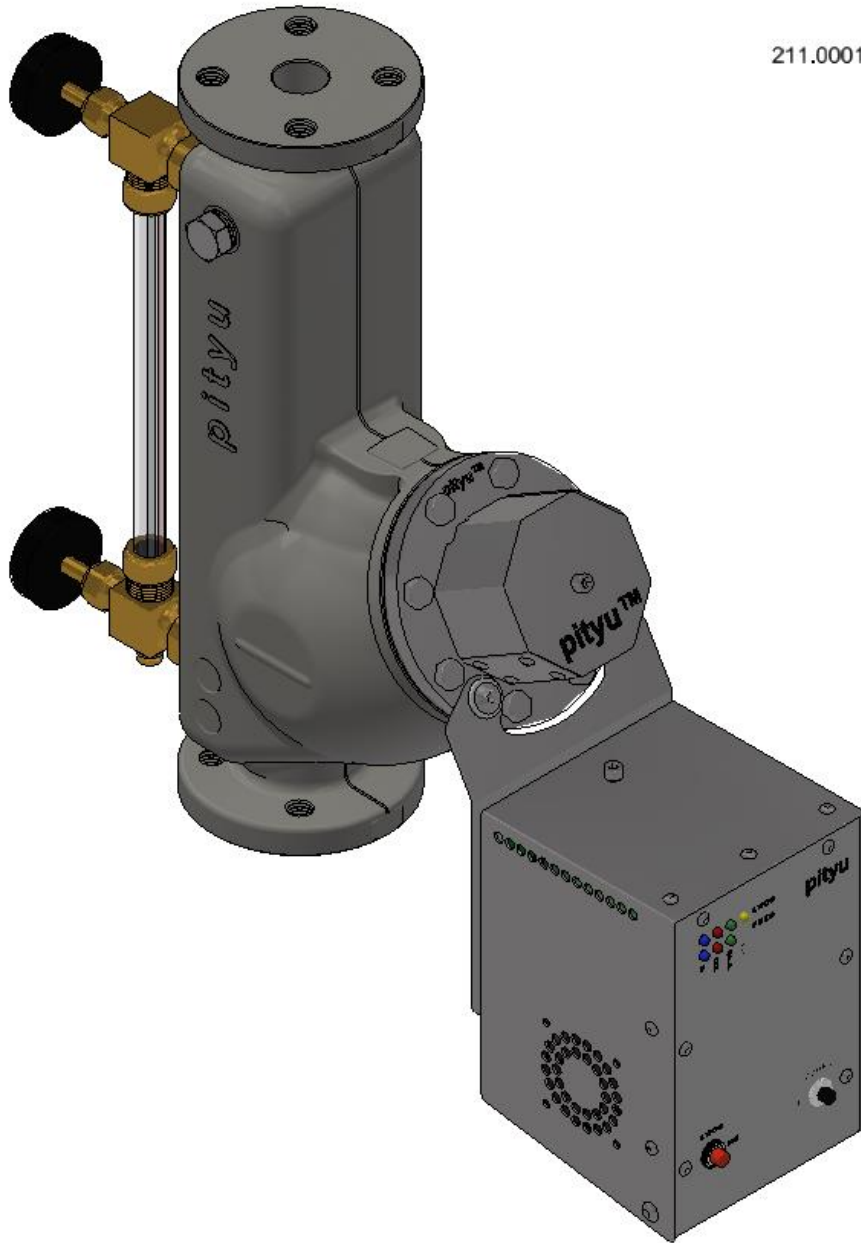




INSTALLATION & MAINTENANCE MANUAL

211.0001



Series: **1-AR**
1-MR

2. CONTENT

	Page
1. Front Page	1
2. Content	2
3. Warnings	3
4. Controls	4
5. Features	6
6. Specifications	8
7. Principle of Operation	9
• LWCO 1-AR	9
• LWCO 1-MR	10
• FEED 1	11
8. LWCO Line	12
9. Primary and Secondary LWCO Installation	14
• Primary LWCO	14
• Secondary LWCO	15
10. Probes and Levels	16
11. LWCO ON and LWCO OFF Levels	18
12. FEED ON and FEED OFF Levels	20
13. Level-Height Settings	22
14. Probe Jam Nut	23
15. Probes Factory Lengths	26
16. Typical Piping	27
17. Wiring Diagram	28
18. Maintenance	29
19. Troubleshooting	30
20. Dimensions	31
21. Parts Exploded View	32
22. Parts List	33
23. Certifications	34

3. WARNINGS



HIGH PRESSURE STEAM

Before servicing the control, lower the steam pressure to 0PSIG.



HOT SURFACE

To prevent burns, cool the control to 80°F.



FIRE

To prevent a fire, do not use the control to switch currents over 10A, 60Hz, 120V.



ELECTRICAL SHOCK

To prevent electrical shock, disconnect all power to the control.



INSTRUCTIONS

Read and understand the instructions.
Save them for future reference.

