AIR MAKE-UP:

It is most important that the boiler room be constructed to provide adequate makeup air. The burning of fuel requires oxygen to support combustion. This oxygen must be readily obtainable either from outside or from an adjoining space. If a passive air opening allows fresh air for the burner, ½ sq. inch per 1,000 BTU's of opening is required. Since the square inch opening must be free, if louvers or screens are used, it is best to figure one and one-half times the required opening.

The NATCO should be in a separate room, tightly sealed against the effects of oil exhaustion due to dryers or exhaust fans. Not only does a dangerous condition exist if air exhaustion from other equipment places the boiler room under a vacuum, but a loss of efficiency and a sooty flame will certainly result.

Rated output can only be expected when the equipment is installed with proper fresh air make-up and when the equipment is installed in a boiler room tightly sealed against the effect of air exhaustion of other equipment.

The following tables indicated the sizes of fresh air openings required for various NATCO Models.

Fresh Air Guidelines, NATCO Boilers

NATCO Model #	Gas Input, MBTU	Oil Input, GPH	Square Inches Total Fresh Air Opening	Diameter, Single Fresh Air Duct	Diameter, Two Fresh Air Ducts
C-58	600	4.5	300	10	7
C-72	730	5.25	365	11	8
C-82	850	6	425	12	9
C-105	1100	8	550	14	10
C-130	1400	10	700	15	11
C-165	1700	12	850	17	12
C-200	2100	15	1050	19	13
C-250	2490	19	1245	20	15
C-290	3000	22	1500	22	16
C-400	4200	30	2100	26	19
C-500	5200	37	2600	29	21
C-600	6200	44	3100	32	23

CHECK THE BOILER FOR MISSING OR DAMAGED ITEMS:

The following items come equipped on the boiler:

- Steel jacketing covering a 2" fiberglass jacket.
- A burner mounting plate covering a burner refractory donut.
- A peep-site assembly.
- A front inspection plate insulated by millboard.
- A copper heat exchanger with a steel or bronze header.

The following items come in a separate parts box:

- A 1/2" brass piping assembly including:
 - o A brass pigtail
 - o A brass tee
 - o 2 brass nipples
 - o 1 brass elbow
 - o 1 brass street-elbow
- A 3/4" iron piping assembly including:
 - o An iron nipple
 - o An iron tee
 - o 2 iron street-elbows.
- Honeywell PA404A Operating Pressure Control
- Pressure Gauge
- Honeywell L4079B Manual Reset Pressure Control w/ 1/2" brass pigtail.
- ITT McDonald and Miller PS801-120 Operating Low Water Cutoff

- ITT McDonald and Miller PS851M-120 Manual Reset Low Water Cutoff
- Gauge Glass Assembly
- 2 Gauge Cocks
- Dial Thermometer
- 2 Air Vents

