

SATURN

HOT WATER OIL-FIRED BOILER

Installation, Operation and Maintenance Manual

**INSTALLATIONS MUST MEET ALL LOCAL AND FEDERAL
CODES THAT MAY DIFFER FROM THIS MANUAL**

Please read this complete manual before beginning installation. These instructions must be kept with the boiler for future reference.

CERTIFIED TO: CAN/CSA Std. B140.0 & Std. B140.7
CONFORMS TO: UL 726

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Keep this manual in a safe place for future reference.

Follow manual carefully for the correct way to install and operate this appliance.

Do not operate this appliance until operating instructions have been read and fully understood.

SAVE THESE INSTRUCTIONS

1.0 HOMEOWNER INFORMATION

1.1 INTRODUCTION

Please read and understand this manual before installing, operating or maintaining the boiler. To ensure you have a clear understanding of the operating procedures of the appliance please take the time to read section **1.0 HOMEOWNER INFORMATION** of this installation/operation manual.

1.2 REGULAR MAINTENANCE

Have operation of boiler, burner and controls regularly checked **at least once per year** by a qualified technician.

1.3 WARNINGS

DISCONNECT POWER SUPPLY AND SHUT OFF OIL BEFORE WORKING ON BOILER.

DO NOT ATTEMPT TO START BURNER WHEN EXCESS OIL HAS ACCUMULATED, WHEN UNIT IS FULL OF VAPOUR OR COMBUSTION ZONE IS VERY HOT.

NEVER BURN GARBAGE OR PAPER IN THE UNIT AND NEVER STORE COMBUSTIBLE MATERIAL AROUND IT.

DO NOT USE GASOLINE, CRANKCASE DRAININGS OR ANY OIL CONTAINING GASOLINE.

1.4 SHUTTING BOILER DOWN

POWER OFF Turn off main power switch.

FUEL OFF Shut off manual fuel supply valve.

Always keep the manual fuel supply valve shut off if the burner is shut down for extended periods.

1.5 RESTARTING BOILER

Follow this procedure before restarting a unit that has been shut down for an extended period.

INSPECTION Have the boiler/system serviced and inspected by a qualified technician.

FUEL Turn on fuel supply and check that there are no leaks.

POWER Turn on power switch and check that the boiler starts and operates as usual.

OPERATION If the boiler/system fails to operate or operates in an unusual way, call a qualified technician. If the burner fails to operate at any time, call a qualified burner technician.

2.0 INSTALLATION

2.1 IMPORTANT

Read manual thoroughly before installation and/or ignition. Consult local authorities if in doubt about your local fire safety regulations. All installations must be made in accordance with local and state or provincial codes which may differ from this manual. Improper installation will result in voiding of warranty. Save these instructions for references.

2.2 CAUTION

INSTALLATION MUST COMPLY WITH REQUIREMENTS OF AUTHORITIES HAVING JURISDICTION. **DO NOT START THE BURNER UNTIL ALL FITTINGS, COVERS AND DOORS ARE IN PLACE. DO NOT TAMPER WITH THE BOILER OR CONTROLS.**

2.3 GENERAL INSTRUCTIONS

Open all boxes, except the one containing the cabinet, and check their contents against the packing slip. In case of shortages or damage, notify the transportation company immediately. The side of the boiler to your right as you faced the front of it is the Right Hand Side (RHS) and the side to your left (Coil Side) is the Left Hand Side (LHS).

2.4 PLACEMENT & VENTING

Installation should conform to CSA standard B139, the Installation Code for Oil Fired Equipment.

FLOOR SUPPORT NON-COMBUSTIBLE – If required, support boiler on a Granby Appliance Stand or five (5) concrete blocks. Make sure centre of boiler base is supported. If boiler is to be erected on a combustible floor, a fire resistant heat shield, which satisfies the requirements of the authorities having jurisdiction, must be placed between the steel base and the floor to create a non-combustible base. Floor must be strong enough to support the weight. Review clearances on operating decal or section 8.0 **GENERAL SPECIFICATIONS.**

VENT SIZE The oil-fired unit must be connected to a chimney/vent system of the appropriate size to satisfy CSA B139, Installation Code. It must have sufficient draft at all times, to assure safe proper operation of the unit.

COMBUSTION AIR The B139 Installation Code requires that the installer provide for sufficient outside make up air for the burner. Do not install oil burners in rooms with insufficient air to support combustion. An opening up to twice the area of the smoke/vent pipe may be necessary.

THROUGH-THE-WALL VENTING Approved for use with the KPV-SS1C through-the-wall vent system. For settings, see KPV instruction sheet. Ensure sufficient combustion and ventilation air is available.

TYPE "L" VENT Approved for Type "L" vent system. Maximum flue gas temperature of 575°F.