4. CONTROLS

LWCO 1-AR is a combined level control made of:

- LWCO 1-AR Module
- FEED 1 Module

LWCO 1-AR Control Unit is a two point ON-OFF Limiting Device, designed to UL353, with Auto Reset. The Control Unit shall allow energy input to the boiler with falling water level down to the LWCO Probe (1).

The level of the LWCO Probe (1) is set at the top face of the bottom sight glass nut.

The top face of the bottom sight glass nut is 0.500 inch above the Minimum Safe Permissible Water Level, specified by the boiler manufacturer.

When the level falls below LWCO Probe (1) the Control is in ON Mode, the LWCO LED Red is ON and the flow of energy to the boiler is disabled.

The Control Unit auto resets when the level rises to LWCO Probe (2). No operator's action is required. The Control Unit is in OFF Mode, the LWCO LED Green is ON and the flow of energy to the boiler is enabled.

The LWCO 1-AR Control Unit level is factory set.

The LWCO 1-AR does not lock out on power interruption.

The LWCO Model 1-AR is used as a Primary LWCO Control.

FEED 1 Control Unit is a two-point auto ON-OFF regulating device, designed to UL508, for maintaining safe water level between two points, the FEED Probe (3), and the FEED Probe (4). It is fully automatic and controls the pump and/or a valve. When the water level is falling and is not touching the FEED Probe (3) the control unit is in the ON Mode, the FEED LED Red is ON, and the Control Unit feeds the boiler until the water touches the FEED Probe (4). When the water level touches the FEED Probe (4) the Control Unit is in OFF Mode, the FEED LED Green is ON, and the control stops feeding the boiler.

The FEED Control Unit level is factory set.

The FEED Probe (3) is in level with LWCO Probe (2).

The FEED Probe (4) is 0.875 inches above FEED Probe (3).

LWCO 1-MR is a single level control made of:

- LWCO 1-MR Module
- FEED 1 Module is Installed on request, only

LWCO 1-MR

Control Unit is a two point ON-OFF Limiting Device, designed to UL353, with Manual Reset. The Control Unit is factory pre-set to allow energy input to the boiler with falling level down to the LWCO Probe (1).

The level of the LWCO Probe (1) is factory set in level with the top face of the bottom sight glass nut.

The top face of the bottom sight glass nut is in level with the Minimum Safe Permissible Water Level, as specified by the boiler manufacturer

When the level falls below LWCO Probe (1) the Control is in ON Mode, the LWCO LED Red is ON and the flow of energy to the boiler is disabled.

The Control Unit DOES NOT Auto Reset when the level rises to LWCO Probe (2). The operator's action is required. To Reset the Control the Manual Reset switch must be pushed. After the Manual Reset switch is pushed the Control Unit is Reset to OFF Mode, the LWCO LED Green is ON and the flow of energy to the boiler is enabled.

To reset the LWCO 1-MR the power must be ON.

The LWCO 1-MR locks out on power interruption. The Manual Reset switch must be pushed.

The LWCO Model 1-MR is used as a Secondary LWCO Control. The LWCO level must be installed in same level with the Minimum Safe Permissible Water Level, as specified by the boiler manufacturer or above.

5. FEATURES

- **Flange Connections**
 - Easy to Install and to Replace.
- **Wide LWCO and FEED levels**
 - All levels are adjustable, Level between LWCO ON and FEED OFF is 2.625 inches.
 - Levels are adjusted by cutting and or extending the probes.
- **Visual Mode Indicators**

-LWCO LED Blue,	Power ON
-LWCO LED Red,	LWCO ON
-LWCO LED Green,	LWCO OFF
-FEED LED Blue,	Power ON
-FEED LED Red,	FEED ON
-FEED LED Green,	FEED OFF
- **Simple design**
 - No Microchips.
 - No Integrated Circuits.
- **Pure AC Sine Wave on Probes**
 - No electrolysis.
 - Less scale build-up on probes.
- **Direct Reading**
 - No time delays.
- **Independent LWCO and FEED Modules**
 - LWCO and FEED modules are independent, if replacement is needed.

- **CSD-1 Code Compliant**
 - Manual** Reset, if the water level falls under the Bottom LWCO Probe (1) the Control Unit shall be in ON Mode and shall stay in ON Mode after the Water Level is Restored to Top LWCO Probe (2). LWCO LED Red is ON. The burner limit circuit is disabled. The Manual Reset switch must be pushed.

- **No Moving Parts**
 - No Moving Parts on water side.

- **Level Setting is Not Pressure Dependent**
 - No bellows to stiffen by pressure and give false reading.

- **Large Flange Opening**
 - Easy to clean the internal of the bottle, 3.375-inch side opening.
- **Service Connection to HWCO**
 - Two ½ NPT Ports provided for High Water Cut-Off.
- **Unique Sight Glass Protector**
 - Easy to install, no tools required, sight glass protector.
- **Large Wire Connecting Space**
 - Large space for connecting wires.