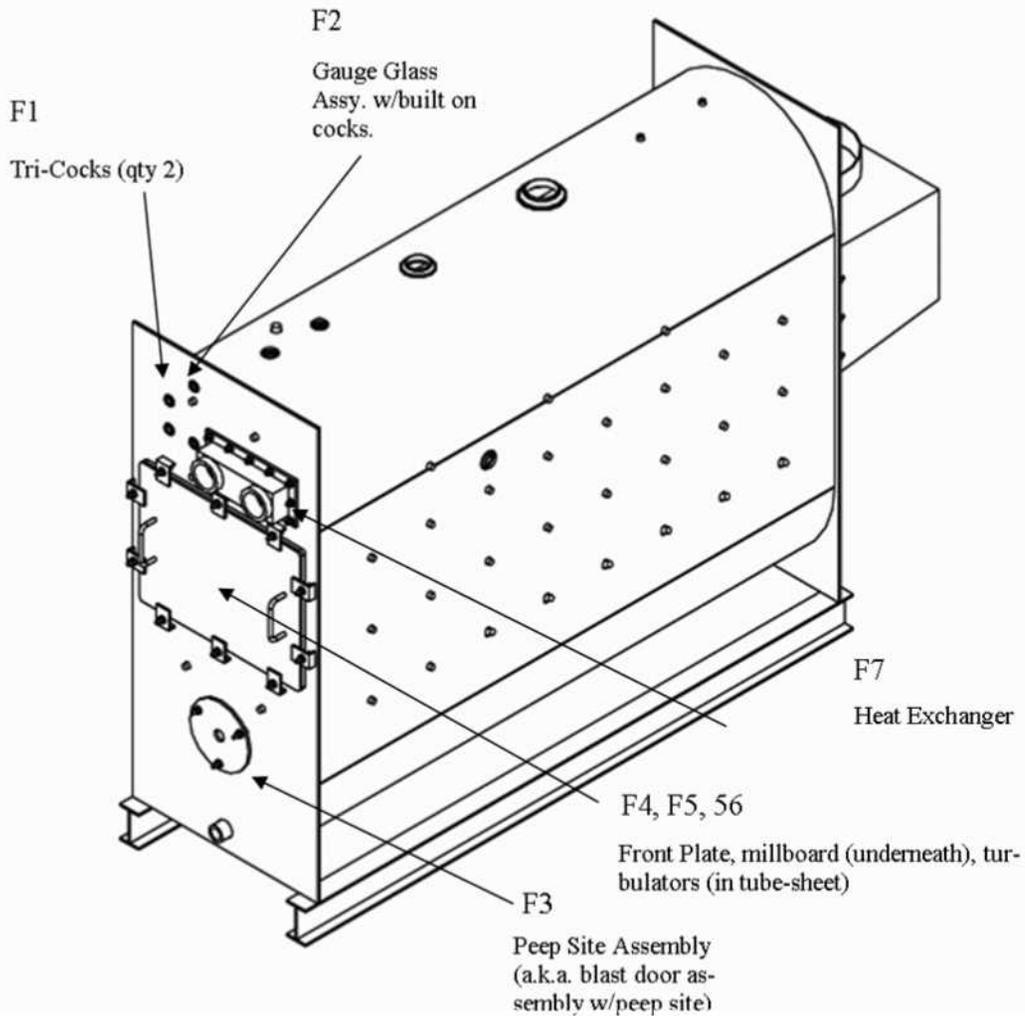
The following items are optional items:

- Tempering Valve
- Automatic Water Feeder
- Magnesium Anode Rod(s)

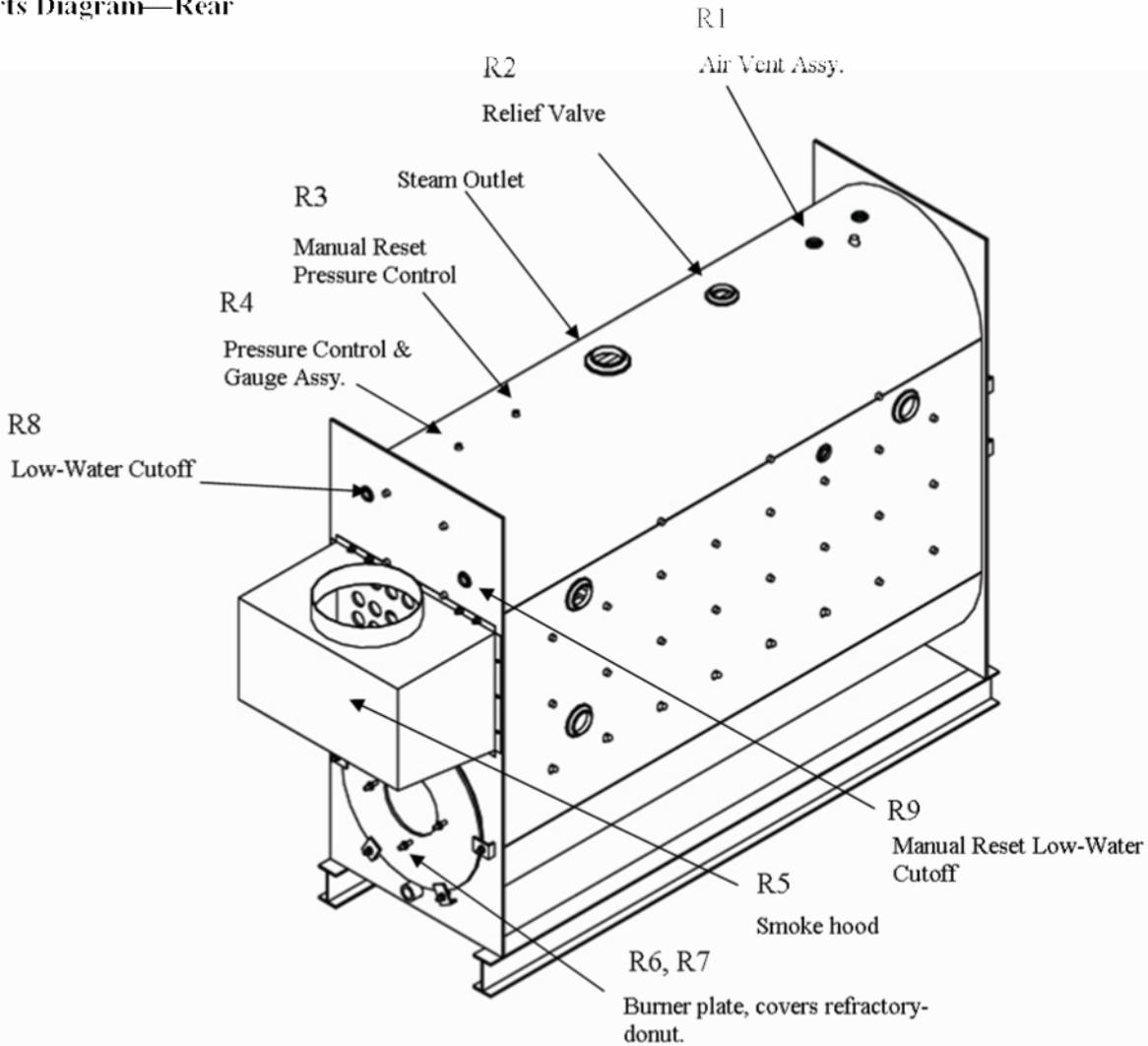
ASSEMBLE AND INSTALL COMPONENTS:

1. Assemble and install the air vent assembly. Using Teflon tape at each connection, attach nipple on center of tee and street-ells on sides of tee. Then install air vents so that they are facing up. Install air vents on assembly first, and then install entire assembly on the $\frac{3}{4}$ " R1 (on diagram) connection on the top of the boiler closest to the rear of the boiler (burner mounting side).
2. Cap the steam outlet. If the steam outlet is not being utilized, cap it with a plug of appropriate size.
3. Install pop safety relief valve on R2 on the diagram. We suggest that you pipe the outlet to the floor or a drain. **Do not reduce the outlet piping from the initial size of the relief valve outlet. For example, if the relief valve has a 2" outlet, your drain-off piping should be 2" diameter.**
4. Set Honeywell L4079B to desired redundant secondary high limit. Usually, this should be set between 12 and 15 PSI. Using Teflon tape, attach control to a brass pigtail and attach to location R3 on the diagram of the rear of the boiler.
5. Set the PA404A operating pressure control setting and differential. The setting for the pressure is on the outside of the control. It is important that the setting is lower than the setting for the L4079B manual reset control. For most applications, set the cut out to 9 PSI, and the differential to 2 PSI. The differential is set underneath the cover.

6. Using Teflon tape at each connection, assemble the ½" brass assembly first before installing. Attach the center outlet of the tee to the end of the brass pigtail. Then attach the nipples to the brass tee assembly. Attach a street ell to one nipple and an elbow to the other nipple. Attach the pressure control into the street-ell, and the pressure gauge to the elbow. Attach the assembly to R4 on the Rear boiler diagram (below).
7. Install the gauge glass assembly onto the two connections indicated by F2 on the front boiler diagram. Install the gauge cocks to left of these, on F1 of the diagram.
8. Install the PS801-120 operating Low-water cutoff at location R8 on the front boiler diagram. It is important that the operating (automatic reset) control is installed at the uppermost connection.
9. Install the PS851M-120 manual reset Low-water cutoff at location R9 on the front boiler diagram.



