Condensing Boiler Training Program

Level III – Service Fundamentals

Rinnai®

Rinnai Condensing Boiler Level III Service Fundamentals Training Program

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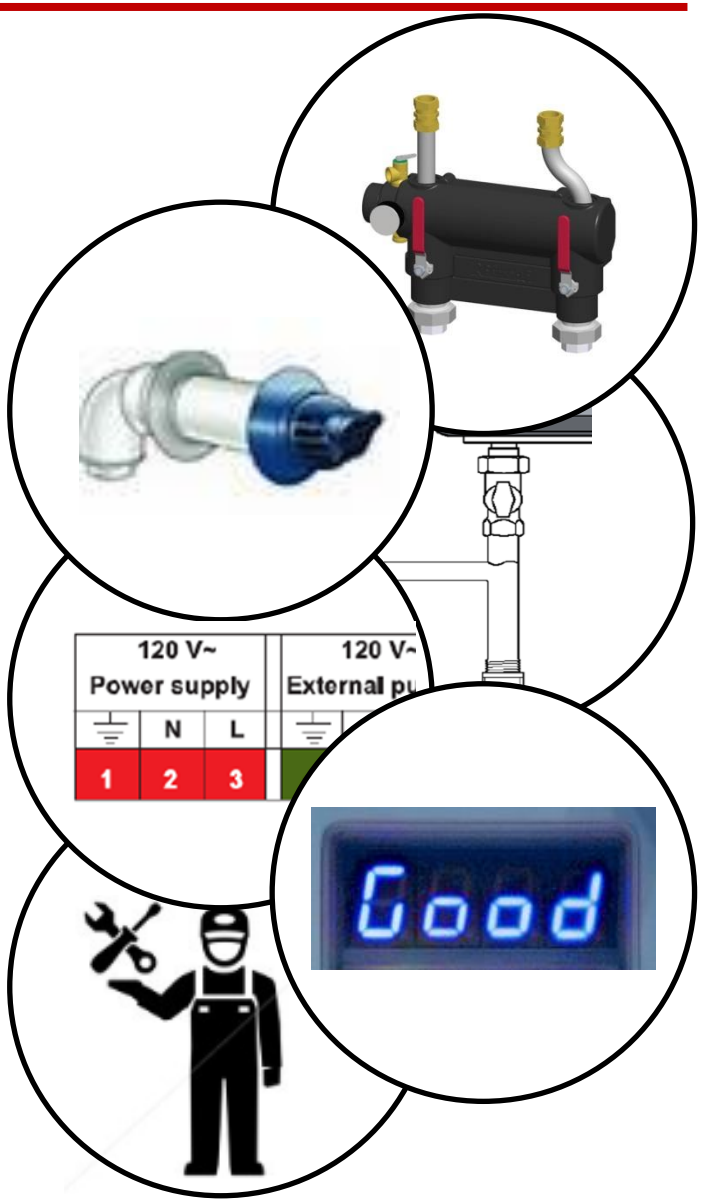
Agenda

- Rinnai Resources
- Features & Benefits
- Warranty
- Spare parts, all sensor 12K Ohms
- Control interphase and settings
- Maintenance & Service intervals: 2yr / 4yr all boilers
- Start-Up
- Commissioning: Setting optimal O2 %
- Service Simulation
- Tear Down
- Re-assemble



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Rinnai Service and Support

1- 800-621-9419

Customer Service

General calls, consumer questions, etc.
Available from 8 a.m. to 8 p.m. EST,
Monday – Friday.

Parts Department

Order Service / Repair Parts
Available from 8 a.m. to 8 p.m. EST,
Monday- Friday

Applications Support

General calls, Applications, Sizing
Available from 8 a.m. to 5 p.m. EST,
Monday – Friday.

Warranty Department

Warranty claim issues.
Available from 8 a.m. to 5 p.m. EST,
Monday- Friday

Tradesman: customerservice@rinnai.us
Wholesaler: sales@rinnai.us

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Rinnai Service and Support

CONTRACTORS ONLY DIRECT LINE

1- 888-RINNAIS (746 -6247)

Technical Support Department

This Phone Number is only provided to Technicians

FOR CALLS FROM THE APPLIANCE

Office Hours:

Monday – Friday **8 a.m**. to **8 p.m**. EST

On Call hours:

24/7/365

Leave a message for the on call technicians anytime.
You will get a call you back within 20 minutes

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LMS (training center)

Rinnai Training Center

- Live Classroom Training Calendar for every product group organized by state
- Self-Paced Online Training available for all products
- Resources page includes many technical documents

This training signs you up for access to the Rinnai Training website where you can find technical documents & trainings like this anytime:

www.rinnai-lms.com

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Live Classroom Training Schedule

Rinnai

Please choose a state to view available classes.

Alabama	Alaska	**Arizona**	Arkansas	California
Colorado	**Connecticut**	Delaware	**Florida**	**Georgia**
Hawaii	Idaho	**Illinois**	Indiana	Iowa
Kansas	**Kentucky**	**Louisiana**	Maine	Maryland
Massachusetts	Michigan	Minnesota	**Mississippi**	**Missouri**
Montana	Nebraska	Nevada	New Hampshire	New Jersey
New Mexico	**New York**	North Carolina	North Dakota	Ohio
Oklahoma	**Oregon**	**Pennsylvania**	Rhode Island	South Carolina
South Dakota	Tennessee	Texas	Utah	Vermont
Virginia	Washington	Washington, DC	**West Virginia**	Wisconsin
Wyoming				

Canada - Alberta	**Canada - British Columbia**	Canada - Manitoba	Canada - New Brunswick	Canada - Newfoundland and Labrador
Canada - Nova Scotia	Canada - Northwest Territories	Canada - Nunavut	**Canada - Ontario**	Canada - Prince Edward Island
Canada - Quebec	Canada - Saskatchewan			

Please choose a state to view available classes.

Alabama	Alaska	Arizona	Arkansas	California
Colorado	Connecticut	Delaware	Florida	Georgia
Hawaii	Idaho	Illinois	Indiana	Iowa
Kansas	Kentucky	Louisiana	Maine	Maryland
Massachusetts	Michigan	Minnesota	Mississippi	Missouri
Montana	Nebraska	Nevada	New Hampshire	New Jersey
New Mexico	**New York**	North Carolina	North Dakota	Ohio
Oklahoma	Oregon	Pennsylvania	Rhode Island	South Carolina
South Dakota	Tennessee	Texas	Utah	Vermont
Virginia	Washington	Washington, DC	West Virginia	Wisconsin
Wyoming				

Canada - Alberta	Canada - British Columbia	Canada - Manitoba	Canada - New Brunswick	Canada - Newfoundland and Labrador
Canada - Nova Scotia	Canada - Northwest Territories	Canada - Nunavut	Canada - Ontario	Canada - Prince Edward Island
Canada - Quebec	Canada - Saskatchewan			

Please choose a state to view available classes.

Alabama	Alaska	Arizona	Arkansas	California
Colorado	Connecticut	Delaware	Florida	Georgia
Hawaii	Idaho	Illinois	Indiana	Iowa
Kansas	Kentucky	Louisiana	Maine	Maryland
Massachusetts	Michigan	Minnesota	Mississippi	Missouri
Montana	Nebraska	Nevada	New Hampshire	New Jersey
New Mexico	**New York**	North Carolina	North Dakota	Ohio
Oklahoma	Oregon	Pennsylvania	Rhode Island	South Carolina
South Dakota	Tennessee	Texas	Utah	Vermont
Virginia	Washington	Washington, DC	West Virginia	Wisconsin
Wyoming				

Canada - Alberta	Canada - British Columbia	Canada - Manitoba	Canada - New Brunswick	Canada - Newfoundland and Labrador
Canada - Nova Scotia	Canada - Northwest Territories	Canada - Nunavut	Canada - Ontario	Canada - Prince Edward Island
Canada - Quebec	Canada - Saskatchewan			

Select the product group and the state where you live

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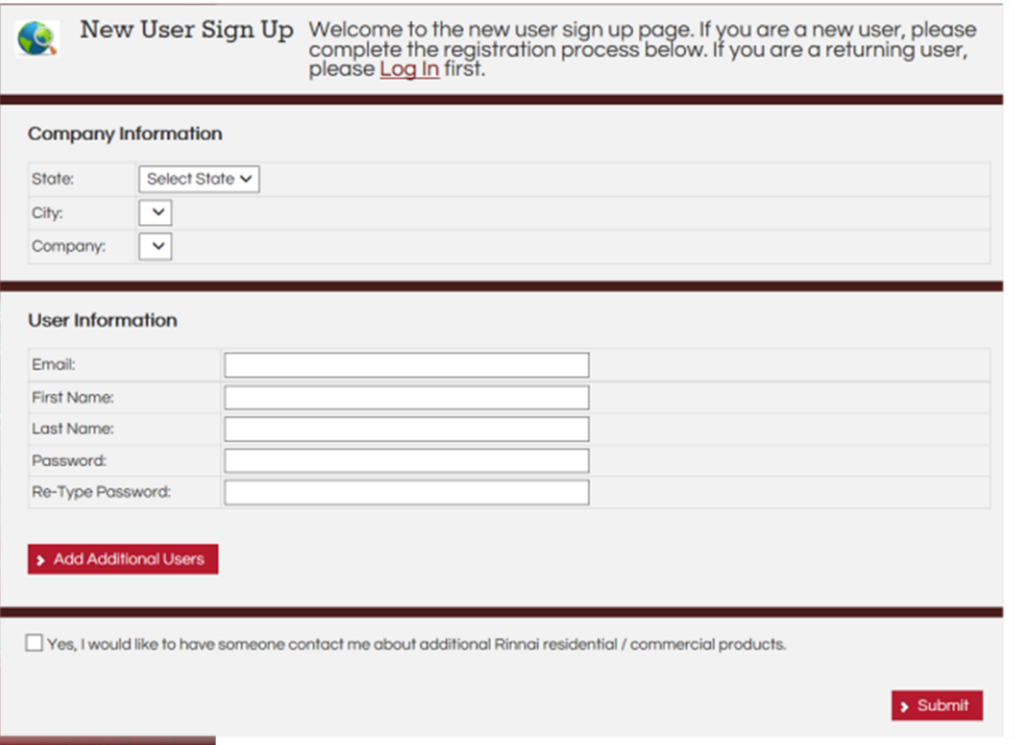
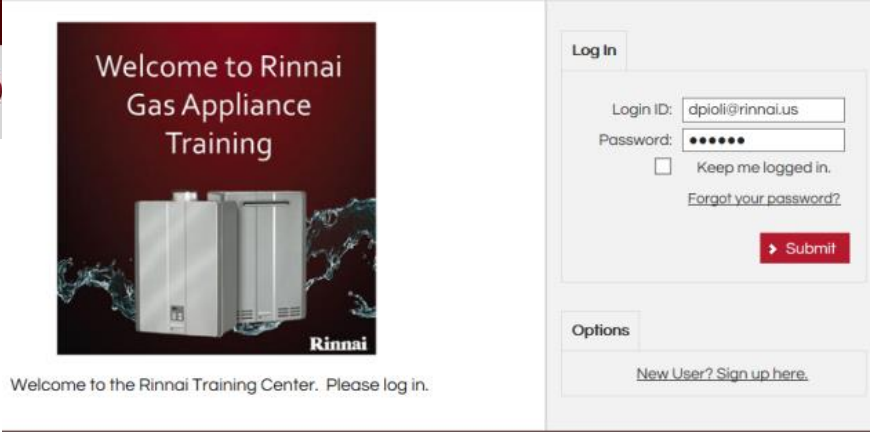
Self Paced Online Training





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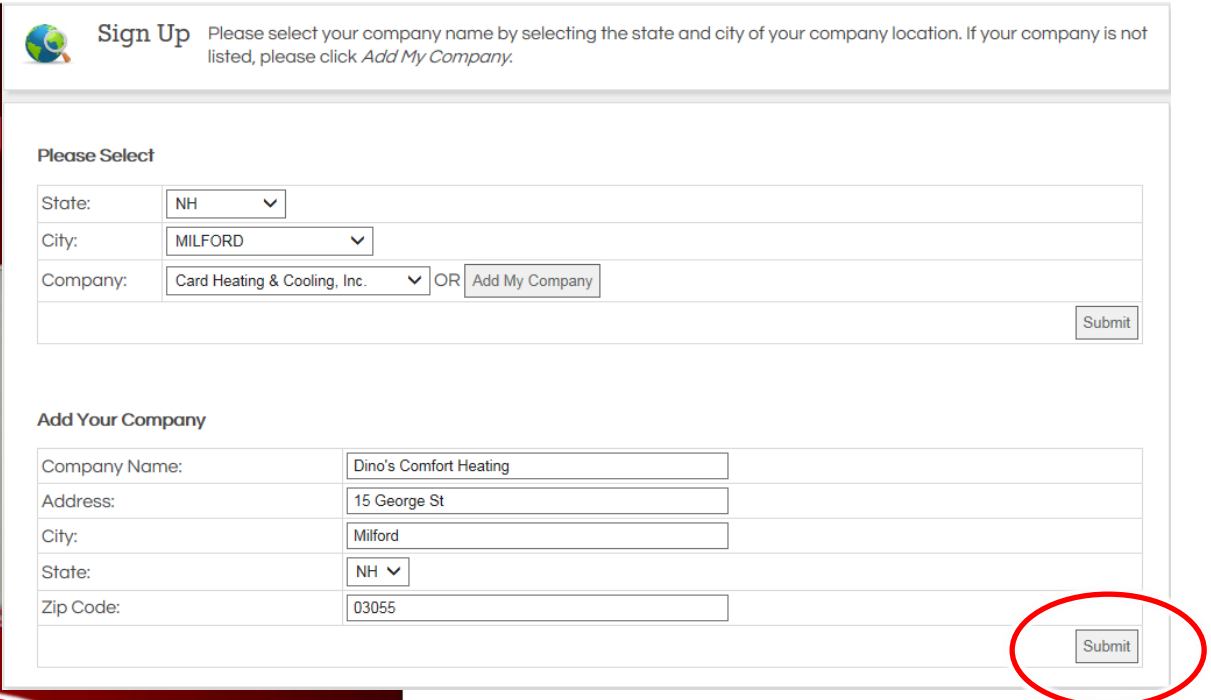
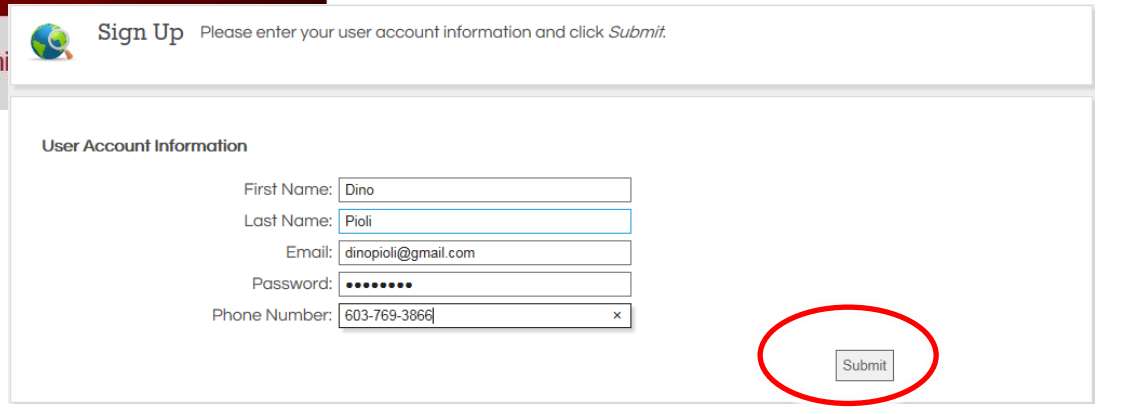
Self Paced Online Training





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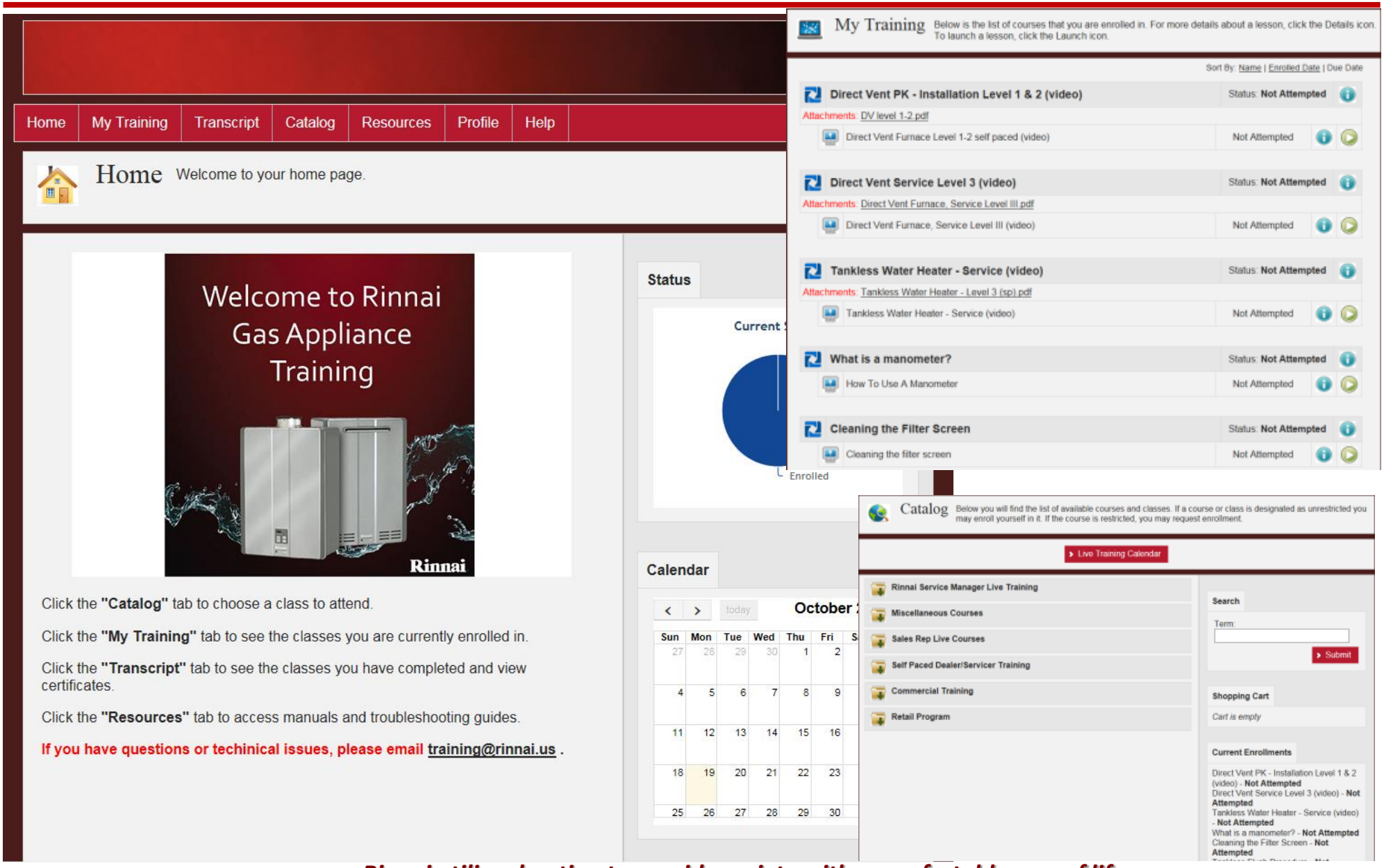
Self Paced Training



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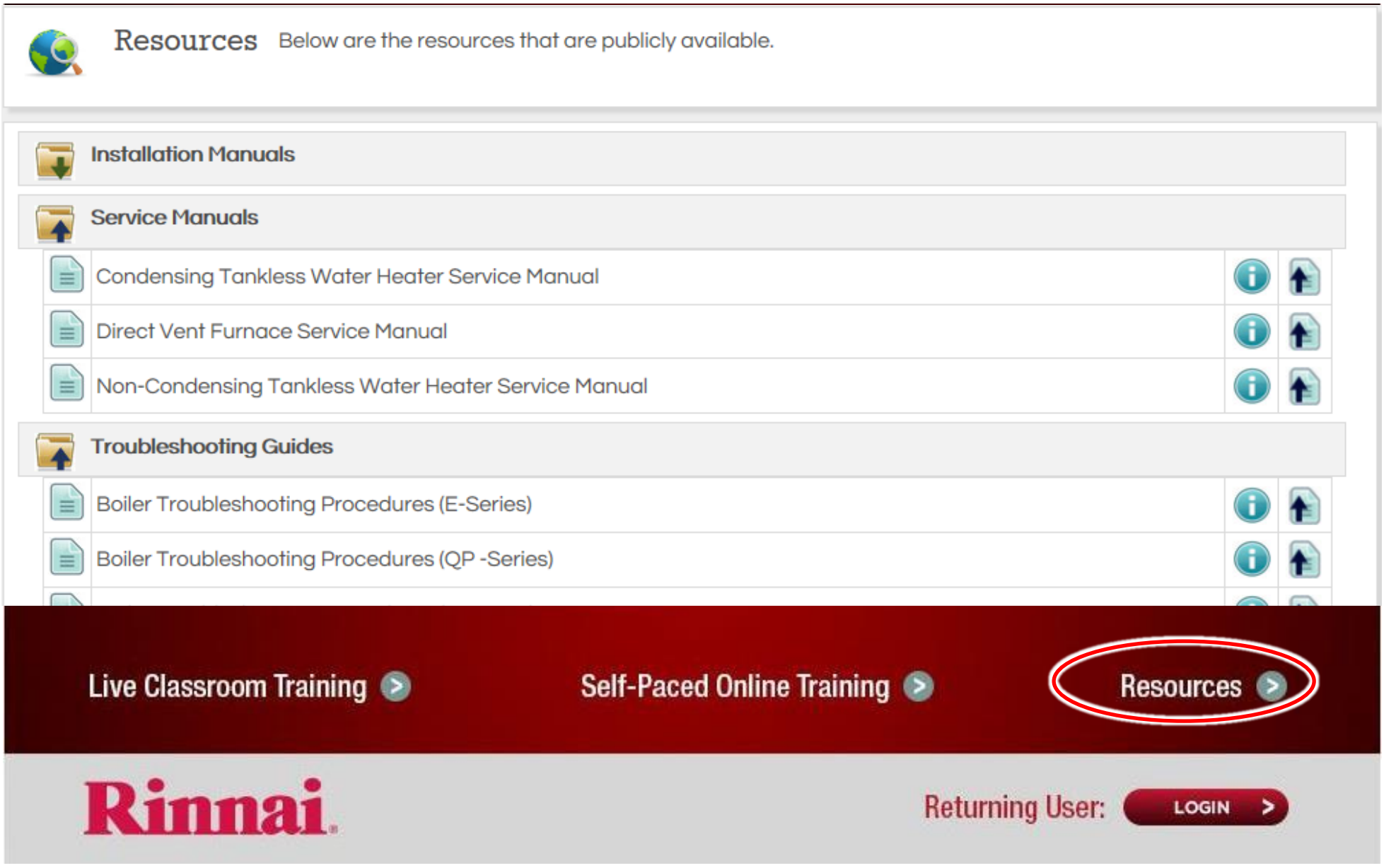
Resources



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Rinnai Boilers

E Series 	E Series boilers provide unsurpassed comfort and system efficiency at an economical price. E Series Boilers are available in 3 Combi Models and 3 Heating Only Models. E Series Boilers are ideal for apartments, condos, townhomes and smaller residential applications with up to 2 bathrooms. .
Q Series 	The Q Series Boilers are similar to E Series in design, operation, service and maintenance, but differ in that a LLH is provided and the cover is metal with a sealed combustion chamber. Available in 4 Heat Only and 1 Combi models. Q Series Boilers are ideal for Space Heating in all single family homes and some light commercial applications. Q Series Heat Only boilers can be used in conjunction with any indirect tank. Rinnai also offers 1 Q175 Combi boiler that is factory fitted with a 6.6 gallon Indirect Tank and Thermostatic Mixing Valve capable of delivering 4.1gpm @ a 75˚ rise.
QP 130 	QP130 all in one boiler is the premier choice for comfort, efficiency, and high performance domestic hot water production. The QP130 can delivery nearly 60 gallons of hot water in a 10 minute period and has the ability to recover the tank in less than 10 minutes. QP130 Boiler uses much less floor space than conventional floor boilers and indirect tank. This combination boiler provides 211 gallons in first hour recovery, which out performs many 40 - 45 gallon indirect tanks .