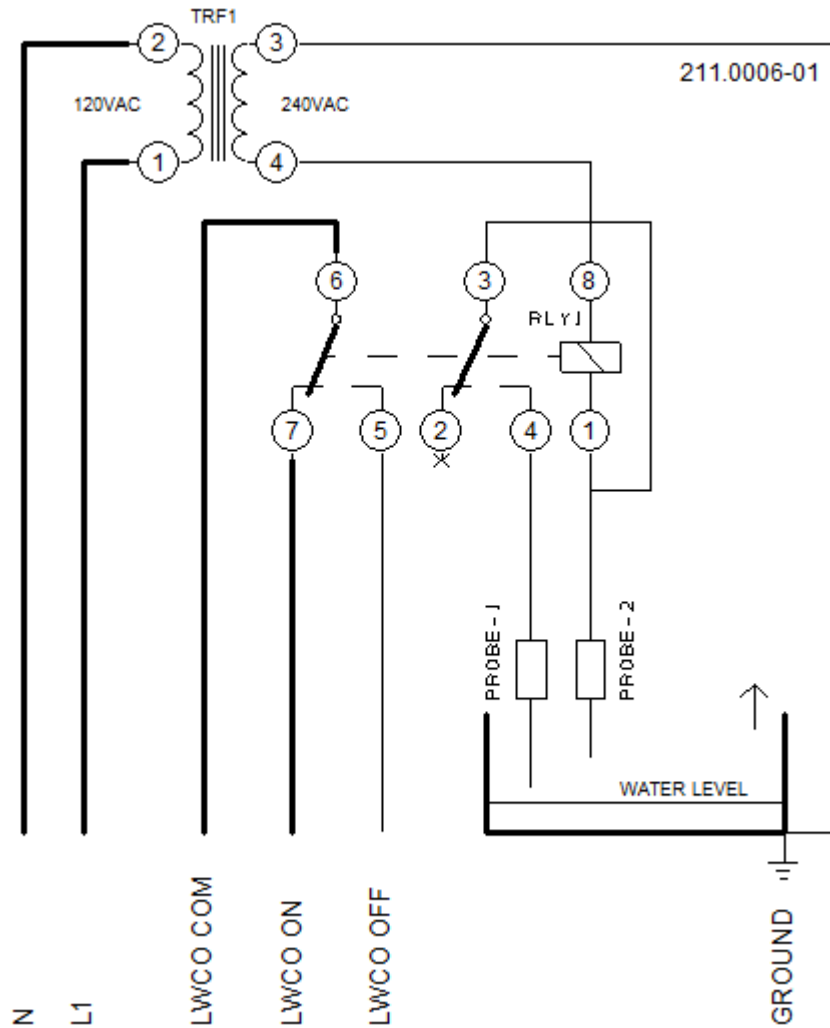
6. SPECIFICATIONS

- Control Type: Conductive
- Action: Direct
- Sensitivity: 10 kΩ
- Wire Length Max: AWG 18, 1,000 ft
- MAWP: 150 PSIG
- Power: 120 VAC, 60 Hz
 - Controls: 120 VAC, 60 Hz
 - Probes: 240 VAC, 60 Hz
- Load FEED:
 - No Load: 15 mA
 - Load FEED:
 - Resistive NO: AC250 V, 16 A, 4,000 VA
 - Resistive NC: AC250 V, 16 A, 4,000 VA
 - Inductive NO: AC250V, 8 A, 2,000 VA
 - Inductive NC: AC250V, 8 A, 2,000 VA
 - Inductive Load: cos Ø=0.3, L/R=7 ms
- Load LWCO:
 - No Load: 15 mA
 - Load LWCO
 - Resistive NO: AC250V, 16 A, 4,000 VA
 - Resistive NC: AC250V, 16 A, 4,000 VA
 - Inductive NO: AC250V, 8 A, 2,000 VA
 - Inductive NC: AC250V, 8 A, 2,000 VA
 - Inductive Load: cos Ø=0.3, L/R=7 ms
- Ambient Temperature: 158 °F
- CSD-1 Code Compliance: YES
- Certification: CSA Special Inspection