2.5 ASSEMBLE BOILER

CABINET	The cabinet assembly comes in seven sections - Right Side, Left Side, Top Front, Top Back, Rear Panel, Front Bottom and Front Top panels.
OIL BURNER	See section 2.6 ASSEMBLE & INSTALL BURNER .
BOILER CONTROL	Honeywell L8124G1020, high limit triple aquastat, White Rogers 8B43A-602 or certified equivalent.
CIRCULATOR	Armstrong SSC-30, Grundfoss 15-42F or equivalent.
DRAIN	1/2" IPS
TRIDICATOR	Combination temperature and pressure indicator. 70 psi/320°F, 30 psig or equivalent.
RELIEF VALVE	Watts 335, 30 psig, 3/4" or equivalent.
BLOW DOWN	Install 3/4" blow down termination within 6" of floor on relief valve outlet. Blow down must contain no fittings that could impair its proper operation and must terminate in a SAFE PLACE.
EXPANSION TANK	Diaphragm or cylinder as required.
WATER VALVE	Watts 1156 or equivalent, 1/2" IPS.
DRAFT CONTROL	Granby 6" 7" 8" Draft Control or CSA approved equivalent. For 5" vent install draft control in short 6" section of vent pipe.
WIRING HARNESS	Supplied, see Figure – 3.
VENT PIPE	Size vent according to local B139 requirements. 7" use approved tapered increasers only. 6" no adapter required. 5" use approved tapered reducers only.
PIPING	1 1/4" pipe for supply and return unless otherwise specified.
DRAFT CONTROL	Attach the balanced draft control to the 6" x 7" smoke/vent pipe. For 5" smoke/vent pipe (ONLY for inputs of 1.25 USGPH or less) adapt to 5" after the balanced draft control.

2.6 ASSEMBLE & INSTALL BURNER

- ASSEMBLE BURNER** Follow assembly and mounting instructions as supplied by burner manufacturer.
- END CONE** BECKETT - Install pin as boiler label. RIELLO - See turbulator settings in manufacturer's manual.
- SELECT NOZZLE** Select oil input, nozzle and burner configuration to correspond with boiler settings table shown on operating decal and section 3.0 **BURNER SPECIFICATIONS.**
- INSTALL NOZZLE** Install selected nozzle and make sure it fits tight in the nozzle adaptor.
- ELECTRODES** See burner manufacturers specifications given in burner instructions.
- INSERT LENGTH** For burners with adjustable mounting flange, install flange and set so the end cone or shroud will be 1/4" back from combustion chamber wall (3 1/4" end cone to gasket face). Check burners supplied with fixed flanges in case of error. Refer to Figure – 1.
- MOUNT BURNER** Mount the burner flange to the front of the boiler, inserting the burner head through the opening in the front of the boiler. Tighten top nut first to ensure burner tips slightly towards chamber.
- WIRING** For correct burner connections refer to Figure – 3 or wiring decal.

2.7 DOMESTIC HOT WATER COIL

Use a Granby K26m coil only. For best performance always connect cold water supply to RHS fitting on coil.

ACTUAL FLOW & TEMPERATURE RATES MAY VARY FROM COIL SPECIFICATION

Oil Pump By-Pass Plug

BURNER	ONE PIPE SYSTEM	TWO PIPE SYSTEM
Beckett	Plug removed *	Insert plug
Riello	Plug removed *	Insert plug

*Indicates factory shipped condition – see burner/oil pump instructions for more detail

2.8 SET BURNER FOR EFFICIENT OPERATION

END CONE	BECKETT - Install pin as per operating decal. RIELLO – see “turbulator settings” in manufacturer manual.
BURNER AIR	BECKETT - Adjust air, as per manufacturer’s instructions. RIELLO - Adjust air, as per manufacturer’s instructions.
PUMP PRESSURE	BECKETT - 140 psi only (factory setting). RIELLO - No factory setting. Set pressure for nozzle selected by section 3.0 BURNER SPECIFICATIONS or operating decal.
SAMPLING HOLE	Between boiler breech and draft control punch or drill a 1/4” round opening.
DRAFT 0.02”	Using an accurate draft meter, adjust the draft control to obtain 0.02” wc of draft at the breech sampling hole.
SMOKE TEST	Allow binder to burn out of combustion chamber. Adjust air control until a clean flame with “0-1” smoke is obtained and then open to a “0” smoke. If flame will not clean up replace nozzle.
CO₂ TEST	CO ₂ should be 11-13% when burner is at “0” smoke. If flame will not clean up replace nozzle.
INSPECTION	Ensure the inspection cover seats flat and tight.
EFFICIENCY	Always leave burner set at “0” smoke with CO ₂ reading about 1% of CO ₂ lower than the peak efficiency achieved with a smoke trace (e.g. 12.5% CO ₂ should be set back 1% to 11.5%). This gives better allowance for fuel and draft variations and maintains a better seasonal efficiency.