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Rinnai Boilers

E Series

Q Series

QP 130

- 95+% AFUE, Energy Star Most Efficient
- CSA, ASME, AHRI Certified
- SCAQMD Low Nox
- Modulating Combustion: Up to 6.25:1
- Modulating Boiler Pump
- Outdoor Reset Sensor Included
- Approved for 2”, 3” & 4” venting
- Approved for: PVC, CPVC, PP, SS, & Concentric Venting
- Approved with Centrotherm & Duravent Polypropylene Venting
- 2yr / 4yr Maintenance Intervals
- Tool Less Ignition Electrode

Most Efficient 2017
www.energystar.gov

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In the Box (Old E Series)

3 speed Circ	LLH*	Concentric Adapter	PP Adapter	2 PP x PVC
				

Expansion Tank	Outdoor Sensor	Pressure Sensor LWCO	Display	Documents
				

E75C & E110C

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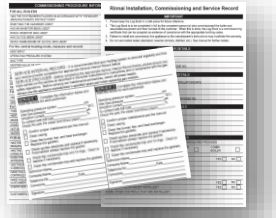
In the Box (E Series Refined)

Mod. Circ	Wall Mount Bracket	Concentric Vent Adapter	PVC Vent Adapter
			
O.A. Sensor	**Pressure Sensor LWCO**	**Display**	**Documents**
			

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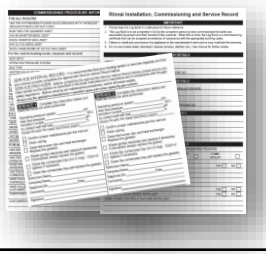
In the Box (Q Series)

LLH	Mod. Circ	Wall Mount Bracket	Concentric Vent Adapter	PVC Vent Adapter
				

O.A. Sensor	Pressure Sensor LWCO	Display	Q175 C DHW	Documents
				

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In the Box (QP Series)

LLH	Mod. Circ	Concentric Adapter	PP Adapter	PP X PVC Adpapters
				

O. A. Sensor	Display	Flat Plate	24 gal SS Tank	DHW Pump T&P
				

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E Series Combi

Models*	E50CR	E75CR	E110CR
Fuel Type (All field convertible)	NG (Field convertible to LP)	NG or LP	NG or LP
AFUE Rating	95.6%	95.5%	95.5%
Turndown Ratio (NG)	3.7 : 1	5.5 : 1	4.2 : 1
Max Heating Capacity (BTU)	47,800 (14 kW)	72,400 (21 kW)	105,700 31 (kW)
Min. Input (BTU)	13,600-NG (4 kW)	13,600-NG / 37,000-LP (4 kW / 11 kW)	26,000-NG / 59,000-LP (8 kW / 17 kW)
Max Input (BTU - DHW)	85,000 (25 kW)	85,000 (25 kW)	130,000 (38 kW)
Max. Input (BTU - Heating)	50,000 (15 kW)	75,000 (22 kW)	110,000 (32 kW)
DHW Activation Rate (G)	0.5 Gallon / Minute	0.5 Gallon / Minute	0.5 Gallon / Minute
DHW Activation Rate (LPM)	1.9 Liter / Minute	1.9 Liter / Minute	1.9 Liter / Minute
Max. DHW @75°F ΔT	2.1 Gallon / Minute	2.1 Gallon / Minute	3.2 Gallon / Minute
Max. DHW @42°C ΔT	7.9 Liter / Minute	7.9 Liter / Minute	12.1 Liter / Minute
Approved Venting Material	Concentric, Polypropylene (PP), Stainless Steel (SS), PVC, CPVC		
Warranty	12-year heat exchanger, 2-year parts, 1-year labor.		
Certifications	ENERGY STAR®, CSA, ASME H Stamp, Low Lead		
Dimensions w, h, d (mm)	19.7 x 25.6 x 15.6 (500 x 650 x 395)		
Weight (lbs/kg)	85 lbs (39 kg)	85 lbs (39 kg)	99 lbs (45 kg)
Db (decibel – noise)	39 db	39 db	49db
Heat Exchanger Surface Area (sq. ft.)	7.0 sq. ft.	7.0 sq. ft	11.4 sq. ft

E Series Solo

Models*	E60SR	E85SR	E110SR
Fuel Type (All Field Convertible)	NG or LP	NG or LP	NG or LP
AFUE Rating	95.6%	95.5%	95.5%
Turndown Ratio (NG)	4.4 : 1	6.3 : 1	4.2 : 1
Max Heating Capacity (BTU)	57,300 (14 kW)	82,000 (24 kW)	105,700 31 (kW)
Min. Input (BTU)	13,600-NG (4 kW)	13,600-NG / 37,000-LP (4 kW / 11 kW)	26,000-NG / 59,000-LP (8 kW / 17 kW)
Max. Input (BTU - Heating)	50,000 (15 kW)	85,000 (25 kW)	110,000 (32 kW)
Approved Venting Material	Concentric, Polypropylene (PP), Stainless Steel (SS), PVC, CPVC		
Warranty	12-year heat exchanger, 2-year parts, 1-year labor.		
Certifications	ENERGY STAR®, CSA, ASME H, Low Lead		
Dimensions w, h, d (mm)	19.7 x 25.6 x 15.6 (500 x 650 x 395)		
Weight (lbs/kg)	79 lbs (39 kg)	79 lbs (39 kg)	92 lbs (45 kg)
Db (decibel – noise)	39 db	39 db	49 db
Heat Exchanger Surface Area (sq. ft.)	7.0 sq. ft.	7.0 sq. ft	11.4 sq. ft.

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Q Series





Models	*Q85S	Q130S	Q175S	Q175C	Q205S
Fuel Type (All Field Convertible)	NG or LP	NG or LP	NG or LP	NG or LP	NG or LP
AFUE Rating	95.40%	95.40%	95.00%	95.00%	95.00%
Dimensions (w, h, d)	19.7 x 26.8 x 15.2	19.7 x 26.8 x 15.2	26 x 26.8 x 15.2	39.4 x 26.8 x 15.2	26 x 26.8 x 15.2
Weight lbs. (kg)	110 lbs (50 kg)	117 lbs (53 kg)	141 lbs (64 kg)	196 lbs (89 kg)	141 lbs (64 kg)
Max Heating Capacity (BTU)	78,000	119,000	161,000	161,000	189,000
Min. Input (BTU)	17,000-NG / 37,000-LP	26,000-NG / 59,000-LP	35,000-NG / 74,000-LP	35,000-NG / 74,000-LP	41,000-NG / 74,000-LP
Max. Input (BTU-Heating)	85,000	130,000	175,000	175,000	205,000
Turn Down Ratio (NG)	5:1	5:1	5:1	5:1	5:1
DHW Activation Rate (G)	Indirect Tank Compatible	Indirect Tank Compatible	Indirect Tank Compatible	0 Gallon / Minute	Indirect Tank Compatible
DHW Activation Rate (LPM)				0 Liter / Minute	
Max. DHW @75°F ΔT				4.1 Gallon / Minute	
Max. DHW @41.7°C ΔT				15.5 Liter / Minute	
Storage Capacity	N/A	N/A	N/A	6.6 Gal (25 L)	N/A
Approved Venting Material	Concentric, Polypropylene, Stainless Steel, PVC, CPVC				
Warranty	12-year heat exchanger, 2-year parts, 1-year labor.				
Certifications	ENERGY STAR®, CSA, NB, IBR, ASME H Stamp				

Q85S is no longer available: see E85SR

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QP Quality Premier - Specifications

Models*	QP130
Fuel Type	NG, LP with conversion kit
AFUE Rating	95.4%
Dimensions inches (w, h, d)	23.6 x 61.8 25.2
Weight (lbs/kg)	243 lbs. (110.2 kg)
DB (noise rating)	50 db
Max Heating Capacity (BTU)	119,000 (35kW)
Min. Input (BTU)	26,000 (8kW)
Max Input (BTU- Hot Water)	119,000 (35kW)
Max. Input (BTU-Heating)	130,000 (38kW)
Turn Down Ratio (NG)	5:1
Max. DHW @75°F ΔT	211 Gallon / First Hour Rating
Max. DHW @41.7°C ΔT	794 Liter / First Hour Rating
Storage Capacity	24 Gal
Approved Venting Material	Concentric, Polypropylene, Stainless Steel, PVC, CPVC
Warranty	12-year heat exchanger, 12-year tank, 2-year parts, 1-year labor.
Certifications	ENERGY STAR, CSA, NB, ASME H Stamp

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Warranty

Product Warranty		
Description	**Residential**	**Commercial**
Primary Heat Exchanger	**12 YRS**	**5 YRS**
Boiler Parts	**2 YRS**	
Labor	**1 YR**	
Please refer to the Documentation Set for full warranty details and guidelines		

KEY POINTS OF WARRANTY COVERAGE

- Warranty covers any defects in materials or workmanship when the product is installed and operated according to Rinnai written installation instructions. This product is intended for Indoor use only
- Warranty applies only to products that are installed per local and/or state codes. Improper installation may void the warranty.
- Warranty doesn't cover failure due to accident, abuse, misuse, alteration, misapplication, force majeure, improper installation, maintenance or service, inadequate water quality, scale buildup, or freeze damage.
- Warranty does not cover product or component failures where the water supply **does not meet** the guidelines and requirements as stated in the installation manual.

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Rinnai Boiler Model Identification

E 110 C R N

E - Series boiler
E, Q, QP Series

110 – Heating Input Rating in MBH
50 – 205 MBH

C - Combi
S - Solo (Heat Only) Boiler

R - Refined (E Series Only)

N - Natural Gas
P - propane

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Serial Numbers and Date Codes

The serial # is found on the Boiler Rating plate label, on the lower left side of the boiler beneath the cover.

Example Serial # GJ012345JB: Manufactured in September 2015

Each serial # begins with a 2 letter date code

First Letter - Year		Second Letter - Month	
A	2009	A	January
B	2010	B	February
C	2011	C	March
D	2012	D	April
E	2013	E	May
F	2014	F	June
G	2015	G	July
H	2016	H	August
J	2017	**J**	September
K	2018	K	October
L	2019	L	November
M	2020	M	December

Most components have a sticker with S/N

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Controls

Technical Readout Mode

Status	Description
0	No Demand
1	Fan Pre / Post Purge
2	Ignition
3	Burner on CH (flame established)
4	Burner on DHW (flame established)
5	Fan Check
6	Pump on, Burner off (set point reached)
7	Pump Overrun for CH
8	Pump Overrun for DHW
9	Burner off, high temp
P	Pressure
F	Fan Service Mode (burner off)
H	Combustion Service Mode (high fire)
A	De-Aeration

Accessing technical readout :
Push and Hold the “Step” button for 5 seconds . Then press step to cycle between the current system status, temperature and system pressure. Example 0 66 means there is no demand and heat exhcnager is 66°F

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Technical Access

Step	Description
1.	Press & Hold “Mode” Button
2.	“Code xxx” appears
3.	Press “Radiator + / Shower Head - ” Button until Code 123 appears
4.	Press & Hold “Snowflake / Store” Button until Code 123 flashes
5.	Press “Mode” Button until PARA appears
6.	Press “Mode” button again to scroll through the INFO, SERV and ERRO chapters
7.	Press the “Step” button to access the different functions of each chapter.

- After 20 minutes of inactivity, the display will automatically revert to “GOOD” or the technical readout.

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INFO Menu

INFO	Increment	Description
1	F°	Supply (flow) water temperature T1
2	F°	MCBA T1 Target Temp
4	F°	Return water temperature T2
5	F°	T3 Value (DHW temperature)
7	F°	Outdoor reset temperature T4
8	F°	Flue Gas Temp (available accessory)
10	F°	Heat Exchanger Delta T
15	Rpm	Fan Revolutions
16	%	Percentage of total power
17	kW	Output power in kW (multiply by 3415 for Btu)
18	kW	Input power in kW (multiply by 3415 for Btu)
24	Hours	Total burner run hours
25	Hours	Total heating only burner run hours
26	Hours	Total DHW only burner run hours
32	Hours	Total number of hours
37	Hours	Total pump hours (heating and DHW)
46	Hours	Count down to service message
48	µA	Ionization Current in 10^7 Amps

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SERVice Menu & ERROr History

SERV	Value	Range	Description
1	OFF	OFF-Max	Boiler in operation with burner function on
2	OFF	OFF-Max	Fan adjustable with burner off
3	OFF	OFF-Max	Pump adjustable with burner on or off
4	OFF	OFF/ON	Showroom mode—allows controller functionality without boiler operation. **(Must be "OFF" for boiler operation)**

ERRO	Description
Err. L-Err. 5	Last saved error up to six preceding errors
1	Error code reported
2	Operation Status of the boiler at time of error
3	T1 Supply water temperature at time of error
4	T2 Return water temperature at time of error
5	kW burner power at time of error (multiply by 3415 for Btu)
6	% Pump capacity at time of error

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PARA Menu

Please refer to the Installation Manual for complete details of parameter settings. If additional adjustments are needed for a specific application, contact Rinnai Engineering for support.

NOTE: When using the RS100, very few adjustments are neccesary due to its processing capabilities.

PARA	Default	Range	Description
1	176°F	68 to176°F	Maximum supply temp in heating mode
2	**00**	**00-04**	**Curve preset for type of heat emitters-see reset curve slide (do not use value 01-curve 01 is value 00)**
3	Max	Min-Max	Max power in heating mode in kW (multiply by 3,415 for Btu)
4	00	00 or 01	00=Thermostat (boiler will fire when terminals 22 & 23 are closed) 01=Continuous pump (22 & 23 closed=day curve, open= night curve)
5	2.3	0.2-3.5	K Factor of outdoor reset curve (this depends on PARA 2)
6	1.4	1.1-1.4	Outdoor reset curve exponent
7	14°F	-4°F to 32°F	Outdoor reset curve coldest design day setting
10	0°F	-8°F to 10°F	Day temperature calibration (outdoor reset curve) N/A when PARA 4 is 00
11	0°F	-8°F to 10°F	Night temperature calibration (outdoor reset curve) N/A when PARA 4 is 00
13	70°F	70°F to 85°F	Summer switch off (Outdoor temperature)
14	10°F/min	0°F to 28°F	Gradient control speed °F per minute

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PARA Menu -Continued

Please refer to the Installation Manual for complete details of parameter settings. If additional adjustments are needed for a specific application, contact Rinnai Engineering for support.

PARA	Default	Range	Description
23	- 4°F	-4°F to 50°F	Freeze protection activation temperature
25	-0°F	-8°F to 10°F	Outdoor Temperature Correction (calibration)
27	**100°F**	**0°F to 158°F**	**Minimum T-set value for heating mode (reset curve base point)**
31	146°F (154°F)	104°F to 176°F	DHW tank temperature adjustment (set at154°F for the Q175C and 132°F for the E series combi models - Not adjustable)
36	20	00, 01, 10, 11, 20, 21	1st digit: E-Series DHW plate warming enable/disable, 2nd digit: type of 3-way valve for DHW tank; (see install manual for details)
43	Max	Min-Max	Max power in DHW mode in kW (multiply by 3,415 for Btu)—if using optional diverter valve kit for Q175S or 205S, this must be set to 38
49	100%	40 to 100%	Maximum pump capacity heating
56	03	00, 03	00 – No Pump Recognition (only to be used for testing test Pressure Switch) 03 – Pump Recognition (verifies pressure increase)
73	**0**	**0 to 100**	**Vent and Altitude Compensation**
89	00	-01 (off) 00 to 07	Boiler address when in cascade (Cascade controller required)
90	01	00 or 01	00 = Temp in Celsius and Pressure in Bar, 01= Temp in Fahrenheit and pressure in PSI

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Restore Factory Default Settings

Step	Description
1.	Press & Hold “Mode” Button
2.	Code xxx appears
3.	Press “Radiator / + ” Button until Code 123 appears
4.	Press & Hold “Snowflake / Store” Button until Code 123 flashes
5.	Press “Mode” Button until PARA appears
6.	Press & Hold “Snowflake / Store” Button (5 seconds) until COPY is displayed
7.	Wait for “GOOD “or “STBY” to be displayed

NOTE: All unique settings will be lost!

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Maintenance & Service

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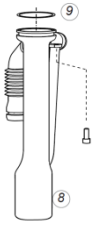
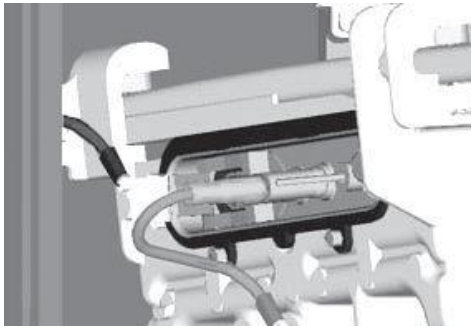
Maintenance • SERV

Rinnai 2yr or 4000hr Service Interval

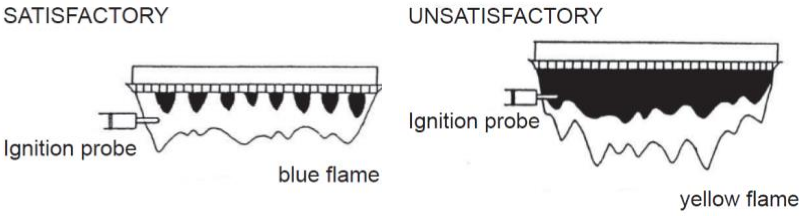
Visual inspection of unit, surroundings, check for leaks on gas, venting, and water, verify pressure



Clean and inspect the condensate trap



Visually inspect the ignitor and flame rod, clean or replace if necessary



Visually inspect flame, Verify proper O2

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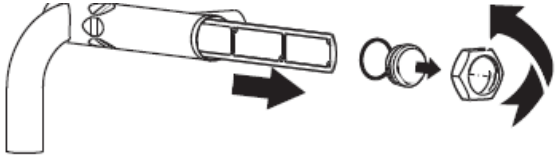
Maintenance

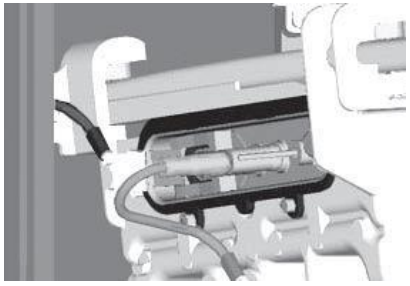
Rinnai 4yr or 8000hr Service Interval

Repeat 2yr service

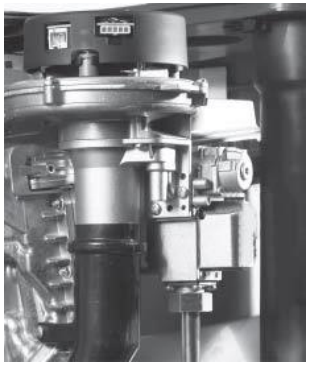
Inspect and clean hood, condensate tray and vacuum burner cartridge Do not blow air into the heat exchanger or burner cartridge.



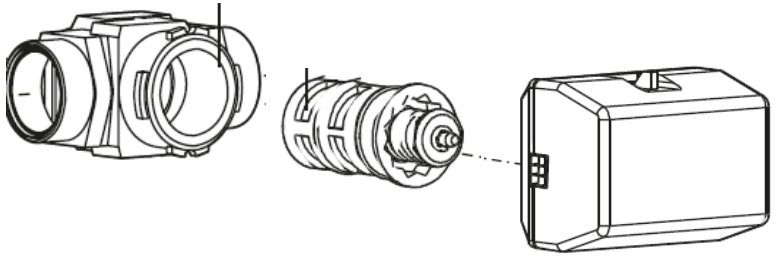
Check boiler water filter, pH level, exercise relief valves



Replace Ignition Electrode & Gasket



Clean and inspect the fan housing & venturi



Exercise 3-way valve cartridge, replace if bound up or sticking .

A service notification will appear on the boiler display after 8000 hours of operation.