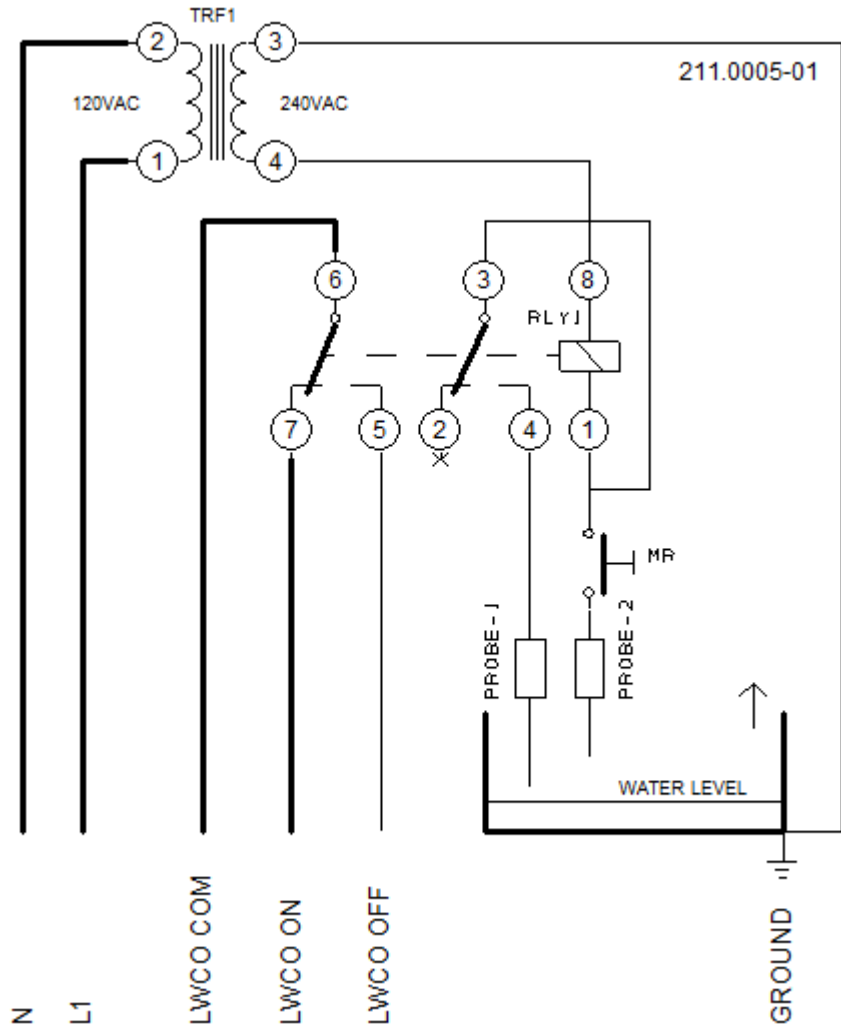
7. PRINCIPLE of OPERATION

Pityu LWCO and FEED Control Units are conductive type, direct reading, Level Controls. Water is used as a conductor to close the circuit between the probes and the ground. When the circuit is closed the signal relay coil is energized and changes the signal relay output. The signal relay output is connected to a power relay coil. The power relay coil is changing the power relay output to make the LWCO control circuit or to break the FEED control circuit.