Part Identification	F1	F2	F3	F4	F5	F6	F7
Part Name	Tri-Cocks (x2)	Gauge Glass	Peep Site Assy.	Front Plate	Turbulators	Millboard	Heat Exchanger
C-58	26-105-28	20-104-10	NATABDA	FP-45	call	MB-45	B3-18-47SP
C-72	same	same	same	FP-55	call	MB-55	B4-24-48U
C-82	same	same	same	FP-70	call	MB-55	B4-24-48U
C-105	same	same	same	FP-90	call	MB-55	B6-24-60V
C-130	same	same	same	FP-105	call	MB-105	BH12-48-55W
C-165	same	same	same	FP-125	call	MB-105	BH12-48-61W
C-200	same	same	same	FP-165	call	MB-105	BH12-48-61W
C-250	same	same	same	FP-215	call	MB-215	BH12-48-73X
C-290	same	same	same	FP-215	call	MB-215	BH12-48-73X
C-400	same	same	same	FP-280	call	MB-215	BH12-48-86X
C-500	same	same	same	FP-400	call	MB-400	BH12-48-86X
C-600	same	same	same	FP-600	call	MB-500	BH12-48-95X



Part Identification

Part Name	R1 <i>Air Vent Assy</i>	R2 <i>Relief Valve</i>	R3 <i>M. Reset Pressure Control</i>	R4 <i>Pressure Control + Gauge Assy.</i>	R5 <i>Smoke Hood</i>	R6 <i>Refractory</i>	R7 <i>Burner Plate*</i>	R8 <i>Low-Water Cutoff</i>	R9 <i>M. Reset LWCO</i>
C-58	#1 Air Vent	13-202-04	L4079B	PA404A	SH-45	RD-045	13-3/4" OD	PS801-120	PS851-M-120
C-72	same	13-213-08	same	same	SH-55	RD-055	17-3/4" OD	same	same
C-82	same	13-213-08	same	same	SH-70	RD-055	17-3/4" OD	same	same
C-105	same	13-213-08	same	same	SH-90	RD-055	17-3/4" OD	same	same
C-130	same	13-213-08	same	same	SH-105	RD-105-6	22-1/4" OD	same	same
C-165	same	12-205-08	same	same	SH-125	RD-105-6	22-1/4" OD	same	same
C-200	same	12-206-08	same	same	SH-165	RD-105-6	22-1/4" OD	same	same
C-250	same	12-206-08	same	same	SH-215	RD-215-9	27-3/4" OD	same	same
C-290	same	12-206-08	same	same	SH-215	RD-215-9	27-3/4" OD	same	same
C-400	same	12-206-08	same	same	SH-280	RD-215-9	27-3/4" OD	same	same
C-500	same	14-207-08	same	same	SH-400	RD-215-9	27-3/4" OD	same	same
C-600	same	14-207-08	same	same	SH-600	RD-215-9	27-3/4" OD	same	same

* Inside diameters and stud pattern depend upon burner brand and model.

INSTALLING THE BURNER:

The burner must be mounted to the included mounting flange so the included burner flange is bolted flush to the mounting flange. Burners must be installed, and fired by qualified burner professionals. Burner professionals can pipe fuel according to the instructions in the included burner installation manual. Professionals shall fire burner and check required readings as required by the included manual.

WIRING THE BOILER/BURNER:

All wiring must be installed by a qualified electrician.

Burners include an "interlock" circuit that allows the boiler controls to have an effect on the firing of the burner. Check the burner installation manual or wiring diagram for the location of this circuit. If you need help locating this, contact NATCO.

There are two ways of wiring the boiler:

Preferred:

1. On the included burner interlock circuit, wire from the burner interlock supply to (i) the PS801-120, (ii) the PA404A operating control, and (iii) back to the return on the burner interlock.
2. Utilizing an isolation relay so that there is 115V on the control side, and appropriate supply voltage on the other side (depends on the burner), wire the L4079B manual reset pressure control and PS851M-120 Low Water Cutoff in series so that if there is a break in the circuit, no power will be supplied to the burner. Think of this circuit as an automatic emergency switch to shut off power to the burner.

Alternative:

On the included burner interlock circuit, wire from the burner interlock supply to the following in series: (i) the PS851M-120, (ii) the PS801-120, (iii) the L4079B, (iv) the PA404A, and (v) to the burner interlock return.

The first method is preferred, because if the burner interlock fails or is left jumped through negligence, a dangerous condition cannot result. **IF YOU HAVE ANY QUESTIONS PLEASE CONTACT NATCO FOR GUIDANCE.**

DRAFT AND FURNACE PRESSURE:

The burner included is designed as a forced draft burner capable of supplying all air for combustion against positive furnace pressure not over 1/2" water column. Furnace pressure must not be positive unless combustion chamber is adequately sealed.

The burner will also operate satisfactorily with conventional stacks and negative furnace pressures. A barometric draft control should not be used unless required to overcome excess draft.