(2013 models and newer). Every 8000 hours of operation or 4 years, whichever occurs first

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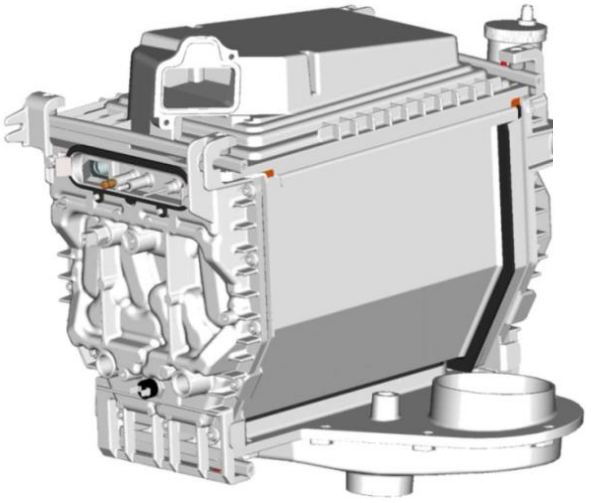
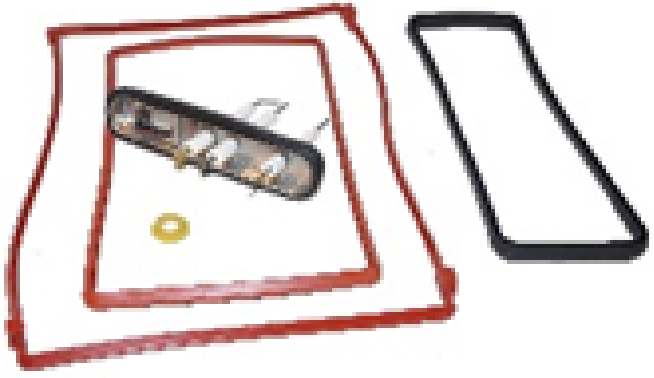
Maintenance Kits



Heat Exchangers		
HEX	Part #	Model
OSS 1	807000019	E50, E60, E75, E85, Q85, QP85
OSS 2	807000020	E110, Q130, QP130
OSS 3	807000021	Q175
OSS 4	807000022	Q205



8000 hr Service Kit		
HEX	Part #	Model
OSS 1	804000068	E50, E60, E75, E85, Q85, QP85
OSS 2	804000069	E110, Q130, QP130
OSS 3 & 4	804000070	Q175, Q205

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Reset Service Message

Step	Description
1.	Press & Hold “Mode” Button
2.	“Code xxx” appears
3.	Press “Radiator + / Shower Head - ” Button until Code 123 appears
4.	Press & Hold “Snowflake / Store” Button until Code 123 flashes
5.	Press “Mode” Button three times until “SERV” appears
6.	Press & Hold “Snowflake / Store” Button (5 seconds) until “COPY” is displayed
7.	Wait for “GOOD “or “STBY” to be displayed

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Commissioning

Water Quality

Hannah HI 98127
Digital pH meter

OR

pH Test Kits

Approved Anti- Freeze
Rhomar Rhogard Multi-Metal Safe
Noble Noburst Al
Sentinel X500
Fernox Alphi 11

Approved Cleaners
Rhomar Hydro-Solv 9100
Noble Noburst Hydronic Cleaner
Sentinel X400
Fernox F3 Cleaner

Water Quality	
PH Level	6.5 – 8.5
Water Hardness	Max. 10.5 gpg (200 mg/l)
Glycol	Max. 50%

Approved Inhibitors
Rhomar Pro-tek 922
Noble Noburst Al Inhibitor
Sentinel X100

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Filling and De-aeration

- Flashing display of “FILL” indicates pressure is less than 11.7 PSI—The boiler will only operate up to 50%.
- Continuous display of “FILL” indicates pressure is less than 10 PSI—The burner will not activate (LWCO).
- If “A XX” appears (XX being a two digit number), this indicates the boiler has entered its 17 minute de-aeration cycle.

- “STOP” will appear when adequate pressure is achieved, then “GOOD” will appear

- Continuous display of “HIGH” indicates pressure exceeds 40 PSI
- Confirm system pressure. If safety relief valve (PRV) rated for 30psi has not opened, and the tridicator does not confirm the high pressure reading the pressure sensor may need to be cleaned or replaced.

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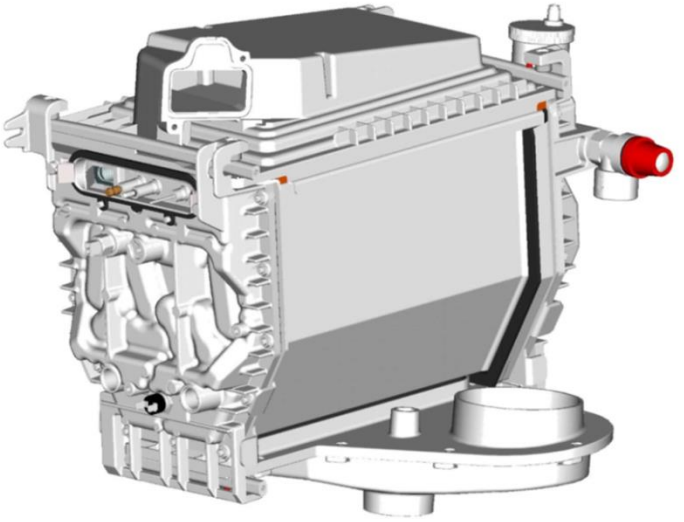
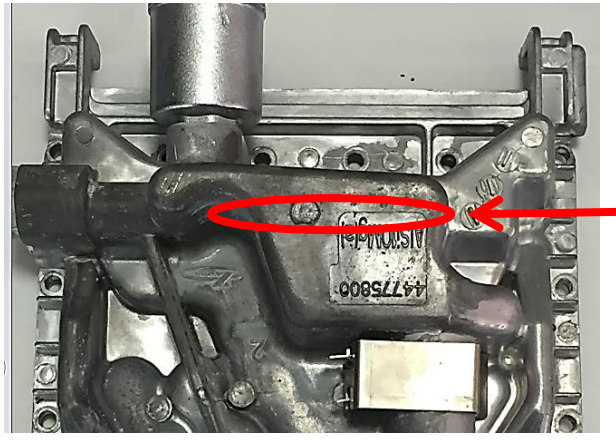
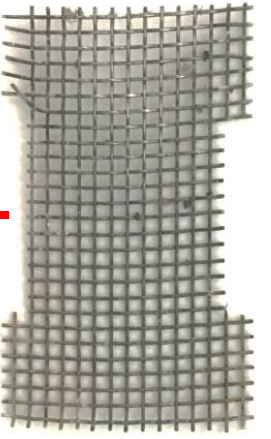
De-Aeration

- Every time power is applied a 17 minute de-aeration cycle is performed.
  - This de-aeration process is designed to protect the boiler and the system ensuring longevity of all components.
  - While de-aeration is underway, the installer can focus on other important tasks such as programming the boiler.
  - On combi boilers alternates 3way valve positon from DHW to CH and back to clear air completely.
- Heat Exchanger 7° Slope is to aid in removal of air.
- End plate has large chamber with mesh filter separating micro bubbles for better air elimination







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By-Pass De-aeration

Step	Description
1.	Press & Hold “Mode” Button
2.	“Code xxx” appears
3.	Press “Radiator + / Shower Head - ” Button until Code 123 appears
4.	Press & Hold “Snowflake / Store” Button until Code 123 flashes
5.	Press & Hold “Reset” Button (1 seconds) until display flashes
6.	Wait for “GOOD “or “STBY” to be displayed

- After 20 minutes of inactivity, the display will automatically revert to “GOOD” or the technical readout.

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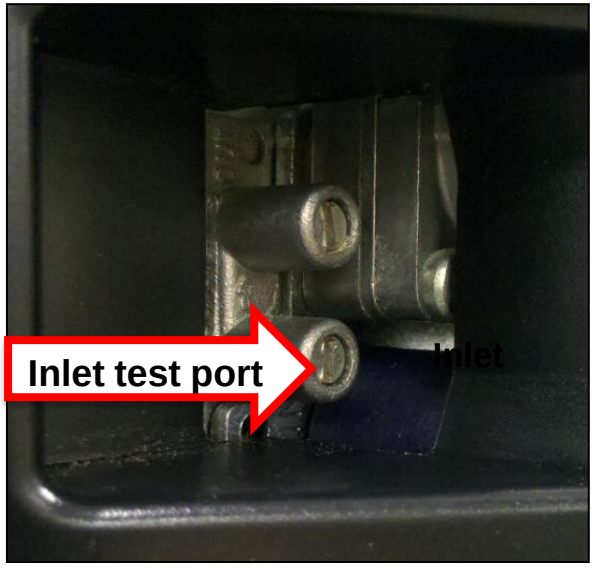
Commissioning: Gas Pressure Test

Fuel Type	Minimum Gas Pressure (Full Load) In. w.c.	Maximum Gas Pressure In. w.c
NG (Natural Gas)	3.0”	10.5”
LPG (Liquid Propane)	8”	14”



Verifying gas pressures

- Put boiler into installer menu, SERVice chapter, Step 1
- Close gas shut off valve. Loosen the lower inlet test port screw on the gas valve with a flat screwdriver 2-3 full turns.
- Connect manometer. Open gas shutoff valve.
- Operate the Boiler in high fire. This will require a high flow DHW demand on combi models or all heating zones operating on solo models.
- Ensure any other appliances or equipment on the same gas service are also operating in high fire during this test.
- Check the manometer reading to ensure the pressure is above minimum gas pressure requirements above.
- Turn off boiler operation. Check manometer reading to ensure lock up pressure is below maximum gas pressure requirements above.

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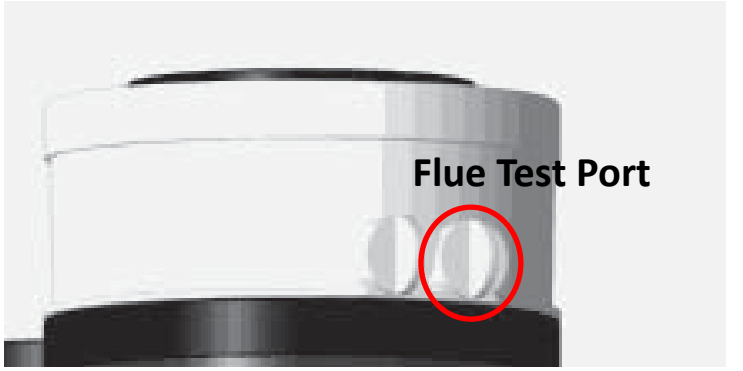
Commissioning: Combustion Test

Remember to calibrated your combustion analyzer !

Fuel Type	O_2 % at Maximum Power	O_2 % at Minimum Power
NG (Natural Gas)	4.4 – 4.7%	4.9 – 7.5%
LPG (Liquid Propane)	4.8 – 5.1%	5.3 – 7.3%



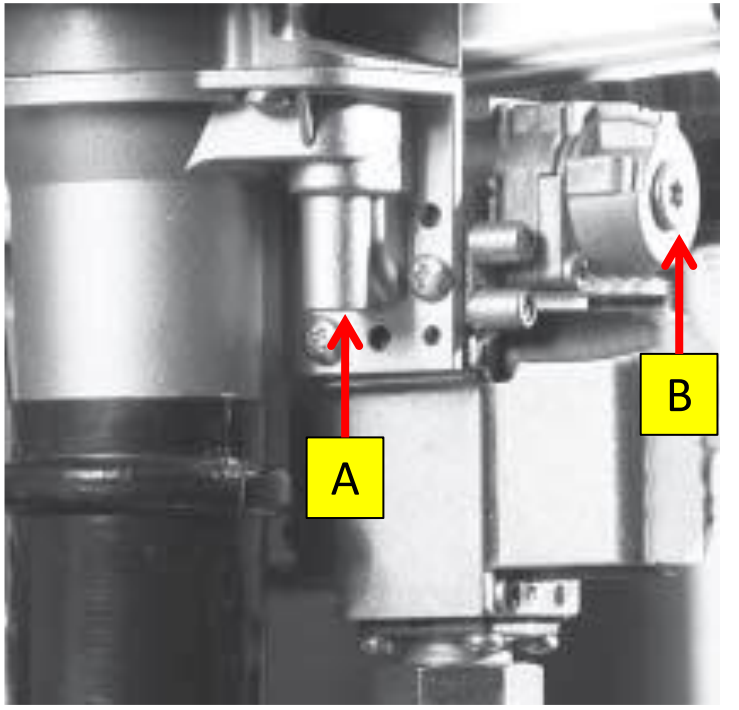
➔ Always confirm load gas pressure is adequate before adjustment

The gas mixture and O2 % is adjusted by a throttle screw located between the gas valve and the venturi below the fan (See A in illustration on right).

The throttle screw (A) faces down and his protected by a plastic tamper cap. Remove the cap. Adjusted with a medium sized flat head screwdriver (1/4" – ¾" blade) or a 4mm Allen key. Clockwise adjustment will reduce gas and increase O2 %.

1. **Adjust maximum power O2 %.**
2. **Adjust minimum power O2 %.** This value must be at least 0.2% higher than the measured maximum power O2 %. Never adjust minimum power O2 % before maximum.

NOTE: Very rarely is an offset adjustment is required on the gas valve to bring the minimum power O2 % up higher than the maximum power O2 %. If this is the case contact Rinnai tech support for guidance. T40 Torx will be required for the procedure (see B in illustration on right). In some cases the gas valve will be replaced.



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High & Low Fire Test

Step	Description
1.	Press & Hold “Mode” Button
2.	“Code xxx” appears
3.	Press “Radiator + / Shower Head - ” Button until Code 123 appears
4.	Press & Hold “Snowflake / Store” Button until Code 123 flashes
5.	Press “Mode” Button until SERV appears
6.	Press “Step” Button until 1 is displayed
7.	Press “Radiator / + ” Button until stops, adjust 02 if needed
8.	When completed: Press “Shower / - ” Button until stops, confirm offset
9.	When completed: Press “Reset” Button until OFF is displayed

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Troubleshooting

This is an overview only—please refer to each boiler's installation manual for additional information

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Notice

WHEN TROUBLESHOOTING IT IS IMPORTANT TO REMEMBER….

- REMEMBER ALL RESOURCES AVAILABLE TO YOU
  - Rinnai documentation (Installation Manuals, Technical Bulletins, Application manuals, etc)
  - Rinnai Support
    - Technical Phone Support (866-RINNAIS)
    - Engineering Phone Support (1-800-621-9419)
    - Local Support (Sales representatives, distributors, etc.)
  - Rinnai Website and Partner Portal: www.rinnai.us
  - Rinnai LMS Training Portal: www.rinnai-LMS.com
- REMEMBER THE QUALITY OF THE PRODUCT
  - Rinnai's quality control is second to none. Every Rinnai Product is fired and tested at the factory.
  - If it is a new install, look to the installation. It is probably not a manufacturing issue.
- REMEMBER THE BASICS
  - Use Technical Readout to check boiler status and the Error Code History to see recent problems.
  - Make certain all inputs are good….water, gas, electricity, and air (venting).
  - Use the manual code tables, wiring diagram and troubleshooting section for guidance.
  - Use the INFO diagnostic menu for troubleshooting
  - Jump terminals 22 and 23 to confirm it will generate a heat call

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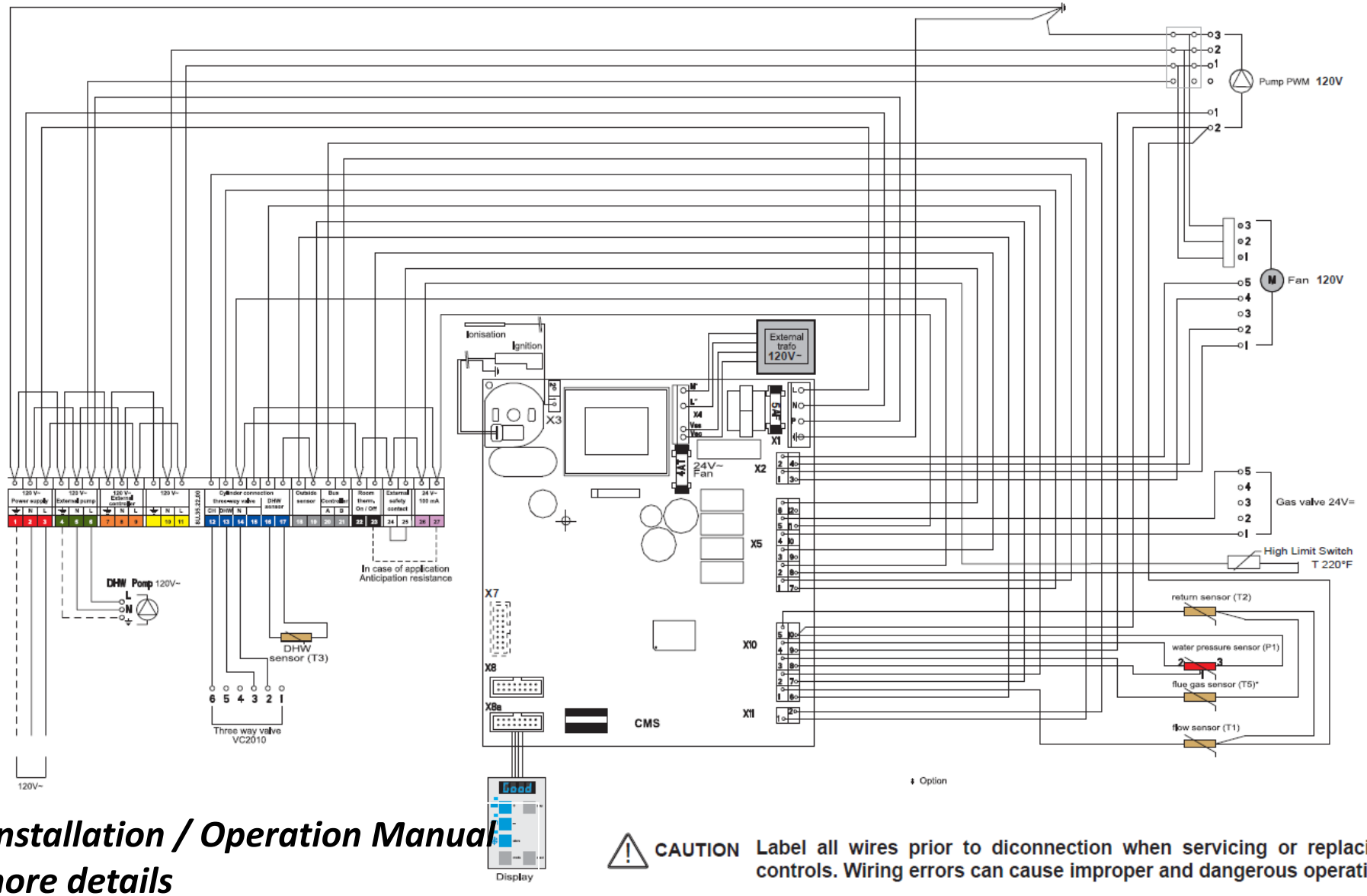
Wiring Schematic



See Installation / Operation Manual for more details

CAUTION Label all wires prior to diconnection when servicing or replacing controls. Wiring errors can cause improper and dangerous operation

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Most Common Blocking Codes

Blocking codes (BL)		
Code	**Description**	**Note**
BL 01	External Safety Contact Open	Reset MRHL or LWCO (check terminals 24|25 for loose or damaged wire)
BL 05	Outdoor Sensor Contact Open	Outdoor sensor error (check terminals 18|19 for loose or damaged wire)
BL 11	Max ΔT of T1 and T2 exceeded in CH	Heat not being dissipated between supply and return in CH mode.
BL 12	Max ΔT of T1 and T2 exceeded in DHW	Heat not being dissipated between supply and return in DHW mode.
BL 60	Incorrect PARA setting of min/max power	Ensure PARA 3 is set correctly
BL 67	An invalid ΔT is detected between T1 and T2 (while burner is not in operation)	Burner will restart if ΔT stabilizes. If not could be temperature sensor problem.
BL 80	Flue Sensor Temperature Too High	Check Vent System
BL 81	Flue Sensor or Thermostat Contact Open	Call Rinnai
BL 82	Flue Sensor Contact Closed	Call Rinnai
BL 84	Flue Gas Thermostat contact Open	Check vent system or check parameter 84 for default
BL 85	No water flow detected	Pump may be stuck / Pressure Sensor may be bad.
BL 86	Inadequate power	This can happen if a generator is not producing 60 Hz
Please refer to the installation manual for troubleshooting details		

Highlighted rows are the most common

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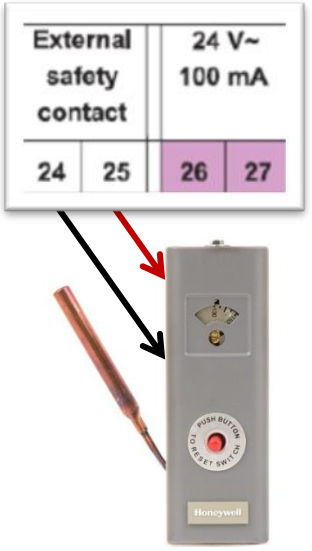
BL01 Open Circuit External Safety

120 V~ Power supply			120 V~ External pump			120 V~ External controller			120 V~			8U.35.22.00	Cylinder connection three-way valve				DHW sensor		Outside sensor		Bus Controller		Room therm. On / Off		External safety contact		24 V~ 100 mA	
⏚	N	L	⏚	N	L	⏚	N	L	⏚	N	L		CH	DHW	N						A	B						
1	2	3	4	5	6	7	8	9		10	11		12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27

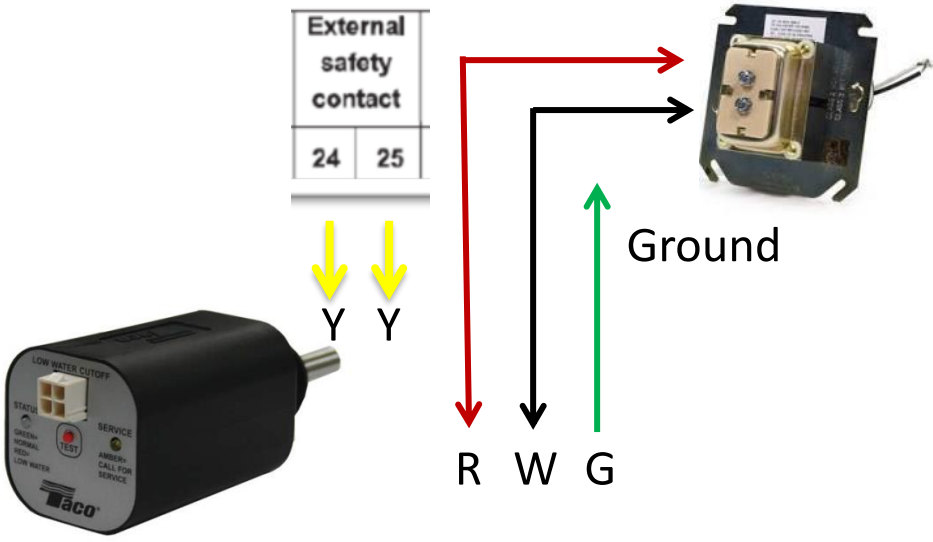
External Safety High Limit

With / without Manual Reset



Low Water Cut-Off

With / without Manual Reset



NOTE: Ensure local code is followed—if an LWCO with a manual reset is required, ensure the LWCO device used will accommodate. The bL01 code resets itself with no intervention when the LWCO is reset

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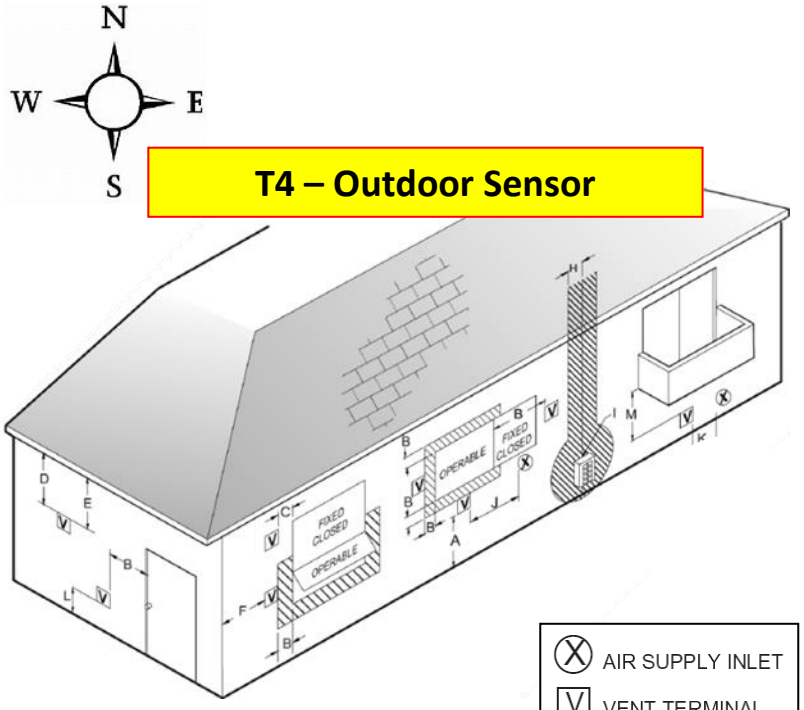
BL05 Open Circuit Outdoor Sensor

120 V~ Power supply			120 V~ External pump			120 V~ External controller			120 V~			8U.35.22.00	Cylinder connection three-way valve				DHW sensor		Outside sensor		Bus Controller		Room therm. On / Off		External safety contact		24 V~ 100 mA	
⏚	N	L	⏚	N	L	⏚	N	L	⏚	N	L		CH	DHW	N						A	B						
1	2	3	4	5	6	7	8	9		10	11		12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27



X AIR SUPPLY INLET

V VENT TERMINAL

AREA WHERE TERMINAL IS NOT PERMITTTED

The T4 sensor should be installed on the North side of the building. Sensor should be installed above anticipated snow fall, out of direct sunlight and shaded areas. Sensor should not be installed near any other source of heat like boiler or dryer vents.