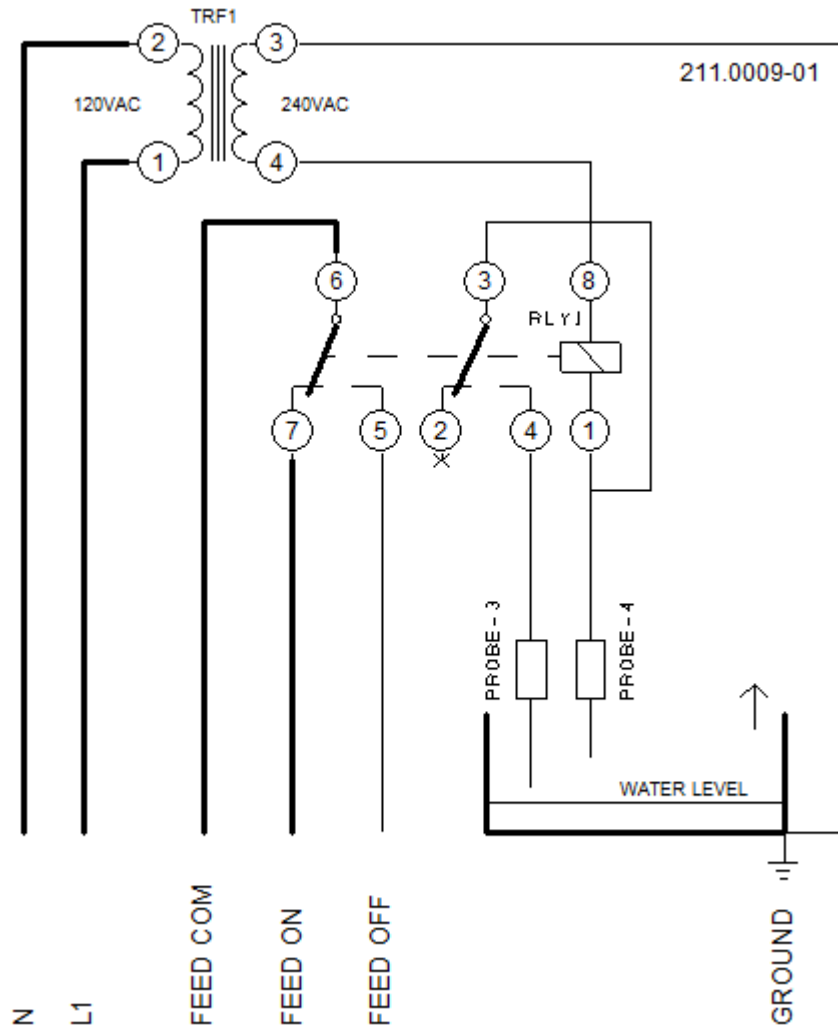
- **LWCO 1-AR**



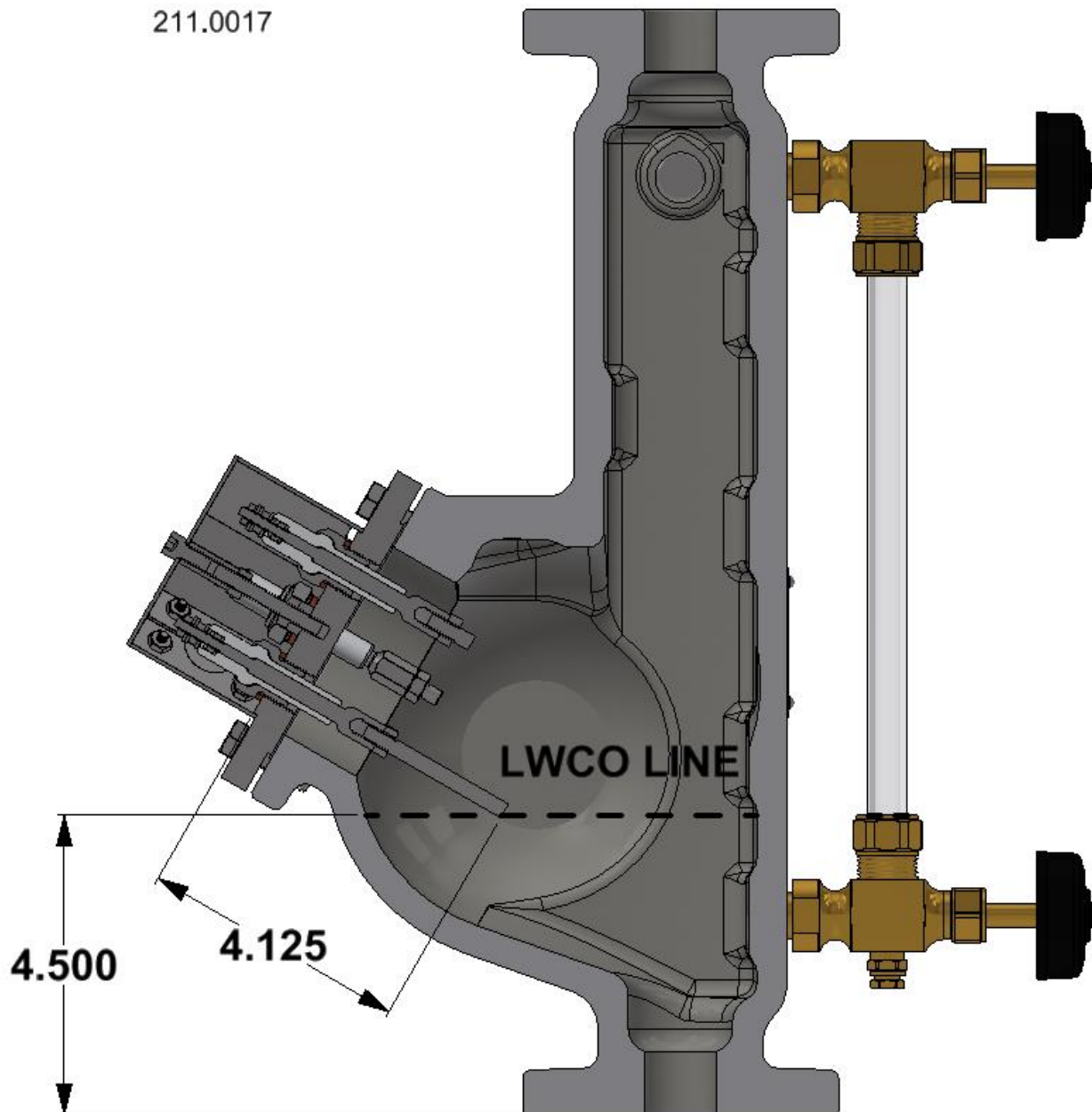
- **LWCO 1-MR**



- FEED 1

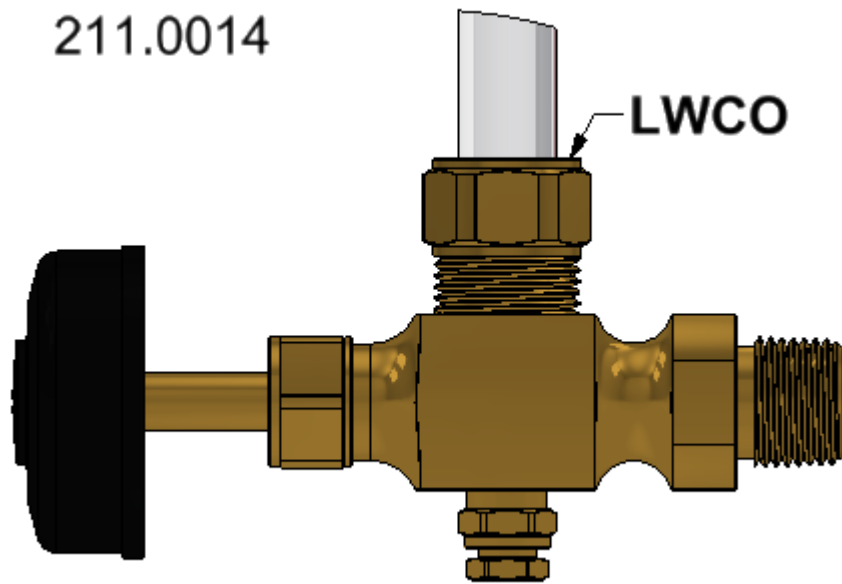


8. LWCO LINE