3.0 BURNER SPECIFICATIONS

Model	Burner	Input		Nozzle	Pump (psi)	Air Setting	Turbulator	Output	
		USGPH	L/h					Btu/h	kW
BST-E1-0110-10(15)	Riello 40 F3	0.80	3.03	0.65 60W	150	3.0	1.0	97,000	28
		0.90	3.41	0.75 60W/AR	145	3.4	1.5	108,000	32
BST-E3-0175-10(15)	Riello 40 F5	0.80	3.03	0.65 60W	150	1.8	1.0	97,000	28
		0.90	3.41	0.75 60W/AR	145	2.0	1.5	108,000	32
		1.00	3.79	0.85 60W/AR	140	2.3	2.0	120,000	35
		1.20	4.54	1.00 60W	145	2.7	2.5	142,000	42
		1.50	5.68	1.25 60W/AR	145	3.5	4.0	174,000	51
BST-B1-0175-10(15)	Beckett AFII 150 PA202	0.77	2.91	0.65 60W	140	4.5	0.0	93,000	27
		0.89	3.37	0.75 60W/AR		6.0	0.0	107,000	31
		1.00	3.79	0.85 60W/AR		6.0	3.0	120,000	35
		1.18	4.47	1.00 60W		7.0	3.0	138,000	40
		1.30	4.92	1.10 60W		7.5	7.0	153,000	45
		1.48	5.60	1.25 60W		8.0	7.0	172,000	50

The information provided by the manufacturer of this boiler supersedes any information provided by any other party including the manufacturer of the burner.

4.0 BOILER RETURN WATER TEMPERATURE

Steel boilers are very susceptible to corrosion caused by condensation of flue gases. In order to prevent this, the return water temperature must not fall below 140°F. Most hydronic systems are designed for a delta T of 20°F. Therefore, the low limit should be set at no lower than 170°F, which accounts for the -10°F differential of the triple aquastat. Heating systems that require lower temperatures such as cast iron radiators and radiant systems require some form of mixing device to ensure the return water is at or above 140°F.

The warranty will not be valid for steel boilers with return temperatures below 140°F. For more information refer to B214-01 Installation Code for Hydronic Heating Systems (or equivalent).

5.0 BLOCKED VENT SWITCH

Oil-fired appliances installed in Canada require a blocked vent shut-off system when installed on a chimney. A safety switch is included with the furnace to perform this function. It is the installer's responsibility to install the switch in accordance with the instructions provided. Not applicable for Direct Vent or Power Vent systems.

Field Controls Model: WMO-1 (Manual Reset)

Switch Operation

Blocked vent switches are flue gas safety devices for detecting spillage of flue gases due to a blocked flue or inadequate draft. After detecting a problem, the switch de-energizes the system's burner control.

NEVER reset the switch unless the cause of the blockage has been corrected.

Installation

- 1) Pierce a 5/8" hole in to the flue vent pipe near the appliance breech connection.
- 2) This hole must be at least 10" before the draft regulator, vertically or horizontally.
- 3) Remove one of the securing nuts from the threaded tube of the safety switch.
- 4) Tighten the other securing nut onto the pipe as far as possible.
- 5) Insert the threaded tube end into the pierced hole of the flue vent pipe.
- 6) Install the securing nut on the safety switch tube, which protrudes into the flue vent pipe. Tighten the nut securely.

Wiring Instructions

Caution: Disconnect the electrical power when wiring the unit.

Wire the Blocked Vent Switch in accordance with The National Electrical Code and applicable local codes. Wire the safety switch in series with the burner limit control or aquastat. Route the wiring with an accepted wiring enclosure in accordance with the National Electrical code and applicable local codes. Refer to wiring decal or Figure - 4.

System Test Procedure

- 1) With the power re-established, block the chimney or vent pipe downstream of the switch.
- 2) Adjust the thermostat to call for heat.
- 3) Once the heating system has started the blocked vent switch should shut down the burner within 10 minutes or sooner.
- 4) Once the system has cooled, the blocked vent switch can manually be reset.
- 5) This procedure should be tested a second time.
- 6) After testing the blocked vent switch the chimney should be cleared of obstruction and the heating system tested on a long run cycle.

If the block vent switch shuts down the system, check to ensure there is enough draft in the chimney and venting pipes.

6.0 OIL TANK & PIPING

Tank installation must conform to local requirements.

Install according to the applicable code. Minimize number of connections in suction line and make all connections as tight as possible. Use a pipe joint compound suitable for oil on all pipe threads. To reduce possibility of air leaks, tighten stem packing gland nut on any valves installed in the suction line. Also, be sure the oil filter is tight, as filter gaskets often shrink. Check for kinks in the oil lines as well as for possible air pockets and for loose connections. Two filters as shown Figure – 2 are recommended. Optional tank gauge protectors and outlet protectors are available at your local dealer.

ONE PIPE SYSTEM Where the tank is above the burner and when the oil flows by gravity to the oil pump, a single-stage fuel unit with a single oil line to the pump may be used.

TWO PIPE SYSTEM When single line is unsuitable, use double line or see your dealer for special oil line fittings.

7.0 CLEANING INSTRUCTIONS

POWER OFF Turn off main power switch.

FUEL OFF Shut off manual fuel supply valve.

REMOVE SMOKE PIPE Remove smoke/vent pipe from the boiler breeching collar.

REMOVE TOP PANEL Remove the two sheet metal screws and top breeching panel of the boiler cabinet.

REMOVE BREECH Remove breeching nuts, carefully loosen boiler breeching and lift off.

REMOVE GAS BAFFLES Remove the flue gas baffles from the boiler tubes and clean with wire brush.

REMOVE BURNER Make sure power and fuel are off.

BRUSH TUBES Brush the tubes with a 1 1/2" tube brush. Take care not to damage combustion chamber.

VACUUM Vacuum the top of boiler.