A bad T4 sensor could produce BL05 codes. Confirm wiring is secure at sensor and terminals 18|19. A 58KΩ resistor applied to terminals 18|19 would communicate an outdoor temperature of 14˚F to the MCBA.

Note: The boiler will function when BL05 is displayed, but will not display GOOD. Boilers produced before September 2012 DOE changes did not required the OA Sensor. If replacing an MCBA with the first digit of the date code being A,B,C,D the OA Sensor may not be present, but will now be required.

T4 Outdoor Sensor Part #	Models
805000047	All Boilers

Temperature sensor T4 – outside temp. [14 - 68°F]				
Wire color	voltage	resistance	MCBA connector	Pin's
Black	2.8 - 2.4Vdc	58 – 15kΩ	X10	6
White	0Vdc	58 – 15kΩ	X10	7

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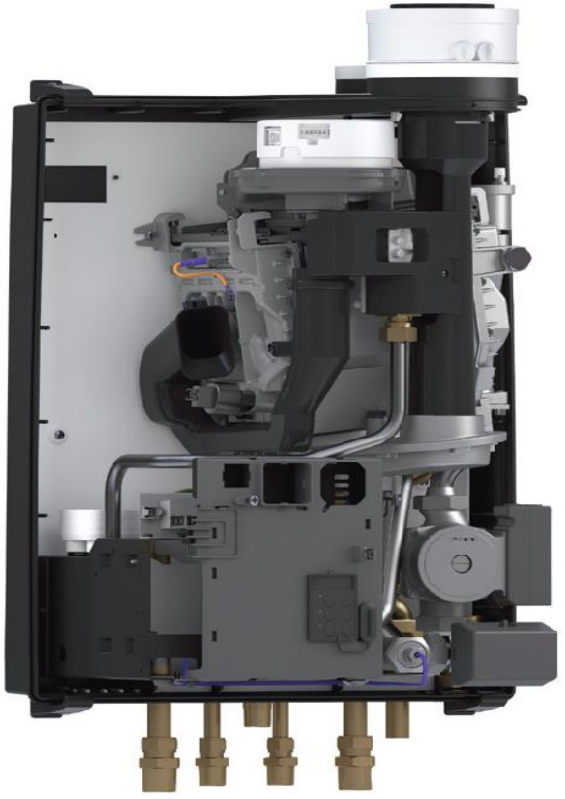
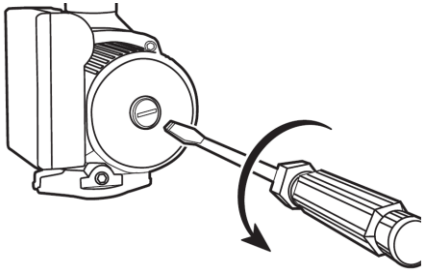
BL85 – No Flow detected



Upon a call for CH and / or DHW the boiler start up sequence will verify flow to ensure safe burner operation and heat transfer.

- First the MCBA will verify static pressure via pressure sensor
- Then MCBA will activate the circulator pump.
- Lastly almost simultaneously the MCBA re-checks pressure sensor again once the pump is activated if the pressure did not increase the burner is blocked and BL85 is displayed.

BL85 – Troubleshooting



- **Verify the Boiler Pump is operational, and spins freely**

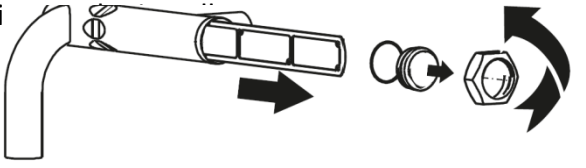
Remove flat screw on front of pump and insert a 4mm allen wrench into front of pump and verify it spins freely.

- **Verify boiler pressure and pressure sensor is reading accurately**

The pressure sensor is connected to a check valve. In many cases the pressure sensor can be removed from the check without draining down the boiler. Turn the pressure sensor counter clockwise slowly, if pressure is pushing water out pass the check, draining the boiler may be necessary. Once Pressure sensor is removed used a small screwdriver and rag to exercise the check valve and ensure it is free from debris. Compare boiler pressure on display matches gauge.

- **Verify that the return pipe strainer is free from debris or blockage**

Check the return piping strainer after draining down the boiler, by removing the hex nut & cap and pull out the strainer. Check the condition, clean the strai



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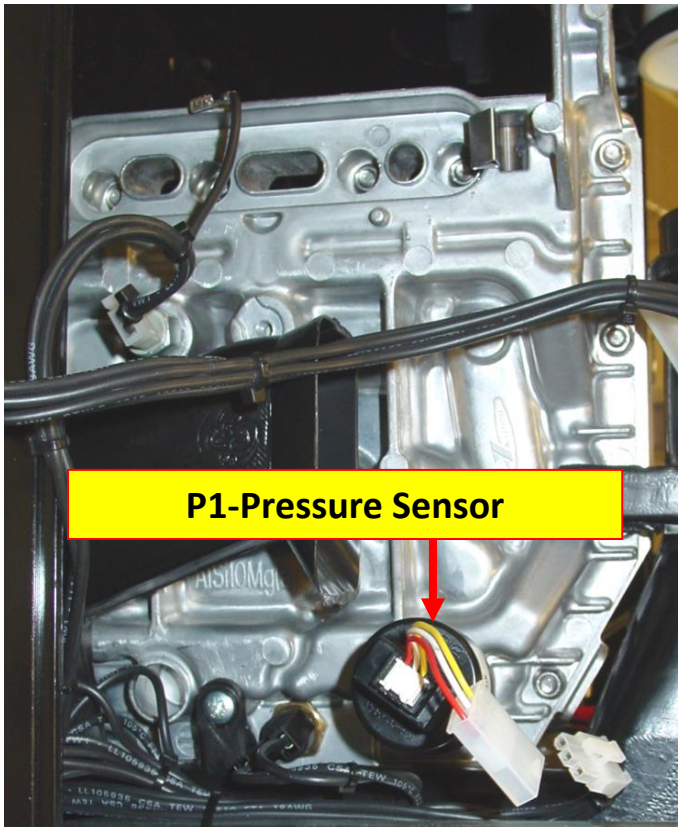
Boiler Pressure Sensor / Switch (LWCO)



On the left side of the heat exchanger, the bottom barrel like sensor is a pressure sensor / switch that is hand tight, sealed by o-ring threaded into a check valve.

Pressure Sensor acts as a LWCO, check with the local authorities having jurisdiction as they may require a 3rd party low water cut off.

If the pressure sensor reads less than 10psi the burner is blocked. If the pressure does not increase during the ignition cycle (pump activation) the burner is blocked and BL85 is displayed.

Step 1. Ensure adequate pressure. Verify that there is no isolation of low loss header or heat emitters

Step 2. Verify the Boiler Pump spins freely and is functional

Step 3. Check for blockage, or debris. Be sure just to remove black barrel pressure sensor and not the check valve. Be sure not to let water drip onto control board or wiring below. (see Parameter 56)

Pressure Sensor / Switch Part #	Models
805000034	All Boilers

Water pressure sensor [0 – 40PSI]			
voltage	MCBA connector	Control Tower connector Pin	Pin
0.5 – 2.6Vdc	X10	4	1
12Vdc	X10	8	3
0Vdc	X10	10	2

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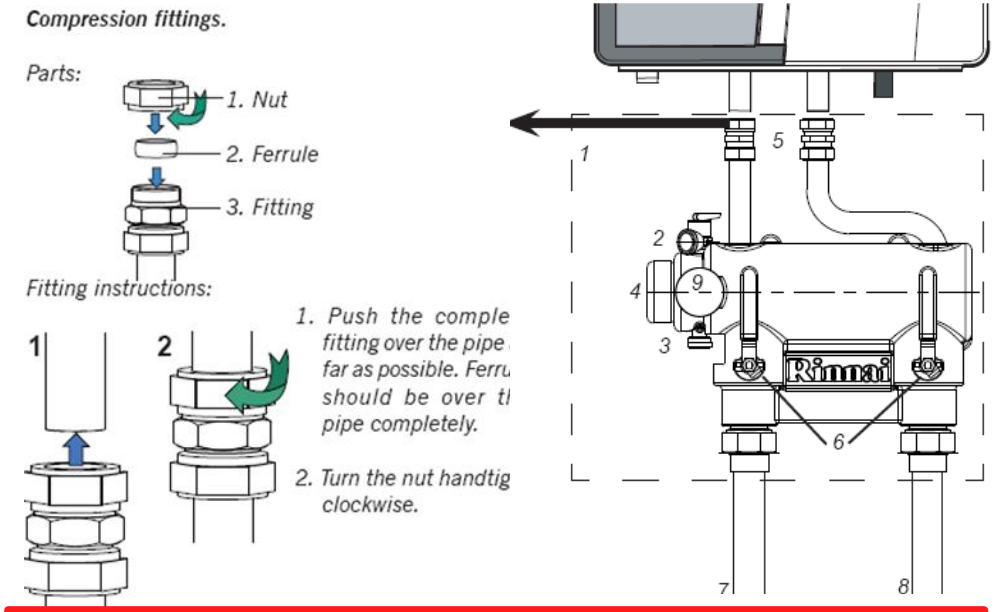
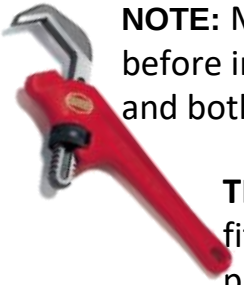
LWCO: Troubleshooting – Leak Repair

Notice: the service ball valve handles have been rotated outwards; ultimately compromising the thread sealant.

While it is important to utilize a backer wrench when tightening the union nuts, Rinnai's continuous improvement team has increased the thread sealant strength to a new formula 8x stronger than before.

It is important to remedy all leaks in the system to prevent any interruption in operation.





NOTE: Mount the plumbing kit to the boiler before installing the insulation, pressure gauge and both service ball valve handles.

TIP: When tightening the compression fittings use a wrench as a backup in order to prevent damage or leaks.

Watts Di-electric Union Gasket Part#	Models
0881409 (GA-K Kit)	All E Series & Q130
0881410 (GA-L Kit)	Q175 & Q205

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Most Common Error Codes

Error Codes (ER)		
Code	**Description**	**Note**
E 00	Flame rod current detected without flame	Inspect the flame rod for a short circuit
E 01	24 Volt short-circuit	Check 24 Volt connections. Check components with 24 volt connections.
E 02	No flame formation	Ensure adequate air and gas is supplied to the boiler.
E03	Control unit connection error	Ensure the gas valve plug is properly connected
E 04	Program error (boiler power is lost during an error read-out)	Reset the boiler and investigate the initial error
E 05	Control unit error	120V stability, voltage deviates more than + 10% and -15%. Poor connection to ribbon cable.
E 06	Control unit error	Moisture on the PCB.
E 07	Control unit error	If using power stealing thermostat is used special anticipation resistance wire is required. Or replace MCBA.
E 11	Control unit error	Incorrect data displayed due to poor ribbon cable connection.
E 12	High limit sensor open	Ensure this sensor is working correctly; inspect heat exchanger
E 13	Control unit error	Replace the control unit
Please refer to the installation manual for troubleshooting details		

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Most Common Error Codes

Error Codes (ER) Cont.		
Code	**Description**	**Note**
E 14	DHW temperature sensor (T3) communication error	Ensure this sensor is connected correctly
E 18	Supply (flow) temperature sensor (T1) over temp	Check for pump failure or blockage in flow within the boiler
E 19	Return temperature sensor (T2) over temp	Check for blockage in flow outside the boiler
E 24	T1 and T2 (swapped)	T2 temperature measured higher than T1.
E 26	Controller failure	Replace controller
E 28	No signal from combustion fan	Ensure fan and wiring are intact
E 29	Negative pressure on vent system (pressure difference)	Check vent system
E 31	Supply (flow) temperature sensor (T1) signal error	Ensure this sensor is connected correctly
E 32	Return temperature sensor (T2) signal error	Ensure this sensor is connected correctly
E 36	Supply (flow) temperature sensor (T1) open	Ensure this sensor is connected correctly
E 37	Return temperature sensor (T2) open	Ensure this sensor is connected correctly
E 41 & 42	Control unit error	Software error, Replace control unit
E 44	Electrical leakage to ground	Moisture on Controller PCB
E 68	No software present.	Reload default settings (see manual)
E 69	Ribbon Cable problem	Replace ribbon cable
E 80	Flue gas temperature too high	Replace sensor or adjust parameter
FUSE	Fuse on control PCB defective	Replace fuse

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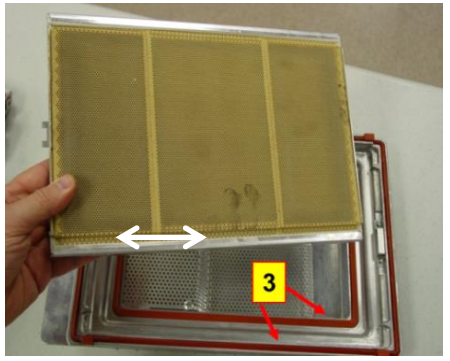
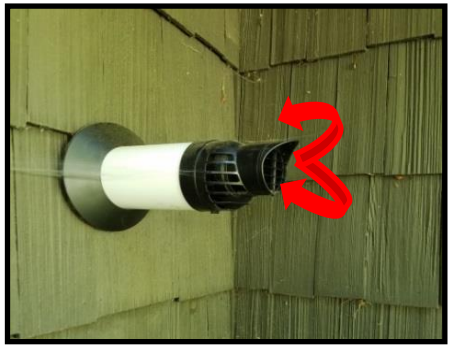
E-02 Indicates No Flame Formation





Check for poor gas quality on LP installations

- Initiate a call for heat or hot water, restricting the air inlet of the appliance by 50% with
  your hand over the inlet tube (1) on the left side of the heat exchanger
- If the unit fires, slowly remove your hand from the intake. Set your O2 4.4-4.7 NG 4.8-5.1LP
- If the unit shuts off immediately after removing your hand from the air intake:
  - On new LP installations, verify you do not have a gas quality issue.
  - Verify that the propane tank was properly purged

- **If the burner doesn't fire, check the venturi and ceramic burner for cracks or any other damage**
  - Remove the burner housing from the heat exchanger
  - Visually and physically inspect the inside of the venturi (2) for cracks or distortion
  - Check the burner for cracks or damage
  - Replace if damaged
  - If burner (3) has any debris, clean gently with a soft brush and vacuum
  - Reinstall components
  - If the burner stays running check and/or adjust your O2 readings per Rinnai installation
    instructions found in the owner's installation manual

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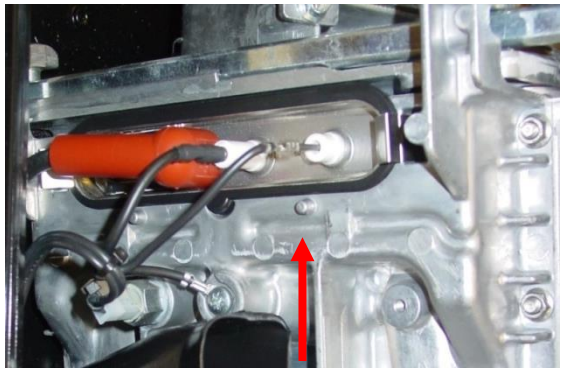
E-00 & E-02 Ignition Electrode



Ignition Electrode

Gen 1

The ignition electrode and gasket requires no tools to replace and is included in the 8000 hr Service Gasket Kit. Ignition Electrode should be replaced if showing signs of wear, or is not Gen 3.

A bad ignitor could result in E00 or E02 codes. Preventing the boiler from operating. Basics confirm power, boiler fuel type, and gas is readily available. Ignition electrode should have a 4mm gap between ignitor and ground,

When troubleshooting poor flame or no flame or intermittent ignition ensure the ground to ignition electrode assembly is secure. Ignition wire is secure at MCBA and on ignition electrode. Confirm ignition wire has continuity. Then measure the Ionization current between the ionization wire and ignition electrode: current should be greater than 4µA during full load.

Check your Ionization current

- With a digital multimeter set to µA (micro Amps)
- Remove the ionization wire from the rod
- Put the probes in series with the ionization rod and wire
- When the boiler fires measure the current on your meter
- The current should be at least 4µA to start, if not replace the igniter assembly

Ignition Electrode Part #	Models
805000036	All Boilers

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E-03 Gas Valve

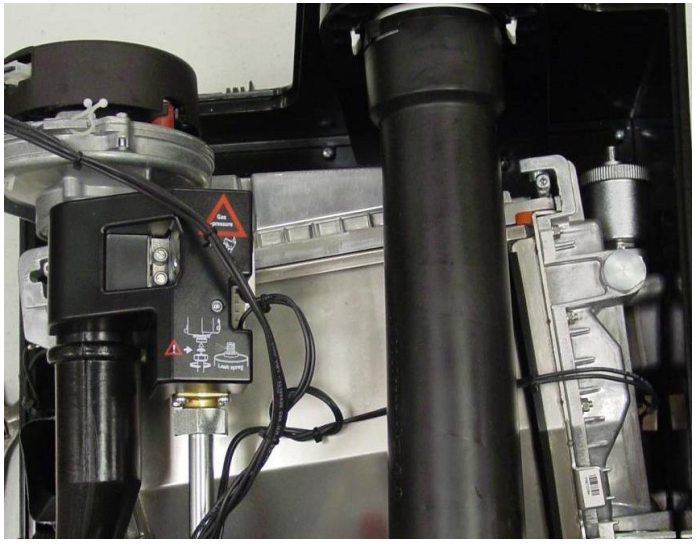

Fig 1.

Rinnai boilers utilize negative pressure gas valve, powered by 24VDC

Replacing the gas valve requires removing three Philips type screws connecting the gas valve and the venturi (fig 2). Fig 3. Depicts an LP orifice and gasket, that is secured in between the gas valve and venturi. Natural Gas applications only have the gasket. There is no orifice on N.G.

E-03: Verify that the gas valve power supply (molex adapter) is secure.
If 24V is not present at the gas valve confirm the MCBA X5 pins 4 and 5 are providing 24VDC. If there is voltage at the gas, verify gas pressure. If there is no pressure drop from static pressure when the gas valve opens, replace the gas valve.

Fig 2.

Fig 3.

Gas Valve Part #	Models
806000019	All Boilers

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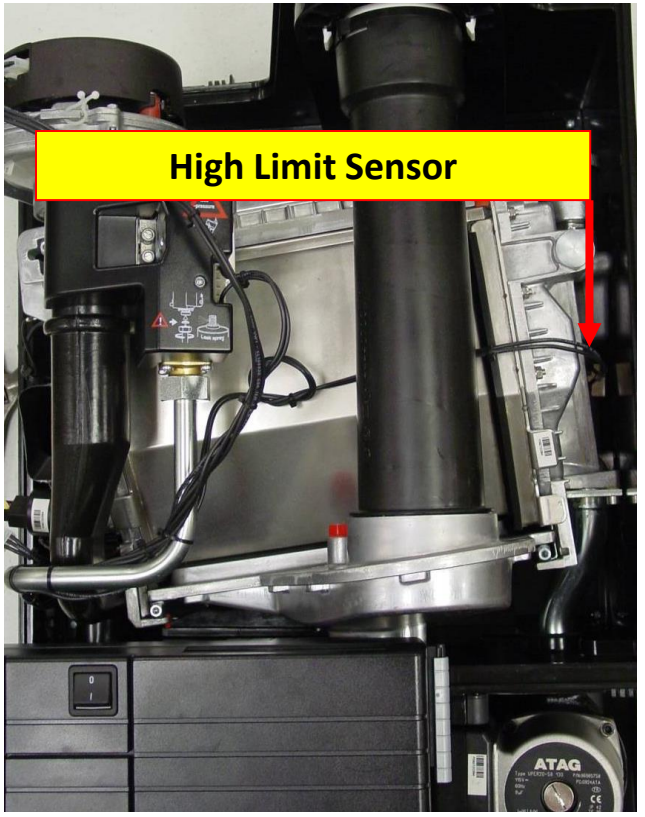
E12 – High Limit Stat Open



On the right side of the heat exchanger, there is an overheat bimetal switch that will open if 194˚F is detected.