Rooms in which burners are located should be provided with adequate air supply to assure continuous complete combustion. It is recommended that outside air openings are provided having a total area not less than 1 square inch for each 2,000 BTU per hour input. Check local requirements.

GAS PIPING:

The standard gas controls are sized to pass the maximum burner rate with 6" W.C. line pressure ahead of the controls. Valves and regulators are suitable for pressures up to 1/2 pound. Controls are available for higher and lower pressures.

The installation, checkout and service of the gas burner should be done only by a qualified, competent gas burner mechanic. He must be equipped with fuel analyzing equipment, gas pressure reading equipment, stack thermometer, and a multimeter.

Gas line should be installed carefully, so that no foreign materials are allowed to enter the gas line; there should be a full size "drip" pipe (or dirt pocket) near the burner to trap foreign material. Gas lines should always be tested with air pressure before connecting to the gas supply. Arrange the piping at the burner so the burner can be moved out for inspection without interference with the gas piping.

All gas piping should be made to highest standards of material and workmanship in accordance with local codes and ordinances. Where local codes do not exist, piping should be accordance with American Standard Requirements of Installation of Gas Equipment in Large Boilers (S.A. 221.33)

PRECAUTIONS TO TAKE WHEN HIGH PRESSURE GAS IN THE STREET IS REDUCED TO LOW PRESSURE GAS IN THE BUILDING:

When high pressure gas in the street is reduced to low pressure gas in the building, it is recommended that the main gas valve be changed to a motorized valve. Frequently the gas company will insist that a motorized valve be installed. Contact NATCO for prices and information.

Very often the gas utility company will use only one gas pressure regulator in the street to reduce their high pressure gas down the inches of water column when entering the building. In most cases when reducing from 5 or 10 PSI to inches, very little trouble is encountered, but when reducing from higher pressure than 10 p.s.i., they might not install the proper regulator to give regulation.

BOILER FLUSH OUT:

The installer should treat and flush out the boiler after the installation is made to get rid of the oil and other impurities. Very often some of the patented compounds sold for the removal of oil are very helpful. A word of caution of the use of compounds: be sure the chemical used is suitable for steel boilers. Acid treatment in general is very harmful to steel boilers.

After the initial cleaning, the NATCO unit which is used only for the generation of hot water will not require any additional cleaning. The reason for this is that the prime water is never changed, whatever impurities that were in the water soon combine with the metal, or the small amount of impurities will settle to the bottom. When the NATCO is used to generate steam, it may be necessary to flush the NATCO more often and it may even be necessary to provide a regular boiler cleaning system. If the NATCO is used for steam generation or if the system is tight, very little make-up will be required and the NATCO will function in much the same manner as if it were used for water generation and the prime water were never changed. If for any reason it becomes necessary to add a considerable amount of make-up water to the NATCO to compensate for steam losses, then a boiler treatment consultant should be called in.

It might be found advisable to install a regular method of treating the NATCO so as to eliminate the possibility of excessive tube corrosion.

We again emphasize that if the NATCO is operated in such a manner that free oxygen will be a factor, then the operator must be prepared to regularly treat the NATCO with an oxygen scavenger. Refer to pages titled "Operating Instruction for the Control of Oxygen Corrosion of Boiler Tubes of the NATCO."

CHECK ALL CONNECTIONS AND FILL NATCO WITH WATER:

Be certain that all unused outlets are plugged (NATCO does not supply any plugs with the boiler) before filling the NATCO. The NATCO must be filled with untreated water (regular tap water). *Never fill the NATCO with softened water, which is extremely corrosive.* Fill the NATCO unit the water level is about 1" below the center of the gauge glass.

Adjust the pressure control cut-out point to 9 PSI and the differential to 2 PSI. The burner will then operate between 7 and 9 PSI. The successful operation of our units depends on storing prime water at 230 degrees or more. It is also important that as soon as water is drawn, the burner starts on a pressure drop. For this reason do not install an aquastat to control the burner unless operated as a hot water boiler.

AIR VENTS:

The venting of the NATCO is very important for successful operation of the equipment. The purpose of the vent valves is to vent air from the NATCO. When the air vents do not work, the gauge may read 9 lbs. of pressure. If the pressure indicating needle drops in one or two seconds to one pound or less, the boiler is air bound, and both valves may require replacing. If the indicating needle drops several pounds and stays at this point for 10 or 15 seconds with the safety valve open, then the vent valves are working properly.