CLEAN CHAMBER Remove loose soot or scale from cerafelt combustion chamber through burner opening. **TAKE CARE – FRAGILE COMBUSTION CHAMBER.**

REINSTALL BURNER Check insertion is 3 1/4" as specified.

REINSTALL BREECH Reinstall breech securely with nuts and reseal against gaskets. Reinstall casing panel and smoke/vent pipe with sheet metal screws. **DO NOT** start burner until all fittings and covers are in place.

- PANEL & PIPE** Reinstall top panel of the boiler cabinet and reinstall smoke/vent pipe. Secure with sheet metal screws.
- POWER & FUEL** Check installation before restoring power and fuel.
- EFFICIENCY** Smoke and CO₂ test. Replace nozzle if required. Set burner for efficient operation.

DO NOT START BURNER UNTIL ALL FITTINGS AND COVERS ARE IN PLACE.

8.0 GENERAL SPECIFICATIONS

CLEARANCE TO COMBUSTIBLES

Top	12"	(305 mm)
Front	24"	(610 mm)
Rear	6"	(152 mm)
Flue Pipe	9"	(229 mm)
Left Side	6"	(152 mm)
Left Side w/Coil	24"	(610 mm)
Right Side	6"	(152 mm)
Floor	Non-combustible	

SMOKE/VENT See Code B139

Smoke Pipe	6"
Flue/Vent Pipe	5, 6 or 7"

KPV-SS1C Settings

Certified for use with Type "L" Vent. Maximum flue temperature is 575°F

DRAFT

Breech Pressure	-0.02" wc
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CONTROLS

AQUASTAT	Honeywell L8124G1020 White Rodgers 8B43A-602
RELIEF VALVE	Watts 335, 30 psig, 3/4" or equivalent
TRIDICATOR	70 psi/320°F or equivalent

CLEANOUTS

Breech cover, burner opening

OIL INPUT

0.77 – 1.50 USGPH
2.91 – 5.68 L/h

FUEL No heavier than No. 2 Furnace oil

DIMENSIONS

Height	38 3/4"	(984 mm)
Width	23"	(584 mm)
Depth	22 3/8"	(568 mm)

OPENING HEIGHTS

Burner center line 8 5/16" (211 mm)

BURNER INSERTION

Beckett/ Riello 3 1/4" (83 mm)

WATER VOLUME

US gallons 30
IMP gallons 25
Liters 113.65

SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

FOR MOST RECENT UPDATES PLEASE VISIT www.GranbyIndustries.com.

The following form **MUST** be completed for the warranty to be valid.

Installed by: _____

Address: _____

Telephone: _____ Date: _____

START UP TEST RESULTS

Nozzle: _____ Pressure: _____

Air: _____ Turbulator: _____

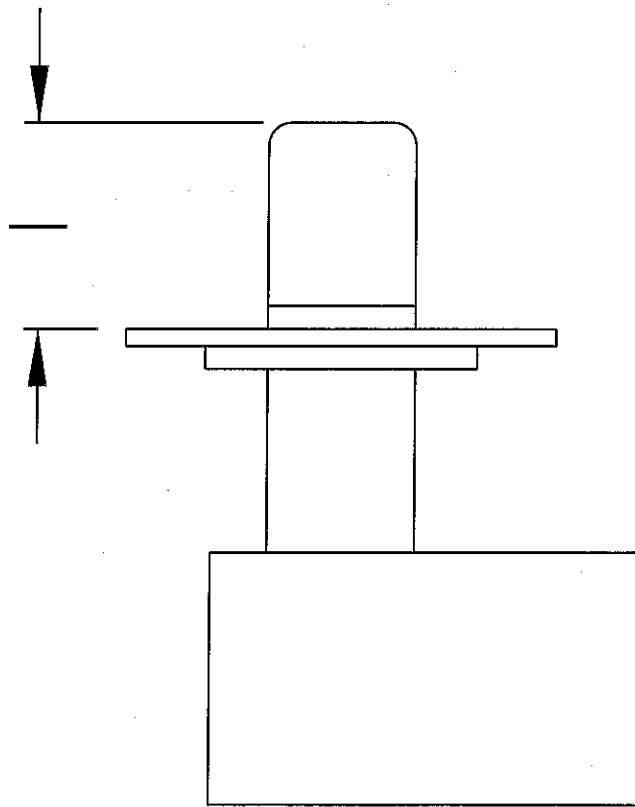
CO₂: _____ Smoke Number: _____

Breech Draft: _____ Stack Temperature: _____

Test Performed By: _____

Staple Printout Here:

Staple Smoke Spot Here:



BURNER INSERTION (I)

in

RIELLO

3 1/4

BECKETT

3 1/4

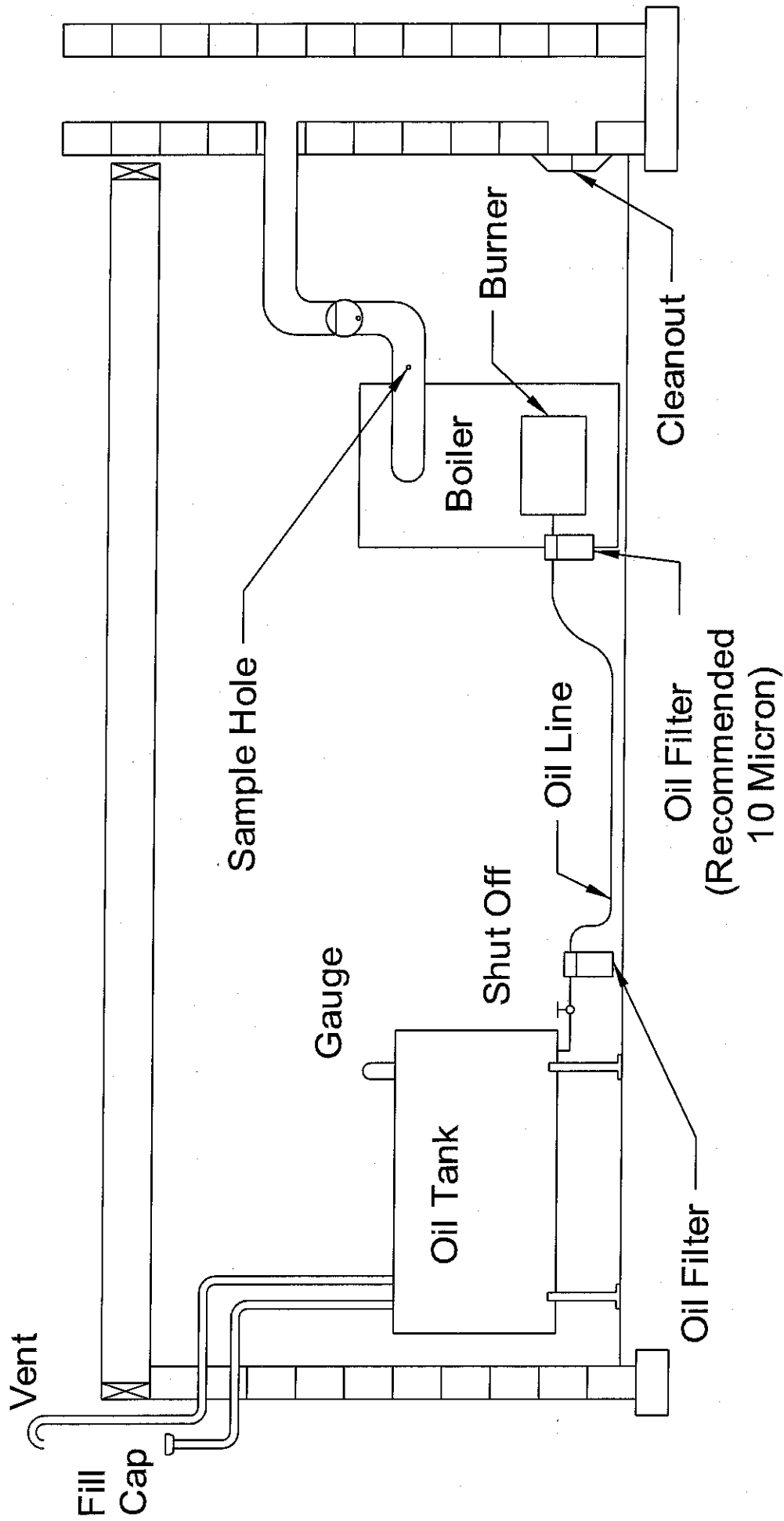
mm

83

83

FIGURE - 1

BURNER INSERTION JAN11

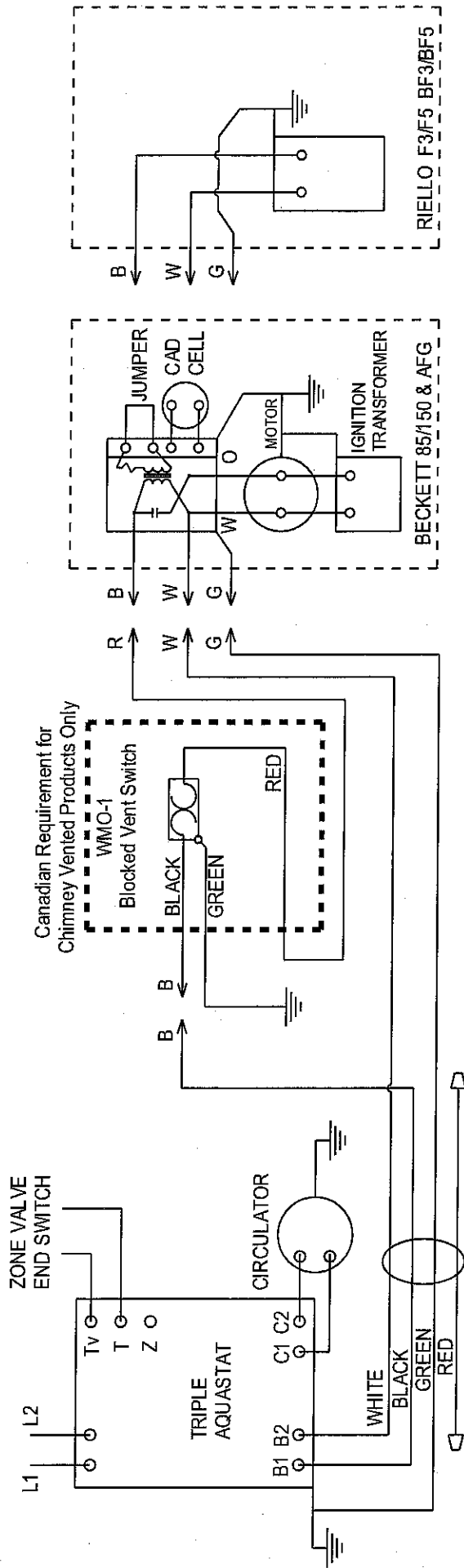


OIL TANK AND PIPING