If this occurs, an E12 will display. Manually resetting the boiler will be required. If the E12 error immediately returns before the boiler starts, the wiring to the overheat switch or the switch itself is the problem.

CAUTION: An E12 during boiler operation indicates the heat exchanger is overheating. The cause is often air or debris interfering with water circulation through the heat exchanger. Check all isolation valves are open and return filter screen is not blocked.

High Limit Sensor Part #	Models
805000033	All Boilers

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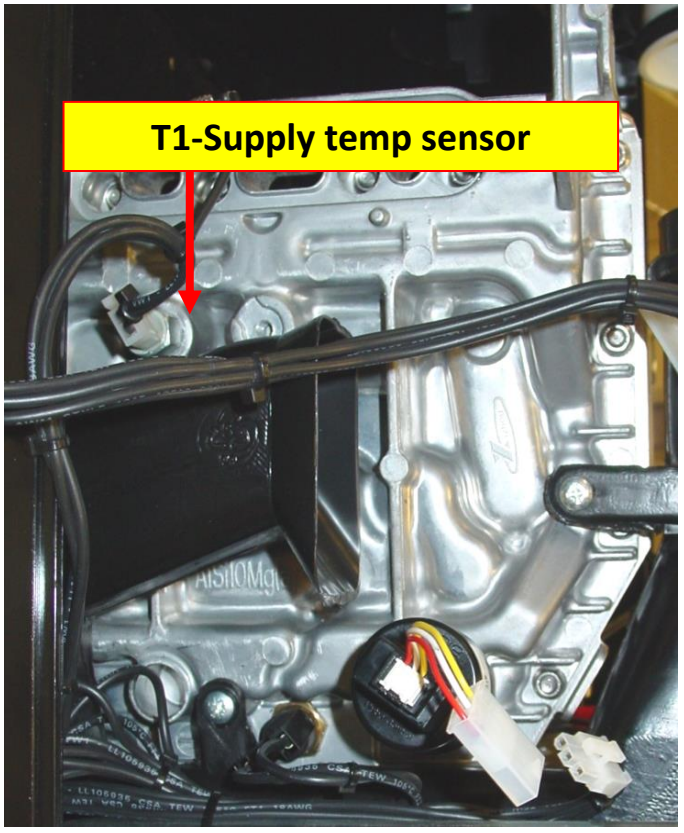
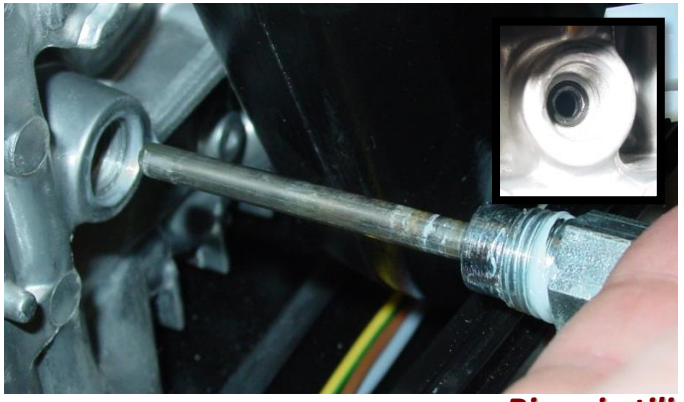
T1 - Supply Temperature Sensor





On the left side of the heat exchanger, the top sensor is a wet well T1 Supply Temperature 12K ohm NTC Sensor.

The T1 sensor is o-ring sealed no Teflon or pipe dope required. If removed o-ring should be replaced. When replacing o-ring is included with sensor.

A bad T1 sensor could produce E18, E31, E36 codes.

Note: Also used as E Series combi boiler T3 DHW Sensor

T1 (supply) Part #	Models
805000035	All Boilers

Temperature sensor T1 – Supply temp. [68 - 176°F]				
Wire color	voltage	resistance	MCBA connector	Pin's
Black	2.3 - 0.9Vdc	15 – 1.7kΩ	X10	1
Black	0Vdc	15 – 1.7kΩ	X10	10

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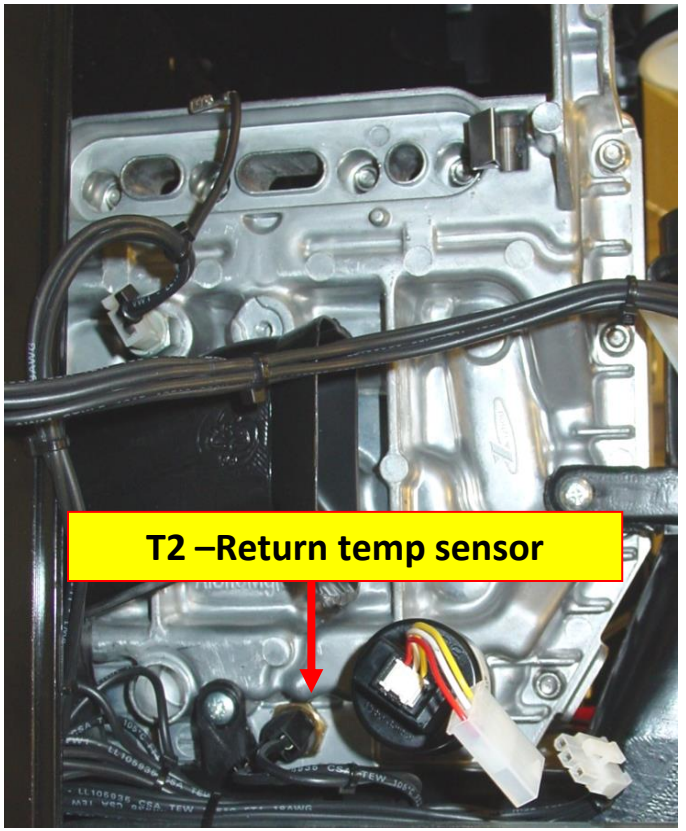
T2 Return Temperature Sensor



On the left side of the heat exchanger, the top sensor is a wet well T2 Return Temperature 12K ohm NTC Sensor.

The T2 sensor is dry well (no sealant required)

A bad T2 sensor could produce E19, E32, E37 codes.

Note: Also used as Q175C T3 DHW Sensor

Models	Models
805000032	All E Boilers

Temperature sensor T2 – Return temp. [68 - 176°F]				
Wire color	voltage	resistance	MCBA connector	Pin's
Black	2.3 - 0.9Vdc	15 – 1.7kΩ	X10	5
Black	0Vdc	15 – 1.7kΩ	X10	10

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E-29 Com Error Fan - MCBA

E-29: Communication issue with the fan speed signal from the fan back to the MCBA

First inspect the vent system and termination in its entirety for leaks, or signs of cross contamination. Ensure the venting is installed according to the manual, and the venting is not too close to inside corners, or any other obstructions like overhangs, fencing, or bulk heads.

Excessive winds blowing back into the air intake and exhaust terminations, could cause the rotation of the fan to spin prior to ignition as a speed greater than 150 rpm .

If the boiler shows signs of cross-contamination replace the fan, inspect the venturi and burner for signs of premature wear.

Signs of cross contamination

- Corrosion on the internal gas supply line
- Discoloration of the molex plugs from white or transparent to yellow
- Dulling of the black plastic within the boiler cabinet
- Discoloration or cracking of the burner
- Moisture in the cabinet

If the fan runs continuously with no call for heat or hot water

- Inspect the wiring, secure molex plugs between the fan and the MCBA.

With power to the boiler, remove the fan communication connector (1) from the fan

- If the fan *does not* ramp up or, replace the fan
- If the fan *does* ramp up but E-29 persist replace the MCBA

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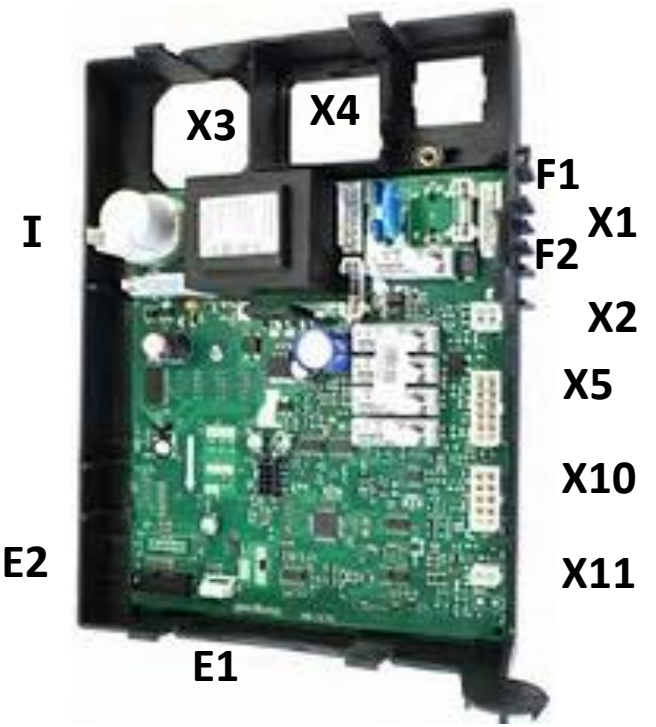
E69 - Boiler Code Chip Missing

Status	Description
X1	Main Power
X2	Fan Power
X3	Ionization Wire
X4	Transformer Power
X5	Gas Valve, 3WV
X10	Sensors, Pump Control
X11	BUS connection
F1	120V Fuse
F2	Low Voltage Fuse
E1	Eprom E Series
E2	Display Ribbon (Eprom Q Series)
I	Electronic Spark



E-69: No software present. Usually presents itself during start-ups of fuel type conversions and MCBA or Eprom replacements.

- Verify the EEPROM is installed correctly and firmly seated into position, verify there are no signs of corrosion on the socket connections of the MCBA.
- If MCBA displays “d—A”, or “A—d” Press and hold the STORE button until COPY is displayed on the screen. After the software has been copied, the boiler should reset and start to transfer the stored information between the Eprom and MCBA
- Press the RESET button for no more than one second, confirm Copy appears on the display when replacing MCBA.
- If the display shows the E69 again replace the EEPROM (1)
- If after replacing the EEPROM you still get an E69 code, replace the MCBA

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No Error Code Troubleshooting

Description	Note
Heating Mode: For Space Heating operation the Radiator Button must be illuminated	
Hot Water Mode: For DHW operation the Shower Head Button must be illuminated	
Frost Protection Mode: For Frost Protection override the Snow Flake Button must be illuminated. This will provide constant power to the internal boiler circulator pump to prevent freezing of the heat exchanger on cold days	

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No Heat, No Hot Water, No Code

Check technical readout for helpful information.

Status	Description
0	No Demand
1	Fan Pre / Post Purge
2	Ignition
3	Burner on CH (flame established)
4	Burner on DHW (flame established)
5	Fan Check
6	Pump on, Burner off (set point reached)
7	Pump Overrun for CH
8	Pump Overrun for DHW
9	Burner off, high temp
P	Pressure
F	Fan Service Mode (burner off)
H	Combustion Service Mode (high fire)
A	De-Aeration

First confirm the boiler is not in De-aeration and all four service menu test are set to off. Also confirm the boiler has adequate pressure.

Check Technical Readout for current boiler status.

SERV	Value	Range	Description
1	OFF	OFF-Max	Boiler in operation with burner function on
2	OFF	OFF-Max	Fan adjustable with burner off
3	OFF	OFF-Max	Pump adjustable with burner on or off
4	OFF	OFF/ON	Showroom mode—allows controller functionality without boiler operation. **(Must be "OFF" for boiler operation)**

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3WV Actuator & Cartridge

Fig.1


Fig.2

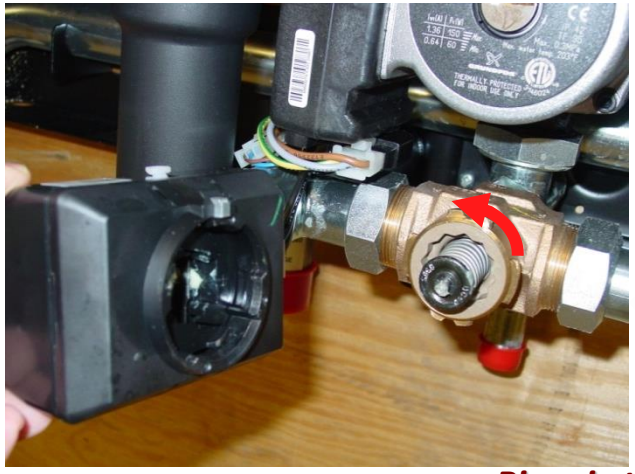
There are a two other components that could cause a Rinnai Boiler to stick in DHW or CH mode and provide no error code. Both are easy to test. First ensure the actuator Molex power plug is secure and power is present.

Simply remove the actuator from the 3way valve using by pressing the button on the top back of the actuator. During a call for DHW the actuator should power to the forward position as shown in the fig 1. This is the standby / resting position as well.

During a call for CH the actuator move to the back position. If the actuator fails to move it should be replaced.

The actuator takes 6 seconds to move from forward to back position.

The 3way valve cartridge should move freely, to test simply press the spring inwards to CH position, then let go. The spring should push outwards smoothly and quickly. If not replace.



3Way Valve Actuator Part #	Models
805000030	All E Combis

3Way Valve Cartridge Part #	Models
807000030	All Combis

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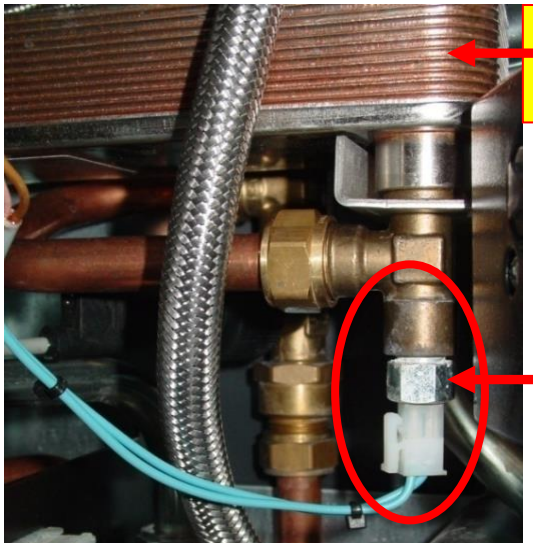
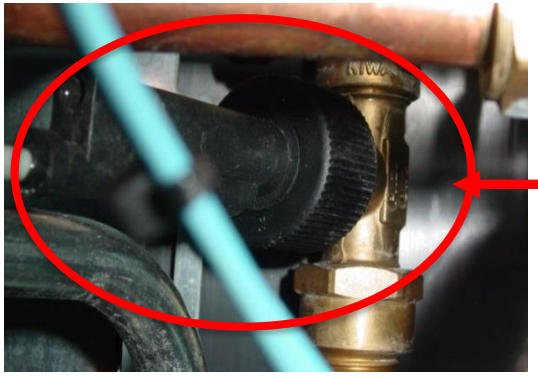
Flow Switch

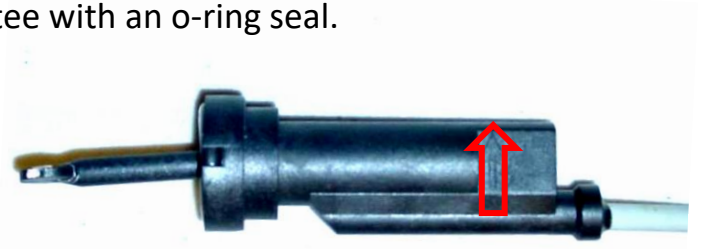




Below the flat plate heat exchanger behind the T3 sensor is the DHW flow Switch. It activates the boiler for DHW with priority at 0.5 gpm or more, (PARA 36 setting 10 or 20).

The flow switch combines a brass tee and paddle switch. Poor water quality can cause the brass body to calcify, blocking the movement of the switch. A stuck flow switch may fail to respond to flow or stick in the on position without flow, preventing the boiler from operating in CH mode.

Isolate the DHW before removing the flow switch. If problems continue after the switch is cleaned, the complete flow switch including the tee must be replaced. The switch itself is hand tightened on the tee with an o-ring seal.



Note: there is an arrow indicating direction of flow. Do not install upside down, do not over tighten

Flow Switch Part #	Models
805000043	E75, E110 Combi

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DHW – E Series

- E Series Boilers have built in DHW priority
- E Series Combi Boilers produce DHW utilizing these components
  - Single Wall Stainless Steel Flat Plate Type Heat Exchanger
  - T3 Temperature Sensor and / or Flow Switch.
  - Three-way diverter valve
  - Open or Close actuator

NOTE: A thermostatic mixing valve is required

E75 & E110 Combi

Para 36	Description	Pro's	Con's
00	Plate Warming	• Similar to old Cast Iron Tankless Coil Logic. Flat Plate is hot and always ready to delivery hot water • Hot Water is delivered a little faster	• Possibility for heat migration if no heat trap or check valves installed • Leaky, dripping faucet could cause unit to stay in DHW mode • Consumes slightly more fuel but conserves water • Potential for cold water sandwich: Initial temperature fluctuation
10	Plate Warming & Flow Switch	• Plate remains warm, activation achieved by a temperature drop at T3 Sensor or the flow switch.	• Same as Para 36 @ 00
20	Flow Switch Activation	• The flow switch activates at 0.5 gpm • No thermal migration • No cold water sandwich	• Consumes slightly more water and delivery is slightly slower • Eliminates plumbing issues causing unit to stay in DHW when no heat trap or checks installed • Consumes less fuel

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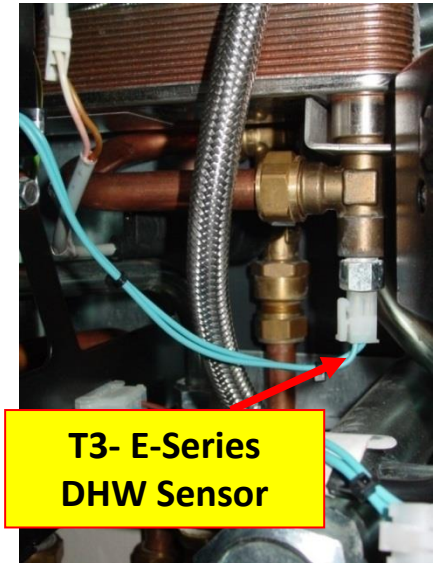
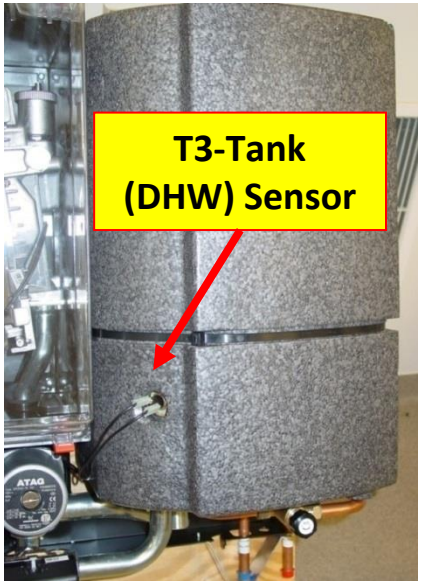
T3 DHW Temperature Sensor





The T3 sensor on E Series Combi's are wet well o-ring sealed no Teflon or pipe dope required. If removed the o-ring should be replaced. When replacing the sensor the o-ring is included with the new sensor.

The T3 sensor on Q Series Combi's is dry well no sealant required.

A bad T3 Sensor could result in poor DHW performance. Could be DHW is not hot enough, or fluctuation in temperature or causing boiler to stick in DHW mode and not switch back to CH mode.

T3 (dhw) Part #	Models
805000035	All E Combi Boilers
805000032	All Q Combi Boilers

Temperature sensor T3 – DHW temp. [68 - 176°F]				
Wire color	voltage	resistance	MCBA connector	Pin's
Black	2.3 - 0.9Vdc	15 – 1.7kΩ	X10	2
Black	0Vdc	15 – 1.7kΩ	X10	7

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OA Reset Curve

In some applications depending on location and building envelope the pre defined Outdoor Reset curves require some adjustments to meet specific needs. Below are some adjustments that can be made to solve seasonal comfort.

PARA	Default	Change	Description
5	2.1	2.4 – 3.5	Para 5: K-Factor (pitch of heating curve). This changes the rate in which the boiler tries to satisfy demand. The default setting is design to satisfy average heat loss in a modern construction homes (concrete foundation, double pane windows, decent insulation). If the building envelope is questionable or want recovery more like a traditional high mass boiler the setting can be set up to 3.5 for fast recovery.
7	14°F	20 - 32°F	Para 7: is based on Outdoor Design Temperature. Default parameter provides 176 degree water when the outdoor temperature is 14 degrees. In some applications in the mountain regions or near large bodies of water where the temperature change is quick and dramatic this adjustment will help create a consistent level of comfort.
14	10	0-28°F per minute	Para 14: Gradient is the increase in which the boiler supply temperature increases. Default setting is 10°F rise in boiler temperature per minute. This can be turned up for fast recovery like a high mass boiler, however depending on emitter and installation increasing supply temperature too fast could lead to system noise.
27	100°F	120 -140°F	Para 27 is the minimum supply temperature provided by the boiler. The traditional boilers removed had a minimum supply temperature of a 140 degree. Rinnai Default minimum supply temperature is 100 degrees. By changing para 27 to 120 degrees the systems will receive warmer water on any given day providing more warmth. We do not want to jump to 140 degree minimum supply temperature because for every 3 degrees we reduce the supply temperature there is a 1% fuel savings.