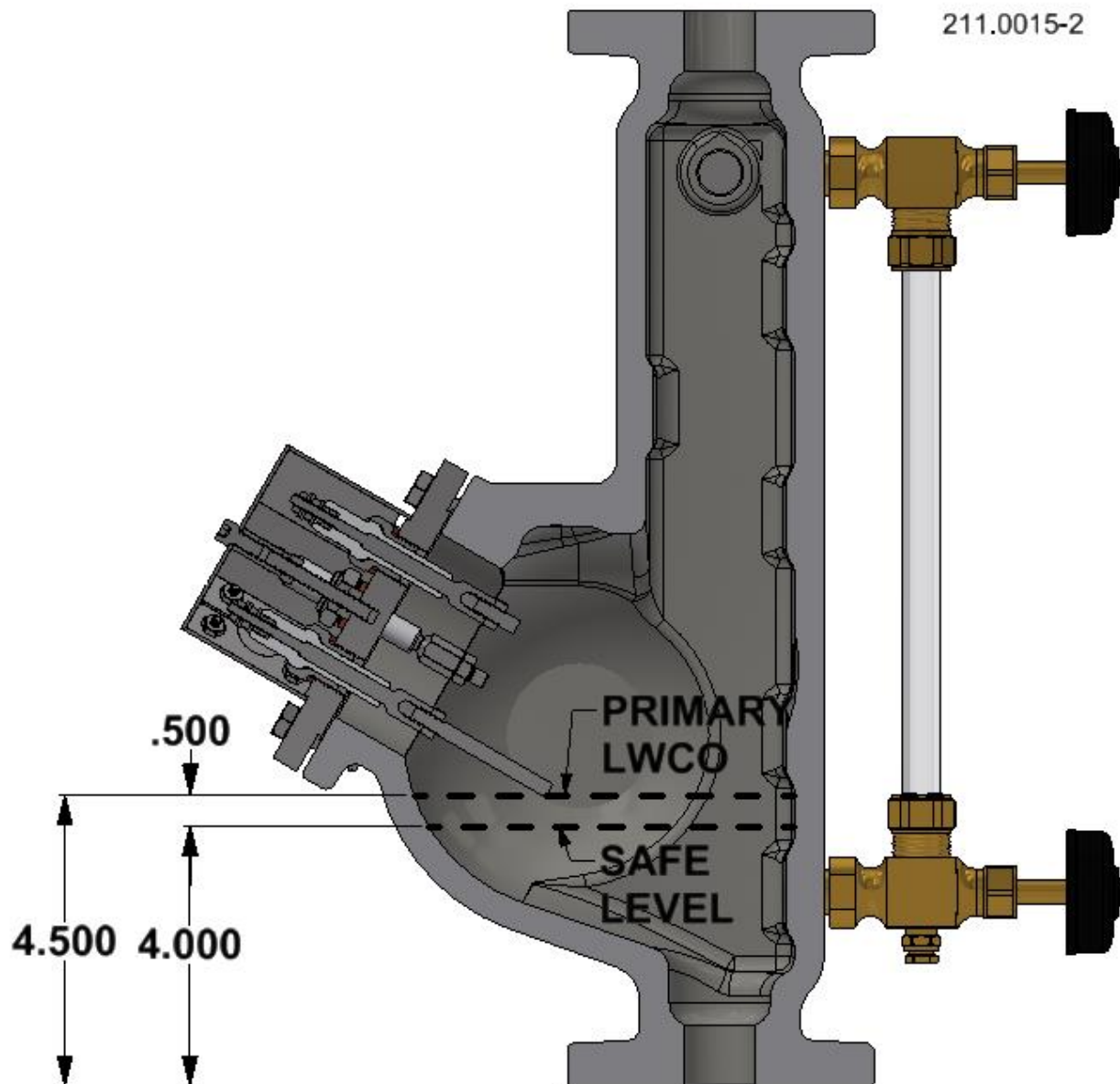
The LWCO ON level is factory set by the LWCO Probe (1). The LWCO Probe (1) is set at the top face of the bottom sight glass nut and should not be changed.