FIGURE - 2

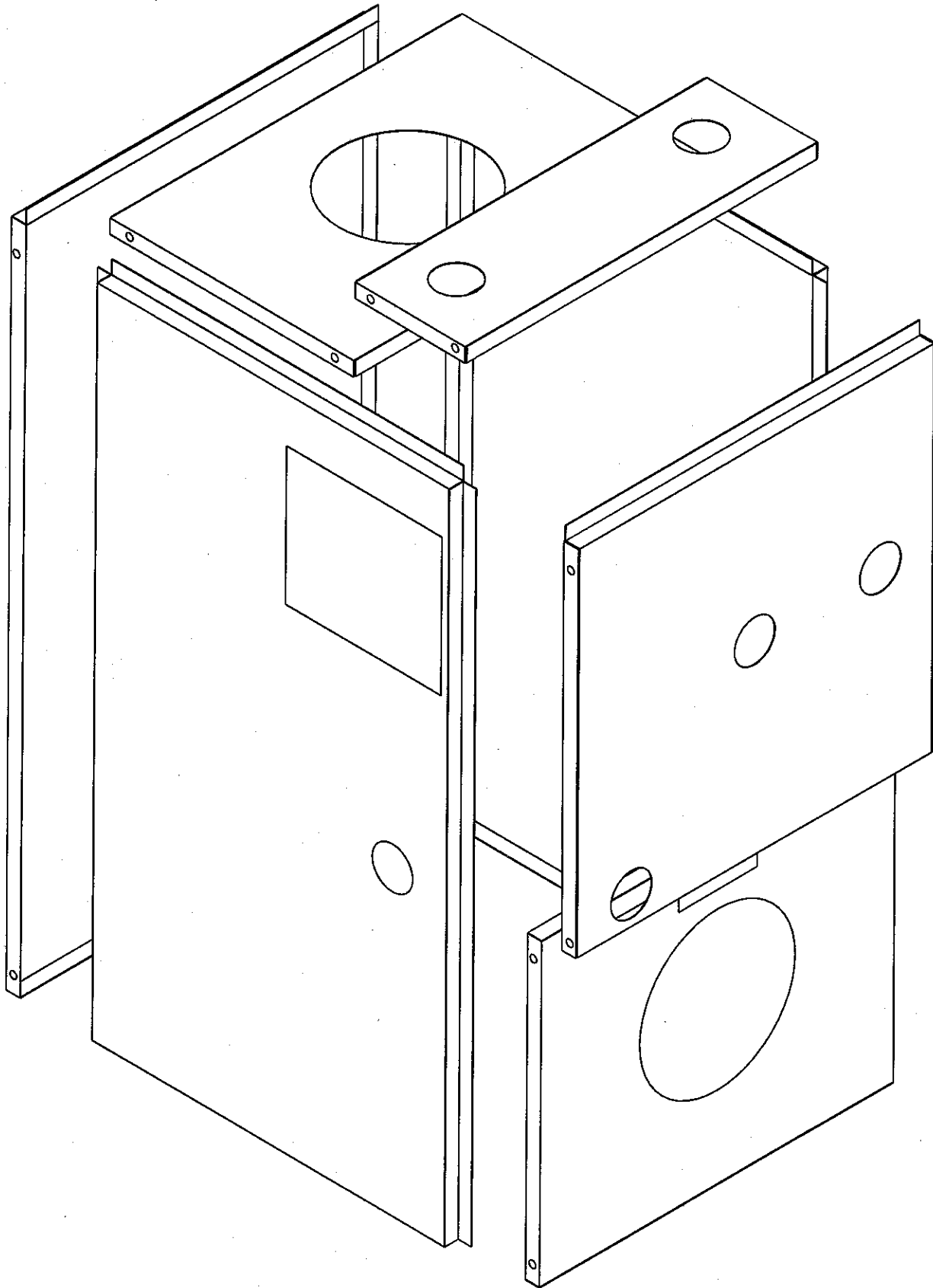
BINSTALLJAN11

RIELLO, BECKETT AFII 85/150 AND AFG BURNERS



WIRING DIAGRAMS

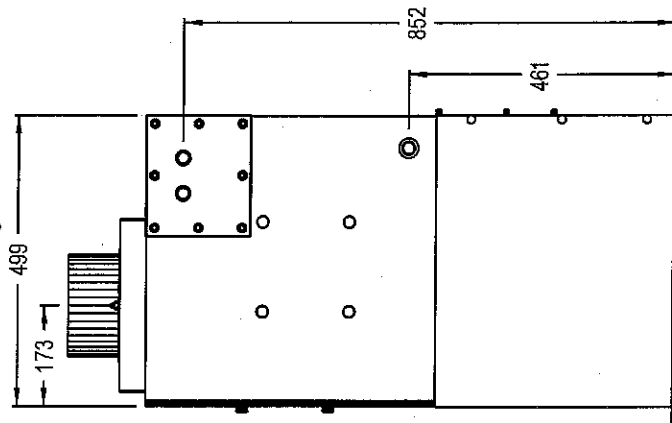