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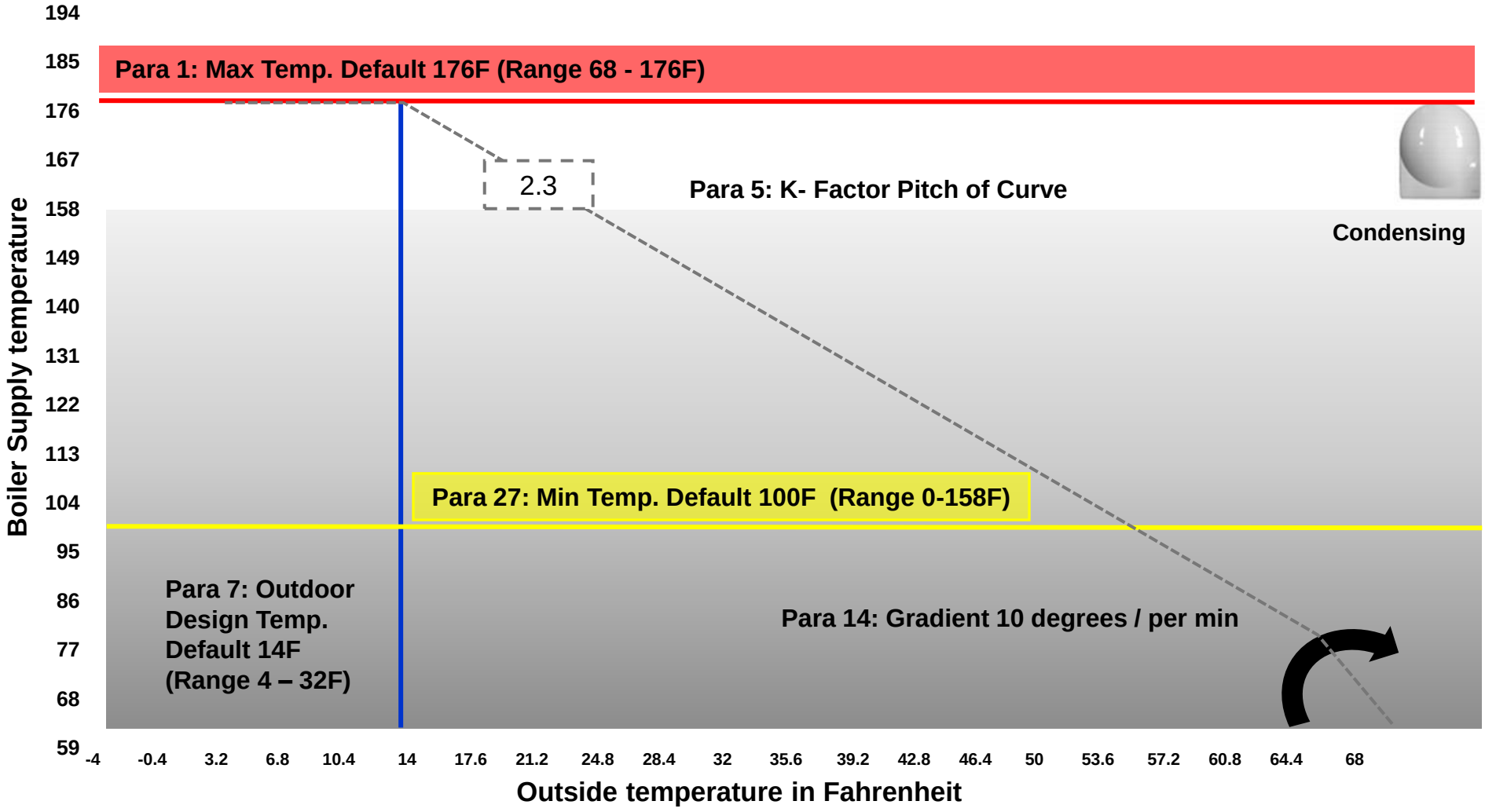
Para 2: Reset Curve Default “00” Baseboard / Air handler
Para 1: Max Temp. = 176, Para 5: K-Factor = 2.3, Para 14: Gradient = 10 min



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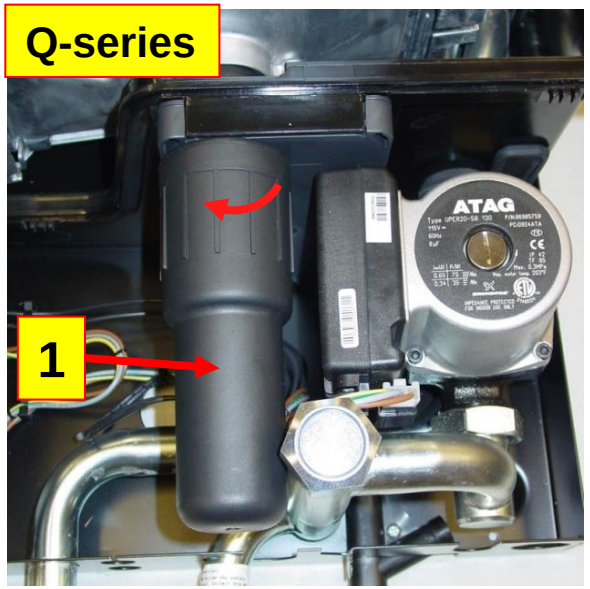
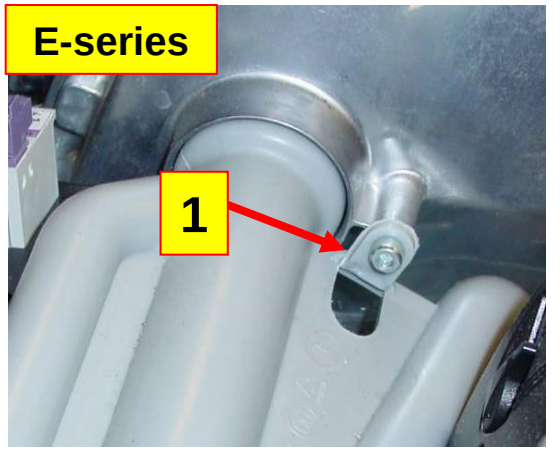
Tear Down

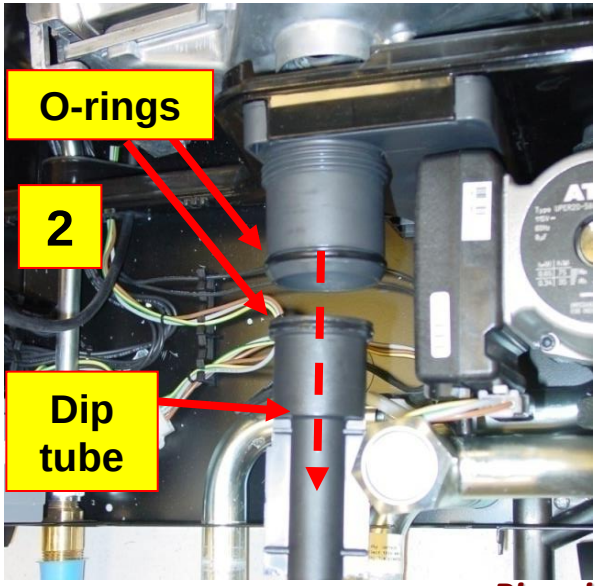
Condensate Trap Removal



Q- SERIES

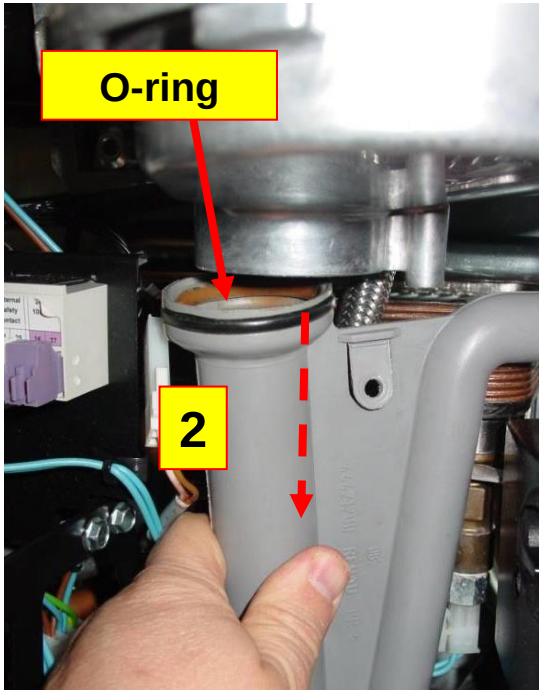
1. Unscrew the condensate trap.
2. Pull down on the dip tube of the condensate trap.
   NOTE: This is also required to remove the condensate tray.
3. Inspect and clean as needed and ensure O-rings are intact.





E-Series

1. Remove the 4mm screw securing the trap.
2. Pull down on the front of the trap and up on its rear tube to release.
   NOTE: This is also required to remove the condensate tray.
3. Inspect and clean as needed and ensure O-rings are intact.



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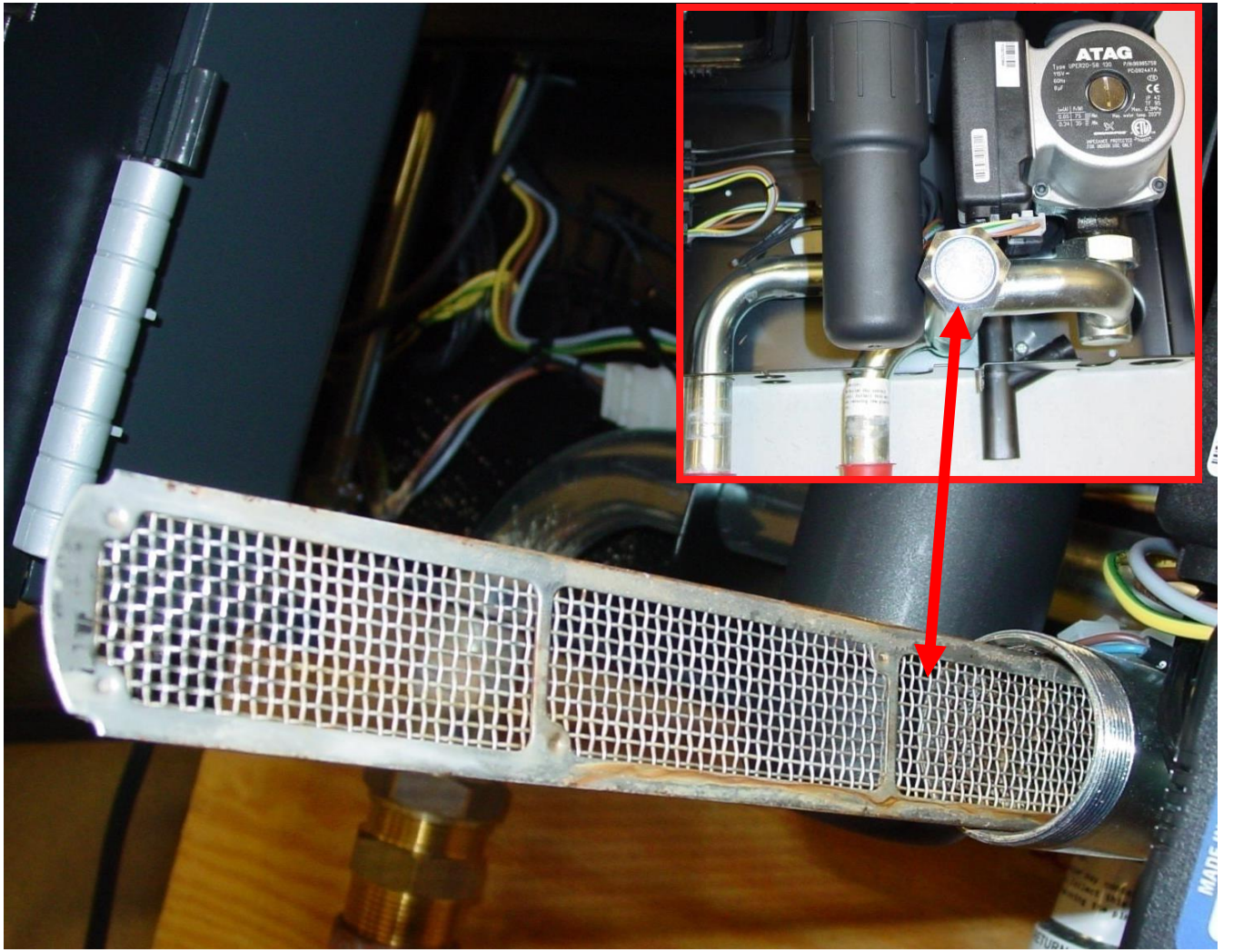
Return Pipe Filter Removal

Close boiler isolation valves. Drain boiler. Remove the cap to inspect and clean the filter.

Ensure the O-ring on cap is intact when reassembling. Part # 809000058

Replace the filter positioned vertically on Q models (align at 12:00 and 6:00).

Replace the filter positioned diagonally on E models (align at 11:00 and 5:00).



NOTE: The filter must be checked at the 8000 hour or 4 year service interval. A blocked filter will reduce boiler flow and increase risk of overheating.

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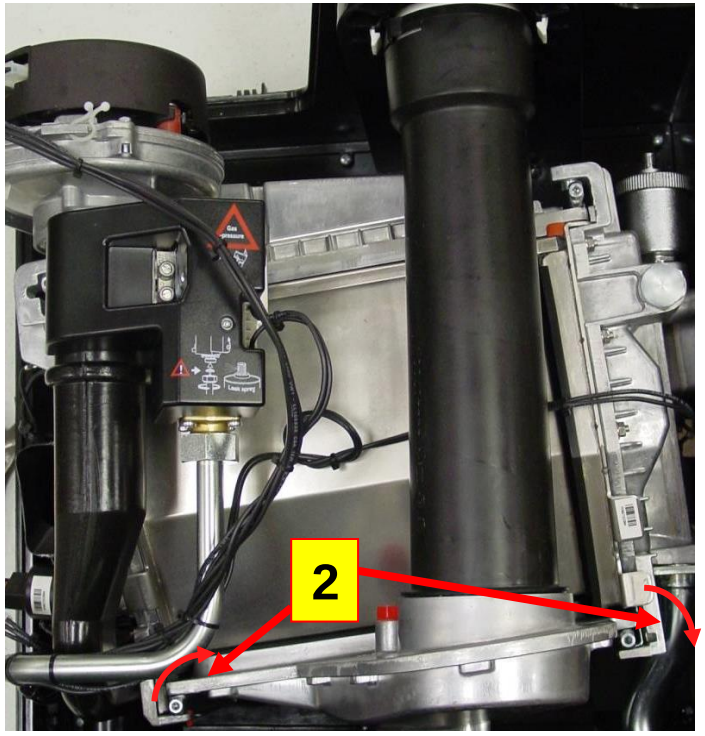
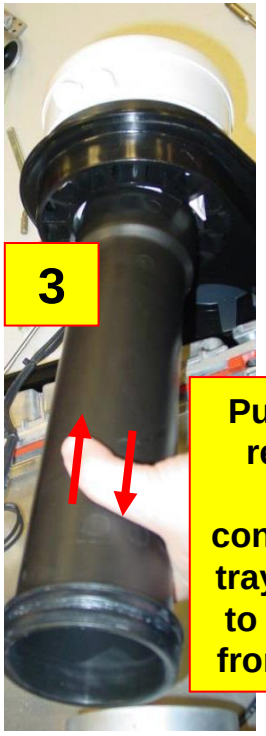
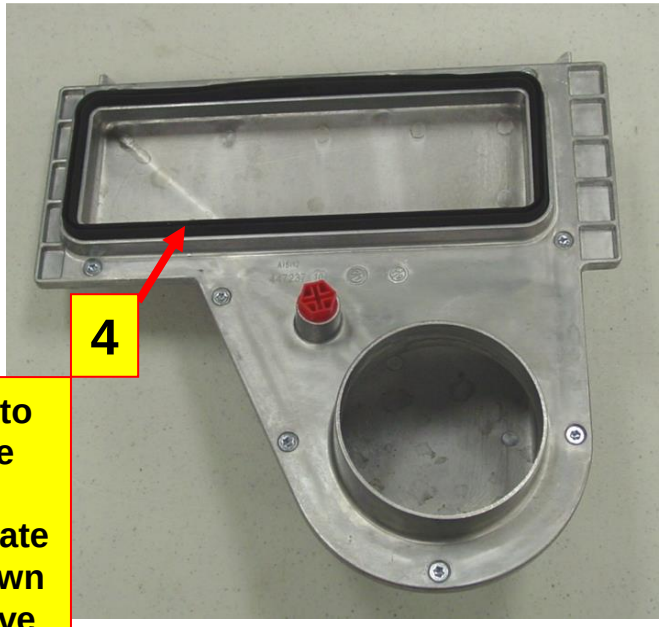
Condensate Tray Removal







Pull up to remove from condensate tray, down to remove from boiler

1. Turn off gas and power, and remove condensate trap.
2. There are two bottom clamp bars that require a ¼ turn **clockwise** to remove
   NOTE: Turning these bars the wrong direction will cause the RED tabs to break
3. After removing these bars, depress the two tabs at the top of the black vent pipe, then push up the pipe into the vent adapter. Pull the bottom of the pipe forward and remove it from the vent adapter.
4. Remove and clean the condensate tray—ensure the gasket is intact and reseats to the heat exchanger correctly (If exposed, this should be replaced).

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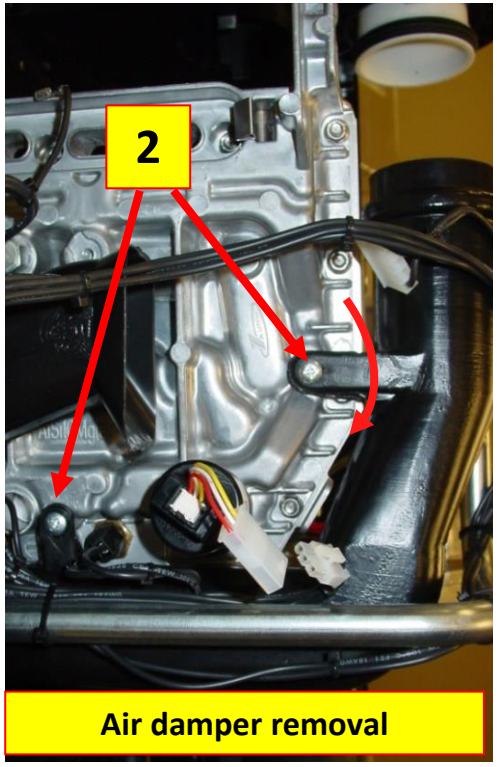
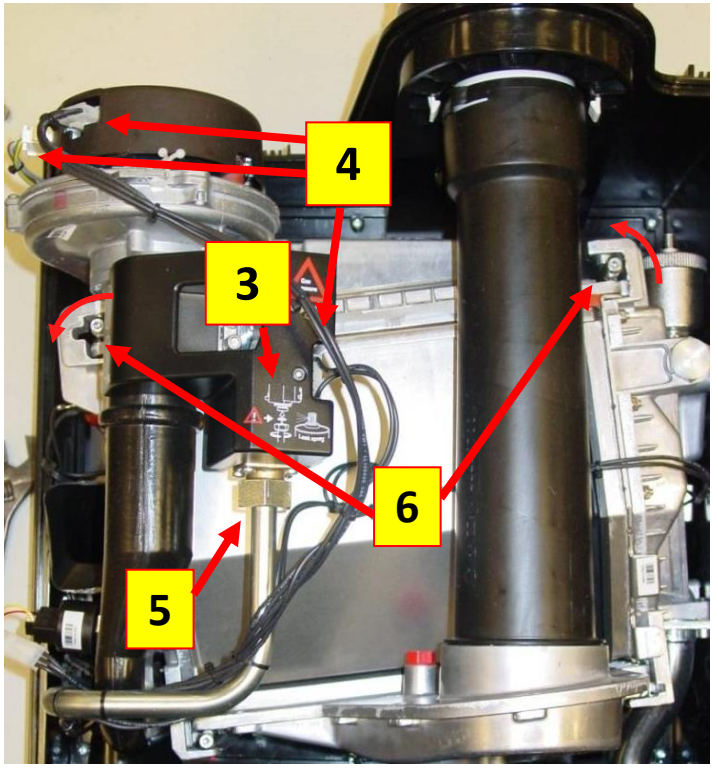
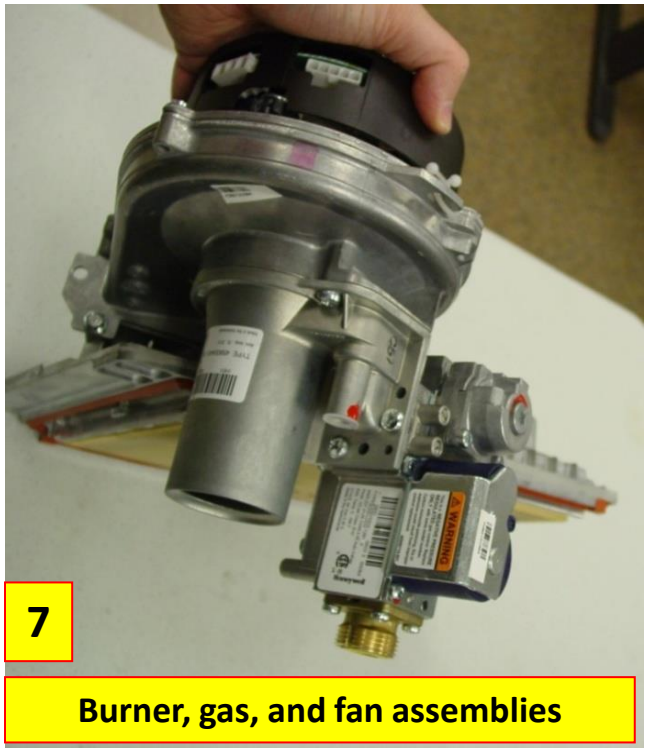
Burner, Fan, Gas Valve Removal



Air damper removal





Burner, gas, and fan assemblies

1. Ensure unit is isolated from power and the exhaust flue is removed (previous slide).
2. Remove two screws from the air damper and push down on it to separate from the fan assembly (left side).
3. Remove the screw securing the gas valve cover (#1 Phillips).
4. Remove the gas valve wire harness and 2 fan harnesses (Ensure these plug in correctly when reassembling)
5. Unscrew the nut below the gas valve.
6. There are two top clamp bars that require a ¼ turn counterclockwise to remove.
   NOTE: Turning these bars the wrong direction will cause their RED tabs to break.
7. The burner and the gas and fan assembly will pull forward and free of the boiler.