SERVICE MAINTENANCE:

The burners should only be started up and adjusted by trained competent personnel. No electrical service should be done to the burner or controls until the main switch is pulled. Never add water to a boiler under pressure. Do not add water to a hot or overheated boiler. Wait until the boiler cools and the pressure falls to zero. If you cannot see water in the gauge glass and the burner is running, pull the main burner switch at once and wait for the boiler to cool and the pressure to drop to zero before adding water. When this occurs, check the low water cutoff at once and make sure it is functioning correctly. If necessary, have it repaired or replaced immediately. The NATCO must not be operated unless the low water cutoff is functioning properly.

The entire system must be checked regularly by trained personnel (at least once a year) to make certain that the NATCO and all controls and

appurtenances and safety devices are working properly. It is very important that the safety valve and low water cutoff be checked monthly.

OPERATING PRESSURES:

When the NATCO is operating as a water heater, only set the Honeywell PA404A to cut out at 9 PSI and set the differential to 2 PSI. If additional reserve is required and the local code permits it, operate between 11 and 13 PSI. If the unit is used for low pressure steam drying and water heating, it might be advantageous to use a large differential. Try setting with 10 lbs. cut-out and a 4 PSI differential. Or, if the code permits, 13 PSI cut-out and a 6 PSI differential. Change these settings if local conditions require it. If boiler is shut down at night or on weekends, refer to special boiler treatment to prevent corrosion section in this manual.

WATER SOFTENERS FOR USE IN HARD WATER AREAS:

Water softeners should never be used for filling the steel body of the boiler with prime water. However, water softeners are very useful for water that enters the heat exchanger – the heated water.

Hard water precipitates lime scale on the interior surfaces in contact with the heated waters. Hard waters are harmful to every type and design of water heater, and the NATCO is no exception. When lime scale is formed, the temperature and volume of the heated water is immediately reduced and eventually, a complete stoppage can take place. This condition is easily and readily overcome by the installation of a water softener. The water should be tested and if the grains hardness is over 10 it is almost certain that water softening system should be used. Some waters of less than 10 grains hardness will precipitate an insoluble lime deposit. Check with your local water supply company.

LOW WATER CUTOFF AND AUTOMATIC WATER FEEDERS:

The NATCO is equipped with a low-water cutoff. The purpose of this cutoff is to automatically shut down the burner if the water level of the NATCO becomes dangerously low. An automatic water feeder is not supplied as standard equipment and is not recommended unless steam is used for process work and the condensate is not returned. If the system is properly installed and is tight, very little make-up water will be needed.

NATCO cannot too strongly recommend that the water line of the NATCO be checked in the water gauge glass daily. It is inadvisable to rely on the automatic control, for unless automatic controls are tested and checked periodically, they might be inoperative when most needed.

If you require an automatic water feeder, please contact NATCO so we can size an appropriate model for your boiler.

FOR BEST PROTECTION-CHECK THE WATER LINE DAILY

HIGH LIMIT PRESSURE CONTROL:

The New York State Code (and some other states) requires the installation of a manual reset high limit pressure control in addition to the operating pressure control. The purpose of this pressure control is to shut off the burner if the operating pressure control fails to function. This pressure control requires manual resetting to put the burner back in operation. Other localities also require a second pressure control but do not always specify that it must be a manual reset. We now include a L4079B Manual Reset Pressure Control as standard. We recommend using it.

PROTECTION AGAINST FREEZING IF A SHUT DOWN OCCURS AT FREEZING TEMPERATURES:

If the NATCO is shut down and there is a danger of freezing, the boiler water in the NATCO must be drained and the coil must be disconnected, removed from the NATCO, and tested on end to drain all the water from the coil and the tempering valve.

OPERATING INSTRUCTIONS FOR THE CONTROL OF OXYGEN CORROSION ON BOILER TUBES OF THE NATCO

Most prime water (the water in the body of the boiler, not entering the heat exchanger) does not require treatment to prevent oxygen corrosion when the NATCO is operated as a water heater and the system is tight. There are circumstances however, where water is corrosive or where the NATCO must be operated in such a way as to permit the introduction of oxygen which can cause tube corrosion.