The top face of the bottom sight glass nut is 4.5 inches above the bottom flange.



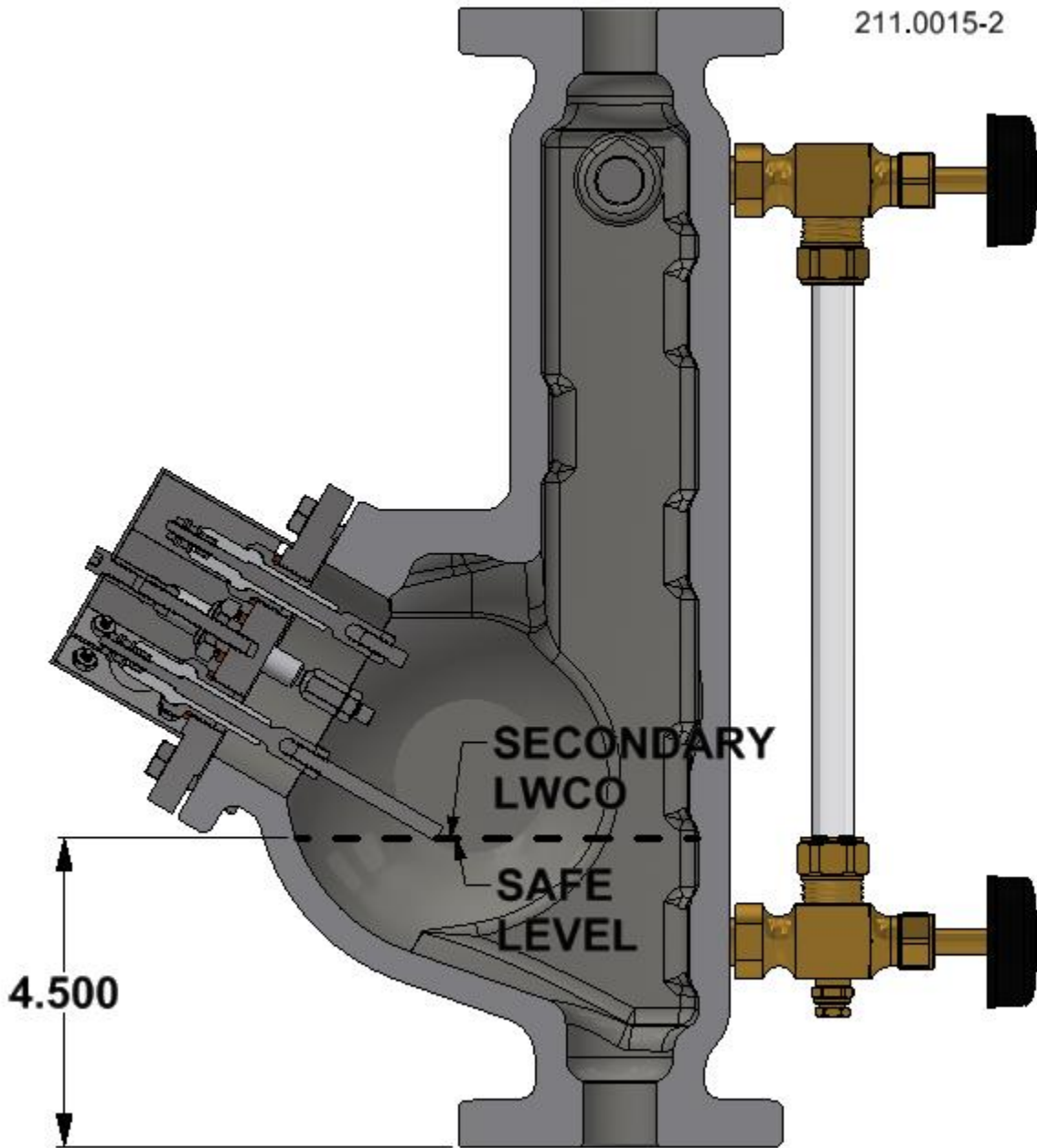
9. PRIMARY and SECONDARY LWCO INSTALLATION