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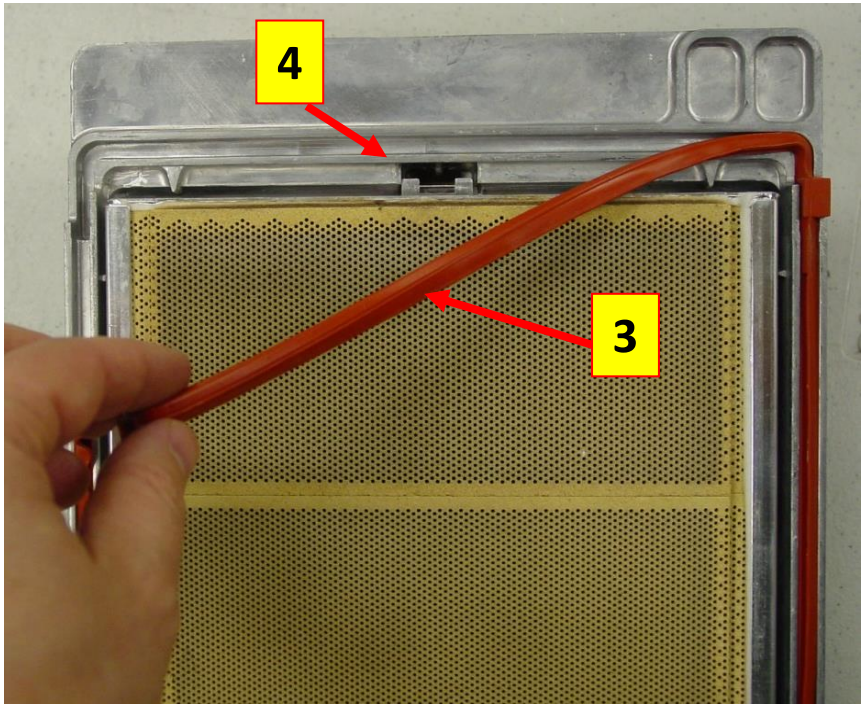
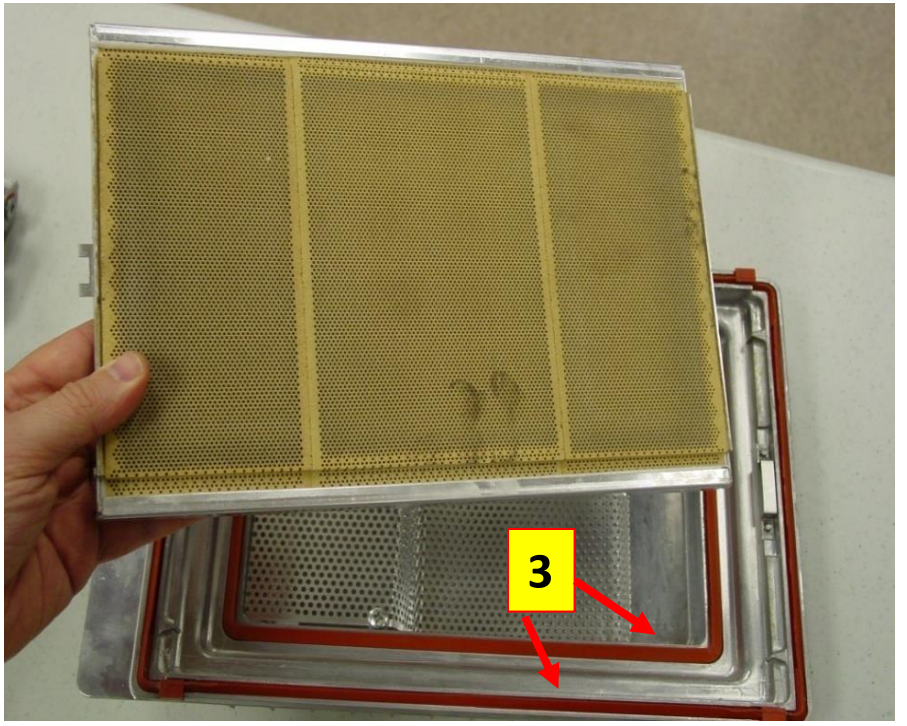
Burner Cleaning and Inspection





1. Ensure unit is isolated from power.
2. Remove burner assembly.
3. Anytime the burner assembly plate is removed from the heat exchanger, both orange gaskets **must** be replaced to ensure a proper seal is maintained. **This must be done at the 4000 hour/4 year service interval.**
4. To remove burner cassette from assembly, release locking tab with a flat head screwdriver.
5. Inspect and vacuum the burner as needed (do not use compressed air).
6. Burner should be almond in color, burners white in color indicate signs of cross contamination

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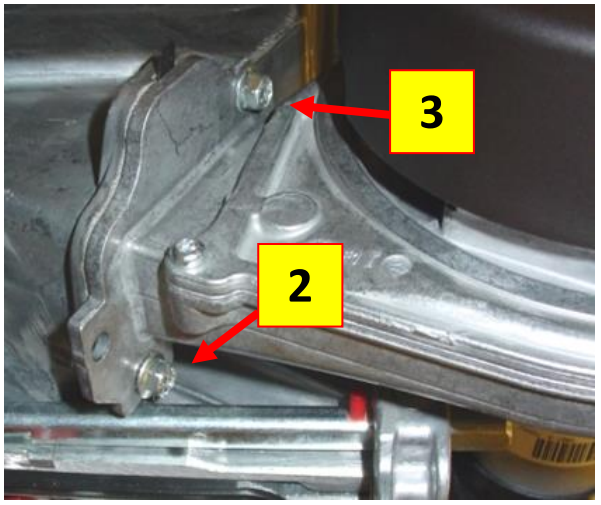
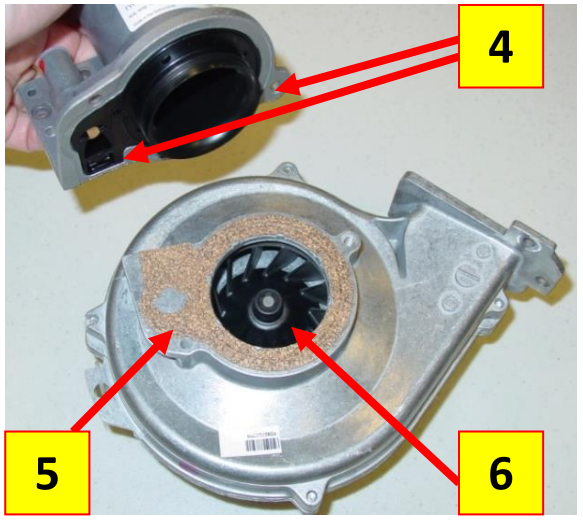
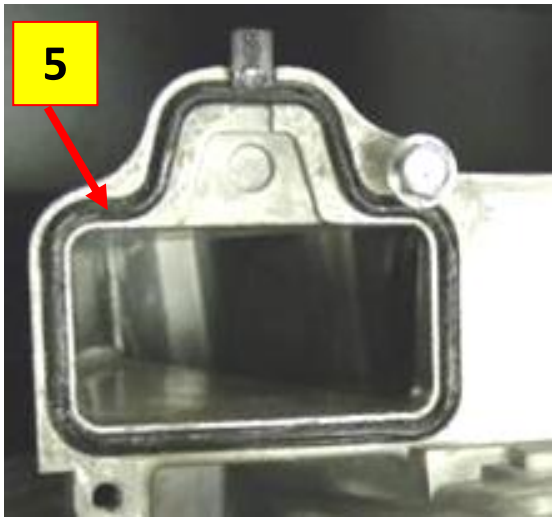
Combustion Fan Removal

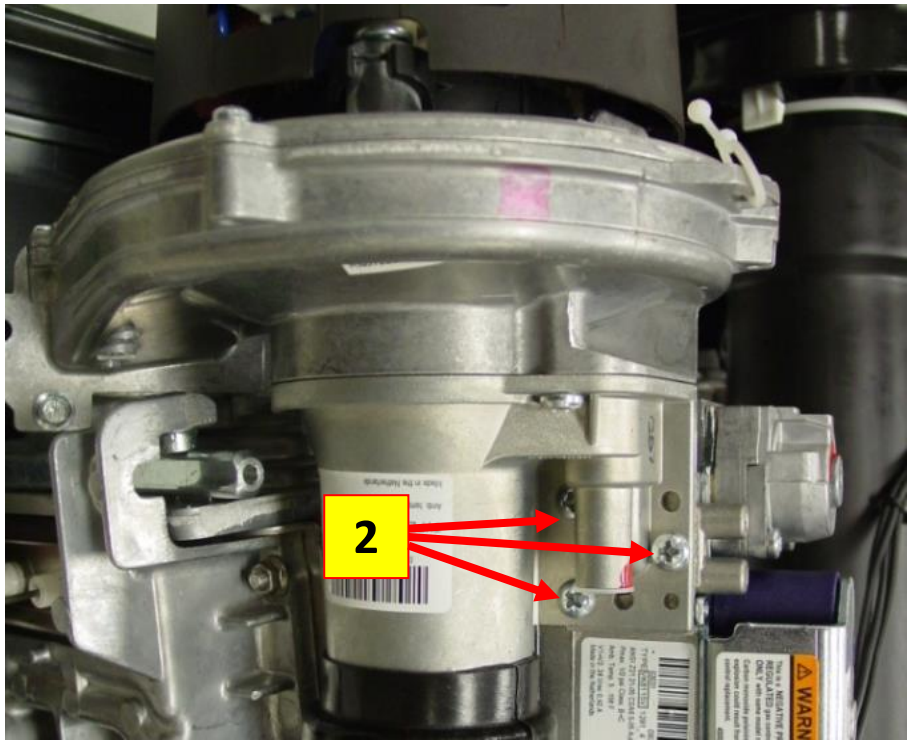


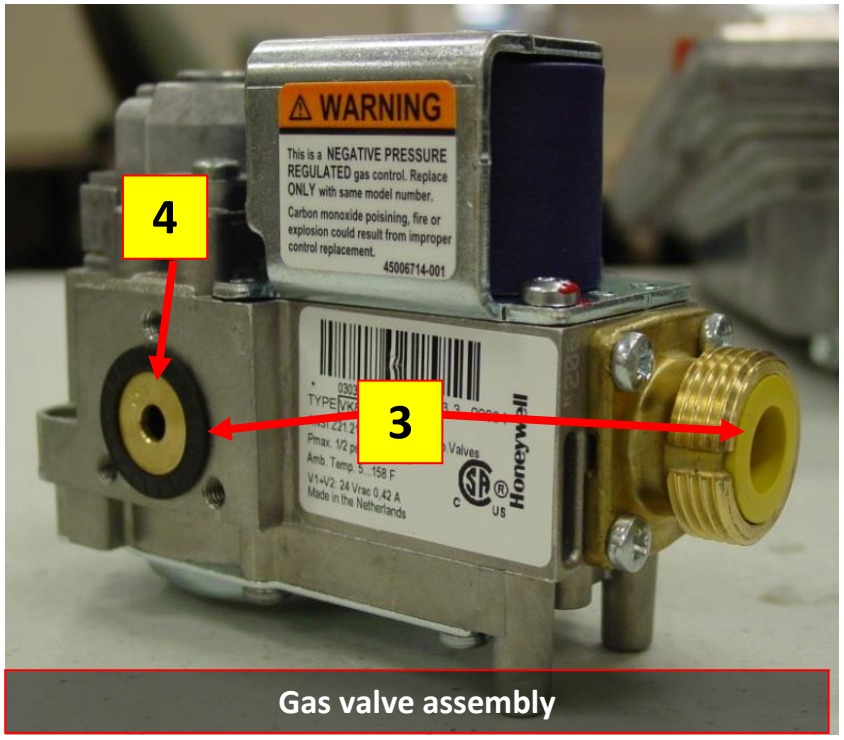




1. Remove burner, fan, and gas valve assemblies from boiler (previous slide)
   NOTE: The combustion fan can be removed with just the venturi (without the burner and gas valve) but it is advisable to remove each of these for inspection if there is an issue.
2. Remove left 8mm screw securing fan to heat exchanger.
3. Loosen right 8mm screw securing fan to heat exchanger—fan and venturi will now come free of boiler.
4. Remove two screws securing venturi from fan.
5. Ensure the cork gasket between the venturi and the fan and the rubber gasket between the heat exchanger and the fan are both intact (if exposed, they should be replaced).
6. If not replacing, inspect fan squirrel cage—ensure it is clean and turns freely.

Gas Valve Replacement





Gas valve assembly

1. Remove burner, fan, and gas valve assemblies from the boiler.
   NOTE: The gas valve can be removed by itself (without the burner and fan) but it is advisable to remove each of these for inspection if there is an issue.
2. Remove 3 screws securing venturi to gas valve.
3. Inspect the black gasket between the venturi and the valve and the yellow gasket between gas line and valve. Ensure both are intact (if exposed, they should be replaced).
4. Propane models will have a restriction plate (orifice) in the gas valve—these vary by model. These are included with a conversion kit. Natural Gas units will not have this plate or orifice.

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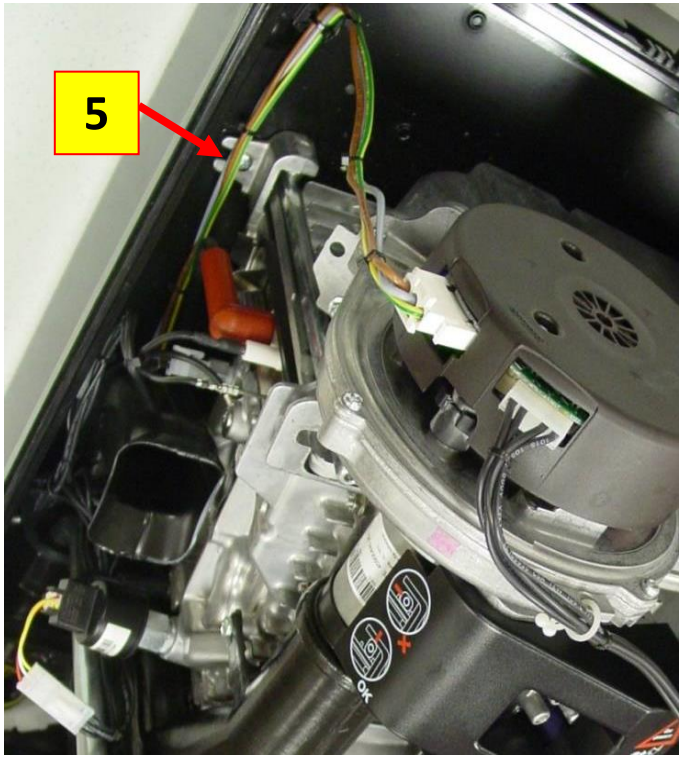
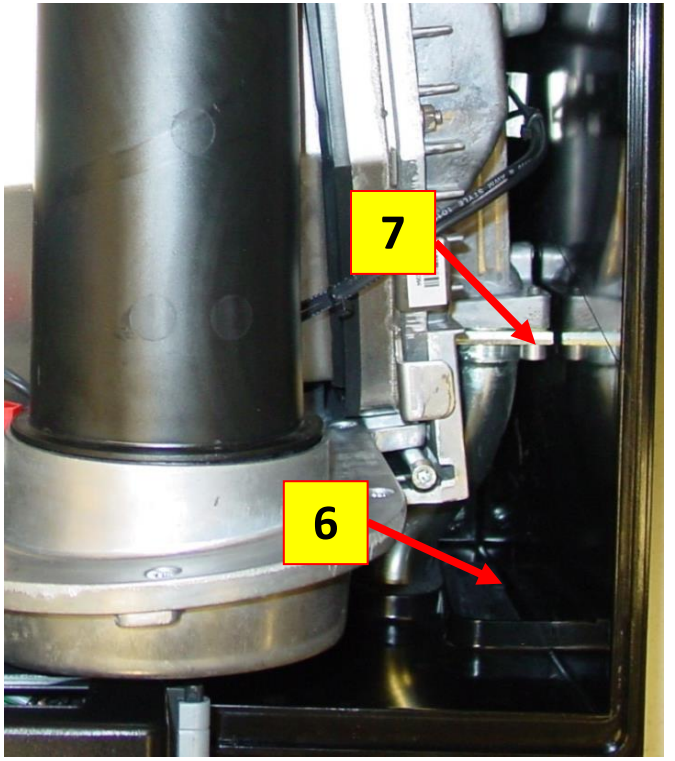
Removing the Heat Exchanger





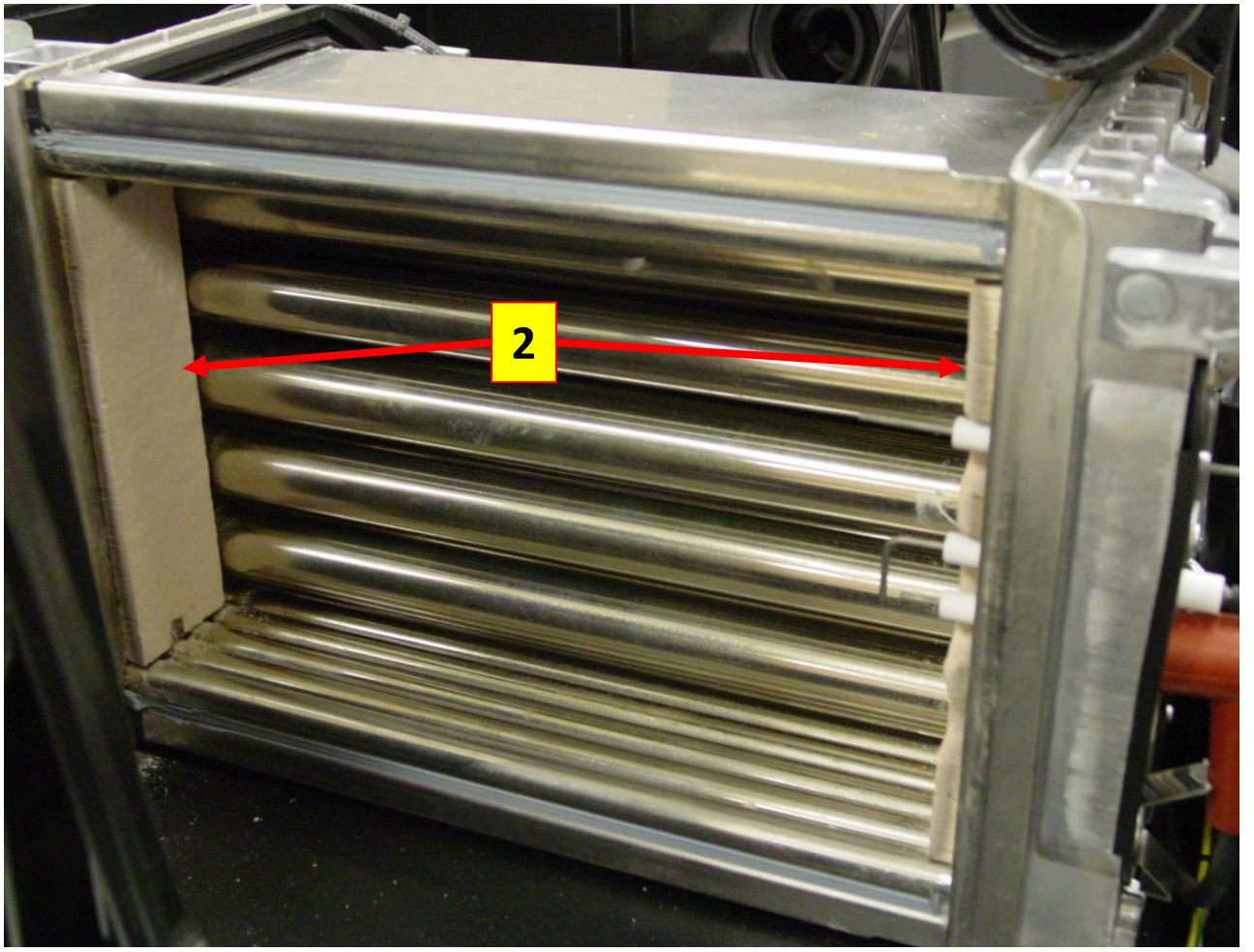
NOTE: The center screw can only be seen from the bottom.

1. Ensure unit is isolated from power.
2. Remove the pressure sensor and all temperature sensors.
3. Remove the condensate and burner assemblies.
4. Removal of the pump isn't required but allows easier access to the bottom screws of the heat exchanger.
5. Loosen the screw at the top left rear of the heat exchanger.
6. Remove the rubber service cap below the pipe assembly.
7. Remove three 5mm screws securing the pipe assembly to the heat exchanger by using the T-handle through the service cap opening. **NOTE:** The center screw can only be seen from the bottom.
8. Pull the right side of the heat exchanger out first and the left side will release from the top left screw.

Heat Exchanger Cleaning and Inspection

1. Remove burner assembly and the condensate tray. Note: Removal of the heat exchanger from the boiler is not necessary for cleaning.
2. Inspect the left and right insulation plates but do not remove unless they appear worn and need replacing. If they are thinning and bright white in color, this is a sign of wear.
3. Vacuum the heat exchanger thoroughly.

   NOTE: DON'T USE COMPRESSED AIR or FLUSH WITH WATER



This must be performed at the 8000 hour/4 year service interval

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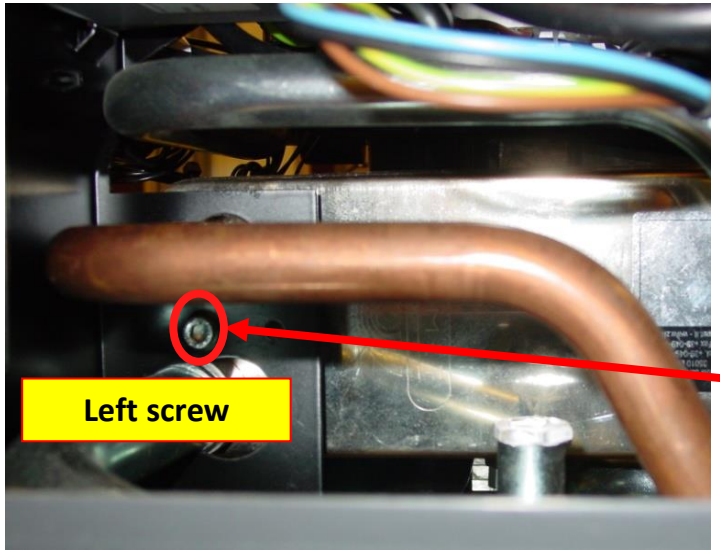

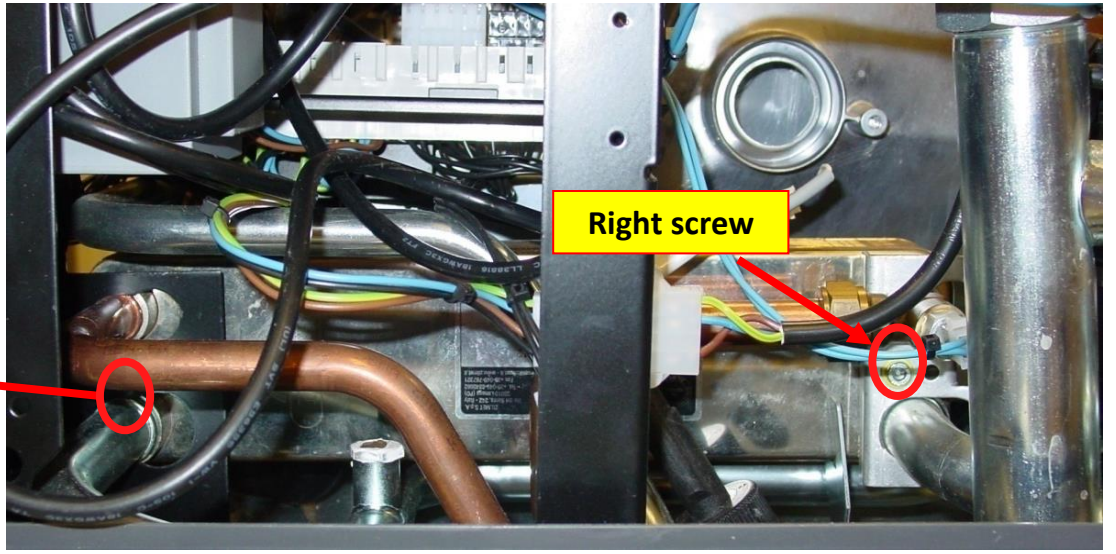

1. The E-series DHW plate heat exchanger should rarely be removed—only in cases of leakage (likely due to poor water quality).
2. It is held in by two 4mm screws—accessible from underneath—one on each end. NOTE: each screw has a yellow rubber washer to help hold the screw in place.