While the principle cause of corrosion is due to oxygen in the boiler water attacking the tubes, there are many variables, and other conditions which can cause corrosion. These exceptional conditions that could cause corrosion include carbon dioxide, stray electrical currents coming in from outside, stray electrical currents because an electric appliance has been grounded to the NATCO, absorption of Perchloroethylene fumes, improper cleaning of the water surfaces of the boiler, etc.

National Combustion Company does not claim that complying with these rules will stop tube corrosion in every case. There are too many variables to contend with. Wherever possible, we suggest that a specialist be called in to make an analysis of the condition and submit a schedule for the regular treatment of the boiler to protect against oxygen corrosion.

The following are a few simple instructions that, if conscientiously followed, will protect the NATCO against tube corrosion in the vast majority of cases:

- A. The NATCO is used as a water heater only and constant steam pressure is maintained. Very little make-up water is required.

The NATCO must be filled with unsoftened water. If a water softener is used, a tap water connection must be made to fill line of the NATCO. The prime water must never be changed. The prime water (boiler water) should be treated with caustic soda, commercially sold as lye (sodium hydroxide, NaOH), to raise the pH to 11.5. We recommend 3 oz. of caustic soda per 100 gallons prime water of boiler water content of the NATCO (20 grams per 100 liters). Refer to NATCO specification sheet for the prime water content of the NATCO.

- B. The NATCO is used as a water heater, but the steam pressure is reduced to zero at nights or over long weekends. This also applies when the NATCO is used for hot water and to provide steam for steam dryers or other equipment where the condensate is returned.

1. Add 3 oz. of caustic soda (lye) per 100 gallons regardless of the original pH of the water.
2. Should the grains of hardness in the water be below 3 (50 ppm), add 1-1/2 oz. of sodium sulphate (Na₂SO₃) per 100 gallons of prime water (10 grams per 100 liters). Add sodium sulphate at least four times a year. Sodium sulphate is an excellent and inexpensive oxygen scavenger. It is good practice to obtain a sodium sulphate tester and maintain a concentration of 100 ppm.
3. A Magnesium Anode Rod can be used as oxygen scavenger as well. One rod should be used per each 300 gallons of prime water in the

boiler (check the specification sheet for the total number of gallons of prime water).

C. The NATCO is used as a steam generator and the steam is not returned to the NATCO. For example, steam is used for baker ovens, Turkish Baths, cookers in dry cleaning Plants, steam for concrete aggregate, etc. Provisions must be made to automatically compensate for the lost condensate, but in addition to this oxygen corrosion must be guarded against.

1. Add 3 oz. of caustic soda (lye) per 100 gallons of prime water.
2. Add 1-1/2 oz. of sodium sulphate per 100 gallons of prime water and maintain the level of 100 ppm. Check with a sodium sulphate tester.
3. Use Magnesium Anode Rods. One rod should be used per each 300 gallons of prime water in the boiler (check the specification sheet for the total number of gallons of prime water).

CAUSTIC SODA CAN BE OBTAINED IN A SUPERMARKET UNDER THE COMMERCIALNAME OF "LYE".

Note: Samples of tap water may be sent to NATCO for analysis and advice.

PROPER CARE OF IDLE BOILERS:

If a NATCO is to remain idle, such as a seasonal shutdown, the boiler must be cared for properly. Water readily absorbs oxygen during a shutdown. An idle boiler must be completely filled with alkaline water (pH between 11 and 11.5) and containing 100 ppm Sodium Sulphate (1-1/2 oz. per 100 gallons of prime water). We recommend that the safety valve be removed and a nipple 8" long be installed. Add water until it overflows.

Before again placing the NATCO in operation, surface blow the boiler under steam pressure for about 5 minutes, then drain the water and refill with fresh tap water. Add caustic soda and sodium sulphate as required. (Refer to preceding paragraphs)

Also test the steam pressure safety valve and clean and test the low-water cutoffs.