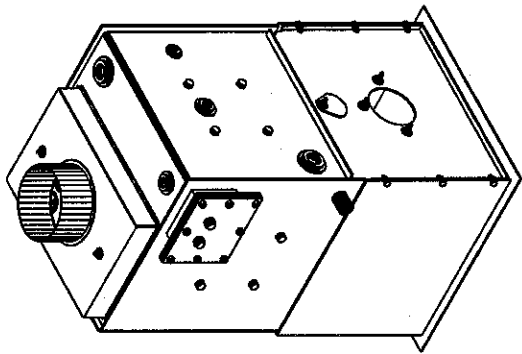
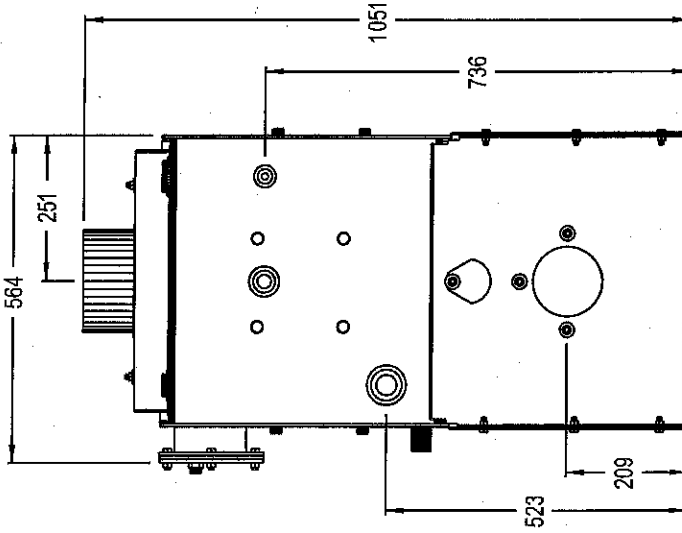
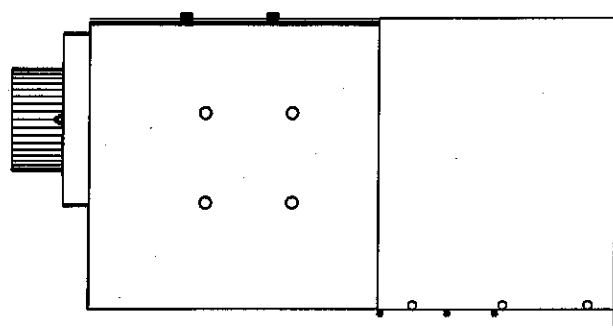
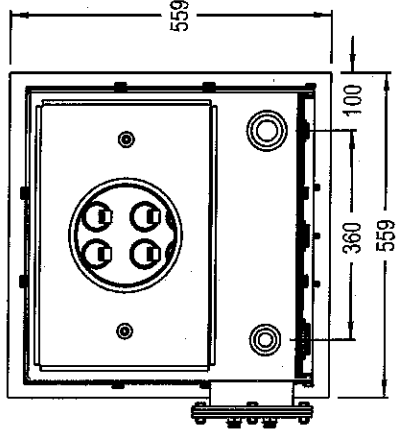
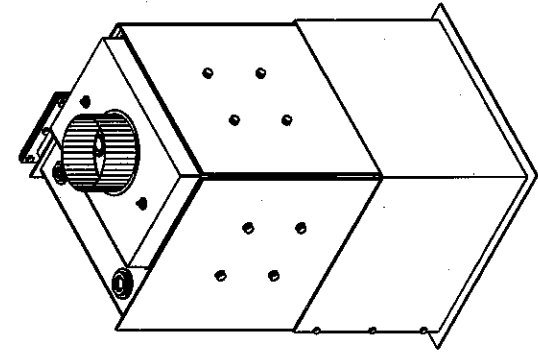
Figure - 3