3. After removal of the screws, gently pull up on the plate to release it from all pipes.
4. The plate will then come free of the boiler by moving it to the right by the pump.
5. Ensure the O-rings on all four ports are intact.

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Spare Parts & Accessory

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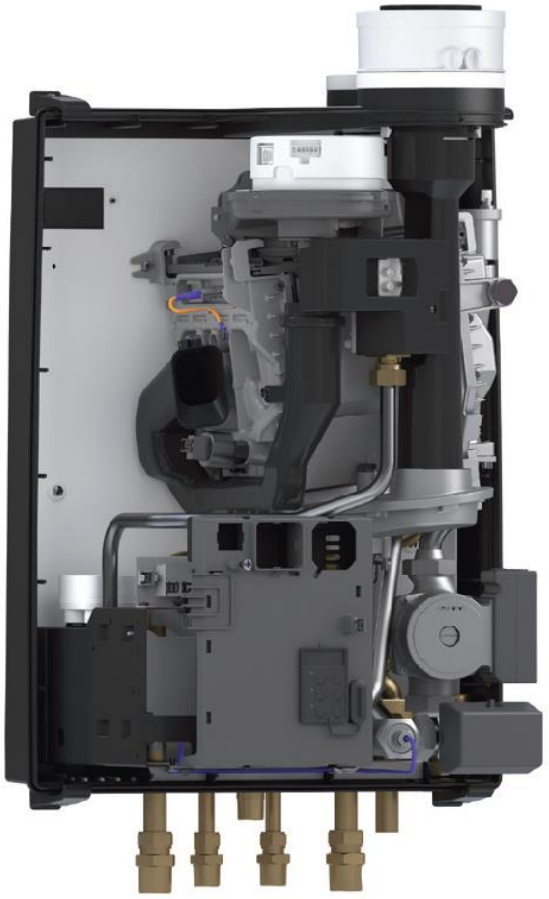
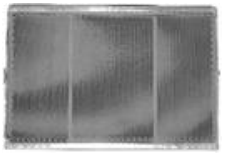
Commonality in Parts





Combustion Fan Part #	Models
808000020	OSS 1 / 2
808000021	OSS 3 / 4

Burner Cassette Part #	Models
806000010	OSS 1
806000011	OSS 2
806000012	OSS 3 / 4

Honeywell Gas Valve Part #	Models
806000019	All Boilers

Honeywell MCBA Board Part #	Models
805000025	All Boilers

Grundfoss Modulating Part #	Models
807000126	OSS 1
807000127	OSS 2 / 3 / 4

Pump Gasket (2pk) Part #	Models
809000056	All Boilers

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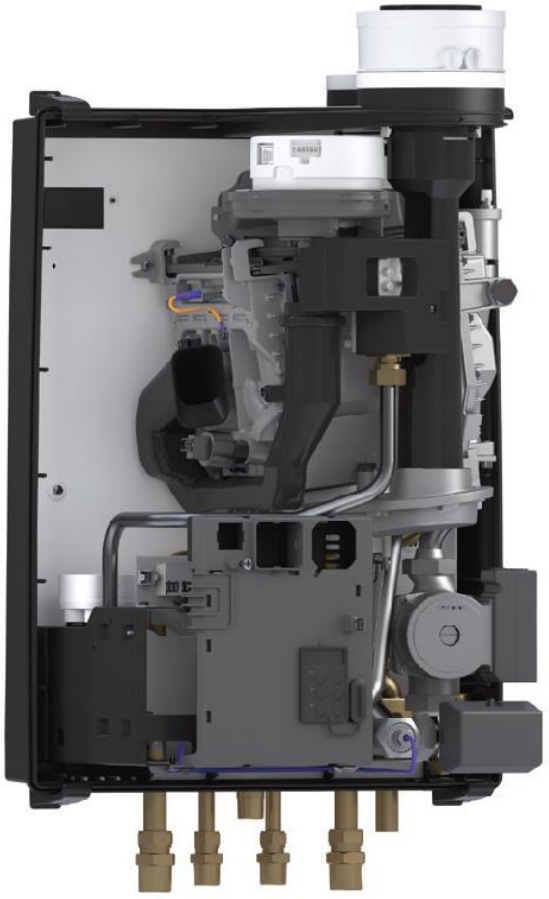
Commonality in Parts



Igniter Electrode Part #	Models
805000036	All Boilers

Ignitior Cable Part #	Models
805000036	All Boilers

T1 Supply Temp Part #	Models
805000035	All Boilers

Pressure Sensor (LWCO) Part #	Models
805000034	All Boilers

T2 Return Temp Sensor	Models
805000032	All Boilers

3/8” Caleffi De-aerator Part #	Models
807000024	All Boilers

High Limit Sensor 220F Part #	Models
805000033	All Boilers

T4 (Outdoor Sensor) Part #	Models
805000047	All Boilers

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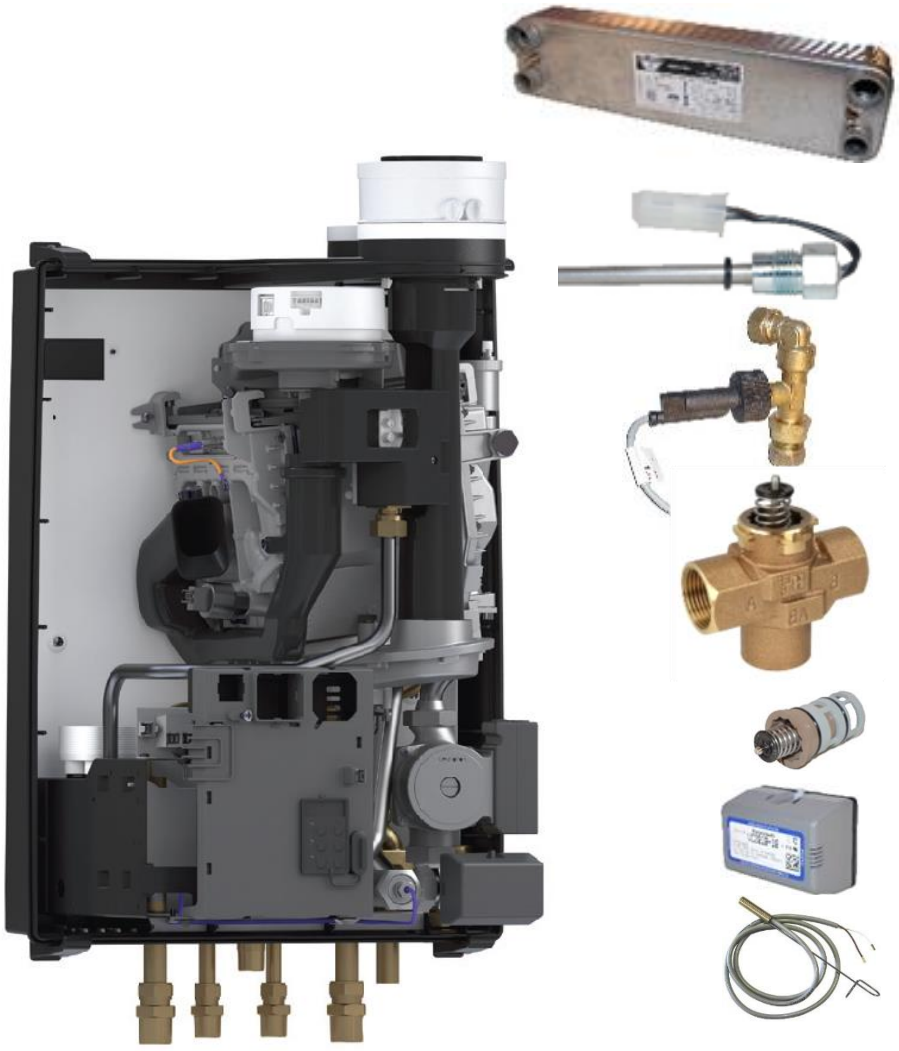
Commonality in Parts



Flat Plate Part #	Models
807000054	E50, E75 Combi
807000055	E110 Combi

T3 (dhw supply) Part #	Models
805000035	All E Combi Boilers

Flow Switch Part #	Models
805000043	E75, E110 Combi

Diverter Valve Part #	Models
809000057	All Combi Boilers

Diverter Valve Cartridge Part #	Models
807000030	All Combi Boilers

Honeywell VC2010 Actuator Part #	Models
805000030	All E Combi Boilers

Indirect Tank Sensor Part #	Models
807000076	All Solo Boilers

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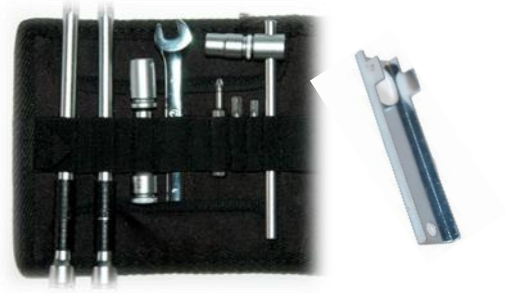
Boiler Accessories

BOILER ACCESSORIES		
Image	**Part Number**	**Description**
	804000074	Boiler Suitcase: • E & Q MCBA Boards • Q Display • E & Q Combustion Fans • E & Q Circulator Pumps • Gas valve • Pressure switch • De-aerator Chrome • 3Way Valve Cartridge • 3Way Valve Actuator • Ignition electrode & gasket • All HX Gaskets
	809000024	Boiler Tool Kit: • ¼" t-handle driver • ¼" wobble bit • (2) ¼" x 5" extension bits • #1 phillips bit • 4mm allen bit • 5mm allen bits • 8mm socket • 8 mm Combination wrench • 3wy cartridge removal tool

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Appendix B: Accessories

BOILER ACCESSORIES		
Image	**Part Number**	**Description**
	804000061	Low Loss Header Plumbing Kit E Series
	804000071	Side Mount Low Loss Header Kit (E, Q Series)
	804000072	Side Mount Low Loss Header Kit (Q85, Q130)
	804000073	Side Mount Low Loss Header Kit (Q175, Q205)
	808000025	Room Air (Intake) Filter

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Boiler Accessories

BOILER ACCESSORIES		
Image	**Part Number**	**Description**
	804000074	Condensate Neutralizer
	80900114	Condensate Neutralizer Refill
	103000038	Scale Cutter
	103000039	Scale Cutter System Refill
	MIVK-T-LW	Isolation Valve Kit

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Boiler Accessories

BOILER ACCESSORIES		
Image	**Part Number**	**Description**
	803000011	RS100 Single Zone Controller
	805000040	Flue Gas Sensor with Cable
	807000076	Indirect Tank Sensor
	803000015	E50C Flow Switch Conversion Kit

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Appendix A

This is an overview only—please refer to each boiler's installation manual that is shipped with the product for the most up to date information.

Appendix A: Temperature Sensor Resistance Table

NTC 12KΩ @ 77°F Temperature Sensor—Supply (T1), Return (T2), DHW (T3), Outside (T4), Flue Gas (T5-optional)							
-4°F	98KΩ	32°F	40.5KΩ	64.4°F	18.1KΩ	96.8°F	7.9KΩ
-0.4°F	90KΩ	35.6°F	36KΩ	68°F	16.6KΩ	100.4°F	7.2KΩ
3.2°F	82KΩ	39.2°F	33.5KΩ	71.6°F	15KΩ	104°F	6.5KΩ
6.8°F	74KΩ	42.8°F	30.9KΩ	75.2°F	14KΩ	113°F	5.6KΩ
10.4°F	66KΩ	46.4°F	28.2KΩ	78.8°F	12.9KΩ	122°F	4.6KΩ
14°F	58KΩ	50°F	25.6KΩ	82.4°F	11.9KΩ	131°F	4KΩ
17.6°F	53.5KΩ	53.6°F	23KΩ	86°F	10.85KΩ	140°F	3.4KΩ
21.2°F	49KΩ	57.2°F	21.4KΩ	89.6°F	9.8KΩ	158°F	2.3KΩ
24.8°F	45KΩ	60.8°F	19.9KΩ	93.2°F	8.5KΩ	176°F	1.7KΩ

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Appendix A: Q and E Series Electrical Troubleshooting

Gas valve				
Wire color	**voltage**	**resistance**	**MCBA connector**	**pins**
Black	0Vdc	50Ω	X5	4
Black	24Vdc			5
Note: Use the Molex connection on the gas valve instead of the connection on the board. Be sure that the multimeter test probes are inserted into the connector before the installer attempts to fire the boiler. There will only be 3 seconds that 24 Vdc will be energized if there is an issue, if everything is working correctly 24 Vdc will stay energized as long as the boiler is fired.				

High limit switch				
wire color	**voltage**	**resistance**	**MCBA connector**	**pins**
Black	0Vac	0Ω	X5	2
Black	24Vac	0Ω		8

Fan 120 V (Not connected through MCBA)				
wire color	**Voltage**	**resistance**	**connector**	**pins**
Brown	120Vac	4.7Ω	Fan/Pump Harness	1 – 1 (H)
Grey	Neutral			2 – 2 (N)
Green/yellow	Ground	0Ω		3 – 3 ground

Fan PWM					
wire color	**voltage**	**resistance**	**MCBA connector**	**MCBA Pins**	**plug pins**
Black	38Vdc	N/A	X2	1	1
Black	0Vdc			2	4
Black	PWM			3	2
Black	Fan RPM			4	5

Fuses

The boiler MCBA control has one 120V 5A glass fuse and one 24V 4A glass fuse.

A blown 120v fuse will cause the fan to run continuously. Remove the fuse and check continuity through it. If you have continuity through the fuse then it is good.

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Pump – 120V				
Wire color	**voltage**	**resistance**	**connector**	**plug pins**
Brown	120Vac		Fan/Pump Harness	1 (H)
Grey	120Vac			2 (N)
Green/yellow	N/A	N/A		3-ground

Pump PWM					
Wire color	**voltage**	**resistance**	**MCBA connector**	**MCBA pins**	**plug pin's**
Black	N/A	N/A	X10	9	1
Black				10	2

3-way valve					
Wire color	**voltage**	**resistance**	**connector**	**MCBA pins**	**actuator pins**
Black	28Vac	62Ω	X5	1 (CH)	6
Black	28Vac			7 (DHW)	3
Black	28Vac	N/A		2 (N)	2

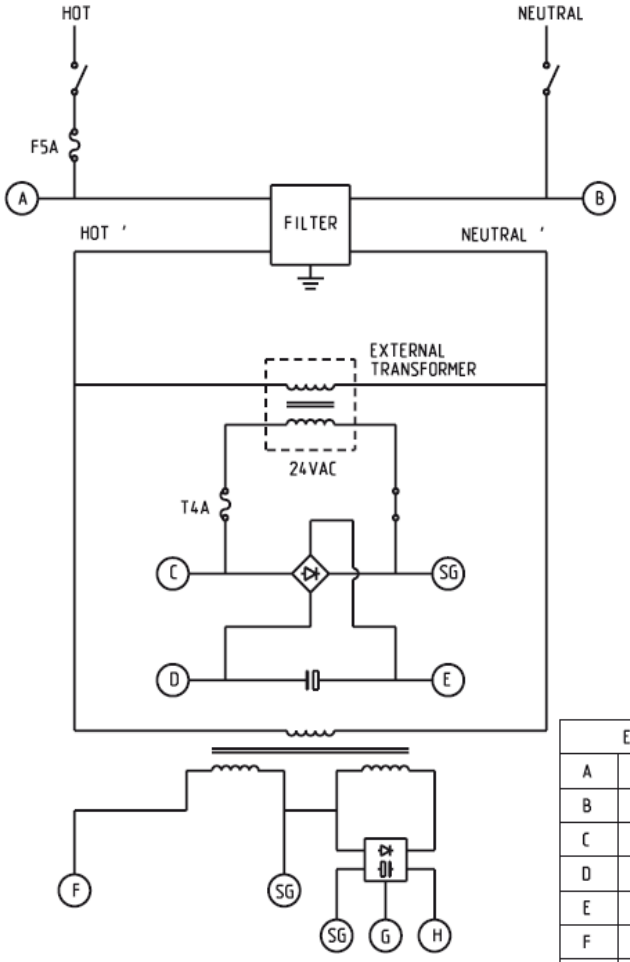
Water pressure sensor [0 – 40PSI]					
Wire color	**voltage**	**resistance**	**MCBA connector**	**MCBA pins**	**plug pin's**
Black	0.5 – 2.6Vdc	N/A	X10	4	1
Black	12Vdc	N/A	X10	8	3
Black	0Vdc	N/A	X10	10	2

Flame rod

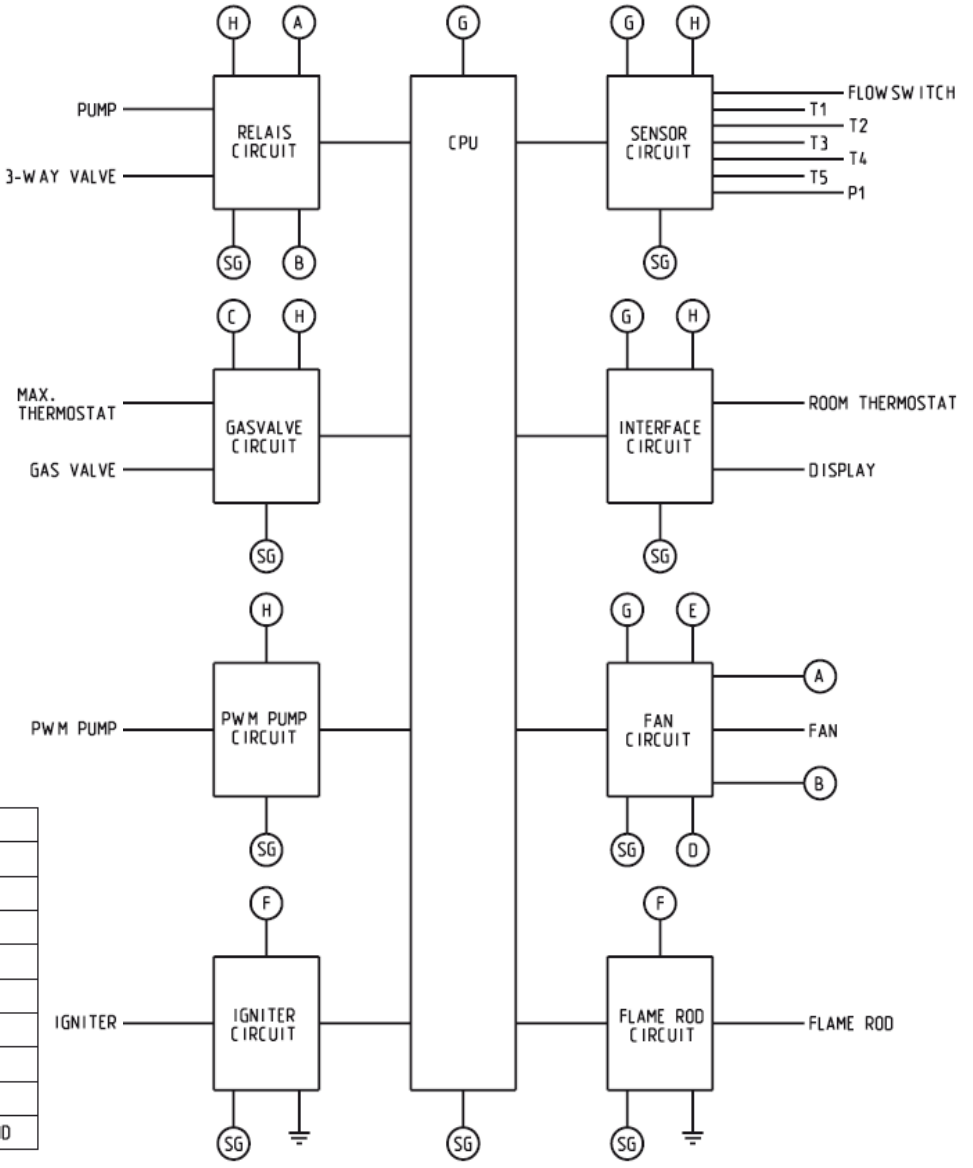
Set your meter to the µ amp scale for DC current. Place meter in series with the flame rod. With the boiler running you should read at least 2 µ amp for proper flame on low or high load (see commissioning for the procedure to force the boiler into high or low load).

Appendix A: Ladder Diagram

NOTE: Flow switch is not on Q-series



EXPLANATION	
A	HOT
B	NEUTRAL
C	~ 24V
D	– 24V
E	+ 24V
F	~ 200V
G	+ 5V
H	+ 10V
SG	SAFETY GROUND



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Appendix A: Start-up Display

Model	Start Up Display
E50CN	15t.2
*E50CP	15t.P
E75CN	22t.2
E75CP	22t.P
E110CN	32t.2
E110CP	32t.P
Q175CN	51t.2
Q175CP	51t.P
Q85SN	25.2
Q85SP	25.P
Q130SN	38.2
Q130SP	38.P
Q175SN	51.2
Q175SP	51.P
Q205SN	60.2
Q205CP	60.P

Model	Start Up Display
E50CRN	15t.1
*E50CRP	15t.P
E75CRN	22t.1
E75CRP	22t.P
E110CRN	32t.1
E110CRP	32t.P
E60SRN	18.1
E60SRP	18.P
E85SRN	25.1
E85SRP	25.P
E110SRN	32.1
E110SRP	32.P

* Field Conversion

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This Concludes Rinnai's Boiler Training Program Level III Service Fundamentals

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Toll-Free: 1-800-621-9419 • Phone: 678829-1700 • www.rinnai.us