RECOMMENDED PROCEDURES IF FIRE TUBES LEAK:

1. It is important to determine if the leak is due to a loosening of the fire tubes in the tube sheet. This is a rare occurrence and is usually an indication of rough handling in shipping or rigging. If this condition exists, it must be immediately corrected by calling in a boiler welder to re-roll the leaking tubes. Leaking boiler tubes will quickly corrode the tube sheet, causing extensive and expensive repairs.
2. If it is determined that one or more of the boiler tubes have an internal leak, we recommend the following procedure be taken:
 1. Plug the tubes that are leaking. 2" steel plugs are available or can be obtained from National Combustion Company.
 2. Test the pH of the water. It should be brought up to a pH of 11-1/2 by the addition of caustic soda.
 3. Check the electrical grounding system and make certain that motors are not grounded to the hot or cold water line of the NATCO.
 4. Operate the NATCO with the tubes that leaked plugged for six months and if no other tubes develop a leak in the period, we recommend that the tubes that were leaking be replaced. If additional tubes break through within the six months period, plug them and wait for another six months. It is usually not necessary to replace all of the tubes in the boiler.

A relatively rare occurrence known as stray electrical current may cause tube corrosion. This can be due to current leakage from high tension lines, large transformers, underground electric service to the building or several other conditions. The current passed through the earth and is picked up by the cold water or gas line entering the building.

If it is suspected that this condition exists, insulate the NATCO by installing dielectric unions on the cold water line, the hot water line, and the water feed lines to the NATCO. This will also protect against stray currents from grounded electric equipment.

Limited Warranty

For Natco Tankless " C-Series and M-Series"

National Combustion Co.,Inc. ("NATCO") sells the NATCO Water Heater, the NATCO Boiler used for both process work and heating, and combination hot water and steam units. The principal part of the system is the steam pressure vessel. The "pressure vessel" is constructed in accordance with ASME low pressure boiler code and it is so stamped. It carries the National Board serial number. The vessel is hydrostatically tested after construction at sixty pounds per square inch by the ASME inspector and a certificate to this effect is furnished with the "pressure vessel". NATCO agrees to repair leaks in the pressure vessel (known as the shell only) developing within One year from the date of installation. There will be no charge for labor or services. However, NATCO will not repair leaks: (1) developing in gaskets, (2) in external threads due to the installer's faulty workmanship, (3) due to misuse or abuse, (4) due to excessive lime formation, (5) caused by oxygen by corrosion of the boiler tubes, or (6) due to conditions beyond the control of NATCO.

Leaks must be promptly reported. NATCO is not responsible for related damage caused by the leak.

We reserve the right to inspect the pressure vessel and access must be provided during normal working hours. If we authorize repairs to the pressure vessel, they will be made only during normal working hours. NATCO will not be responsible for any repairs made to the pressure vessel that were made without its written authorization.

NATCO may furnish, in conjunction with the NATCO heater, various appurtenances such as burner, coils, pumps, controls, etc. NATCO warrants to the original purchaser such equipment to be free from defects in material and workmanship under normal use and service. Our obligation under this warranty shall be limited to the repair or exchange, F.O.B., New York City of any part or parts returned to us at customer's expense, which may prove defective under normal use and service within one year from date of installation and which our examination shall disclose to our satisfaction to be thus defective.

Equipment which is repaired or replaced shall carry a warranty equal to the unexpired portion of the original warranty. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED INCLUDING THE WARRANTIES OR MERCHANTABILITY AND FITNESS FOR USE AND OF ALL OTHER OBLIGATIONS OR LIABILITIES ON OUR PART, AND WE NEITHER ASSUME, NOR AUTHORIZE ANY OTHER PERSON TO ASSUME FOR US, ANY OTHER LIABILITY IN CONNECTION WITH PRODUCTS SOLD BY NATCO ("EQUIPMENT"). THIS WARRANTY SHALL NOT APPLY TO EQUIPMENT OR ANY PART THEREOF WHICH HAS BEEN SUBJECT TO ACCIDENT, NEGLIGENCE, ALTERATION, ABUSE OR MISUSE. WE MAKE NO WARRANTY WHATSOEVER IN RESPECT TO ACCESSORIES OF PARTS NOT SUPPLIED BY US. THE TERM "ORIGINAL PURCHASER", AS USED IN THIS WARRANTY, SHALL BE DEEMED TO MEAN THAT PERSON OR FIRM FOR WHOM EQUIPMENT IS ORIGINALLY INSTALLED.

Defects caused by improper installation, operation, handling or acts beyond our control are not covered.

NATCO will not be responsible for any service except as set forth herein. The purchaser expressly waives all damages whether direct, incidental, or consequential.

Where applicable, refer to the Installation Manual for details of installation and operation.