LOCATION OF CABINET SCREWS

FIGURE - 4

SAT0004JAN11



SATURN DIMENSIONS

FIGURE - 5

SAT0001 JAN11

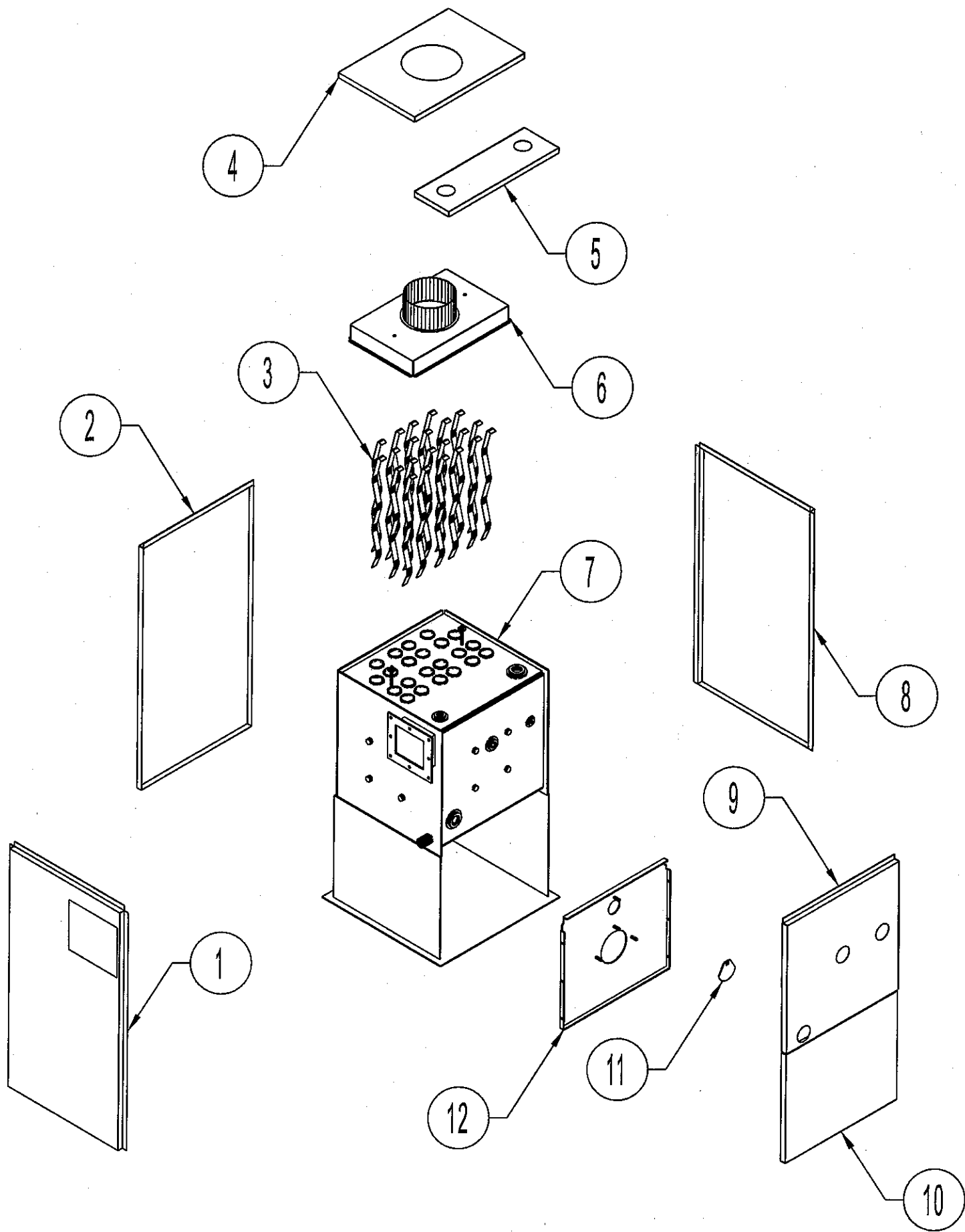


FIGURE - 6
SATPM001 JAN11

Table - 1

Saturn Oil-Fired Boiler		
Order No.	Item No.	Part Description
BST-CB-0055-00	SATURN-1	Cabinet Side Left
BST-CB-0015-00	SATURN-2	Cabinet Rear
B00-PV-0424-00	SATURN-3	Flue Gas Baffles
BST-CB-0252-00	SATURN-4	Cabinet Top Back
BST-CB-0254-00	SATURN-5	Cabinet Top Front
BST-PV-0006-00	SATURN-6	Collector Cover Assembly
BST-PV-0000-00	SATURN-7A	Pressure Vessel Assembly
BSN-PV-0000-00	SATURN-7B	Pressure Vessel Assembly - CRN (Not Shown)
BST-CB-0054-00	SATURN-8	Cabinet Side Right
BST-CB-0017-00	SATURN-9	Cabinet Front Top
BST-CB-0016-00	SATURN-10	Cabinet Front Bottom
BST-PV-0464-00	SATURN-11	Inspection Hole Cover
BST-PV-0003-00	SATURN-12	Fire Box Front
3CC-00-CHAM-01	SATURN-13	Combustion Chamber (Not Shown)
3TC-05-K260-00	SATURN-14	K26 Tankless Coil (Not Shown)
3GK-00-COIL-00	SATURN-15	Coil Flange Gasket (Not Shown)
BST-PV-0035-00	SATURN-16	Collector Gasket Set (Not Shown)
BST-PV-0050-00	SATURN-17	Fire Box Door Gasket Set (Not Shown)
4TD-00-PG75-10	SATURN-18	Tridicator (Not Shown)
4AQ-00-L102-9B	SATURN-19	Aquastat L8124L1029B (Not Shown)
3BN-0F-3LBT-00	SATURN-20	40F3 Riello Burner (Short Tube)
3BN-0F-5LBT-00	SATURN-21	40F5 Riello Burner (Short Tube)
3BN-00-PA90-10	SATURN-22	AFII 150 Beckett Burner