- PRIMARY LWCO



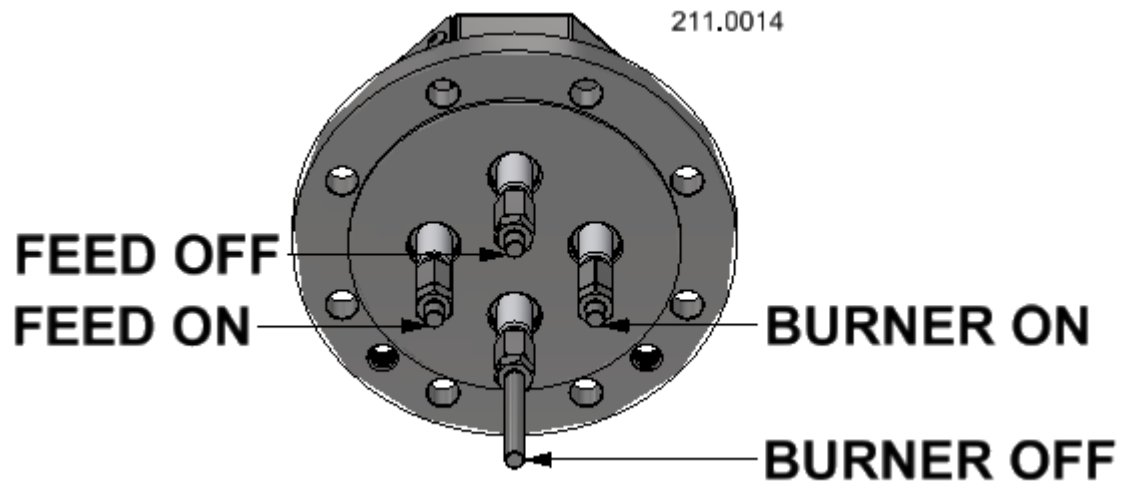
The Primary LWCO is 0.5 inches above the Minimum Safe Water Level specified by the boiler manufacturer.

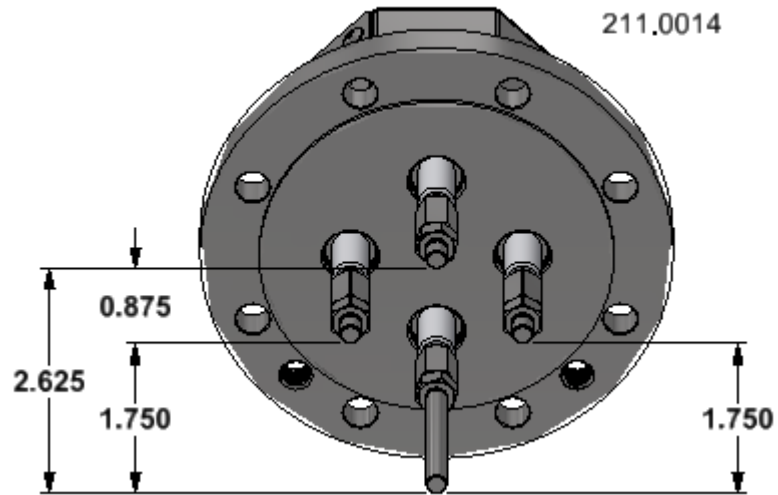
- **SECONDARY LWCO**



The Secondary LWCO ON Level must be installed at or above the Minimum Safe Water Level Specified by the Boiler Manufacturer. The Secondary LWCO ON Level is 4.5 inches above the LWCO bottom flange.

10. PROBES and LEVELS

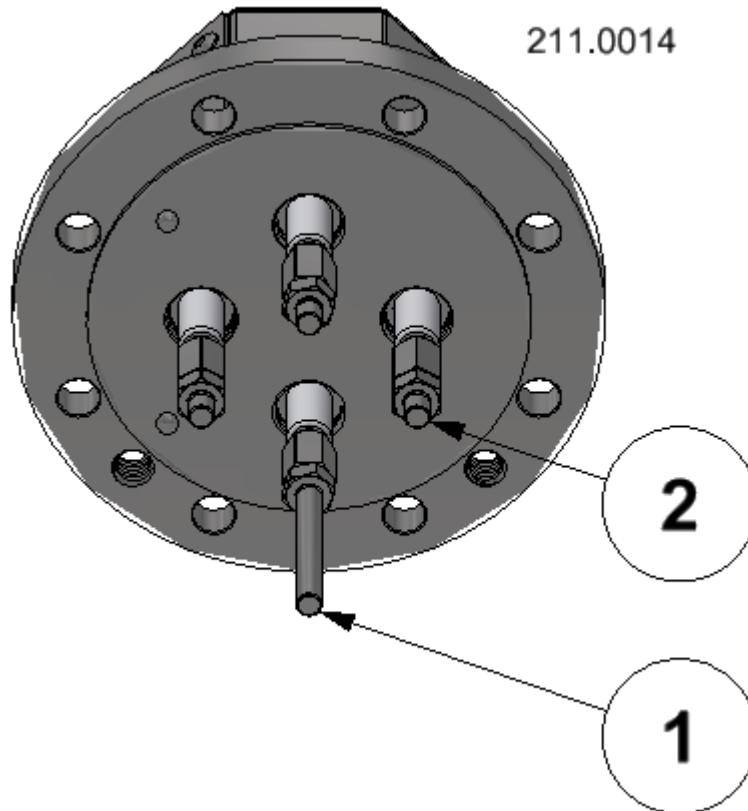




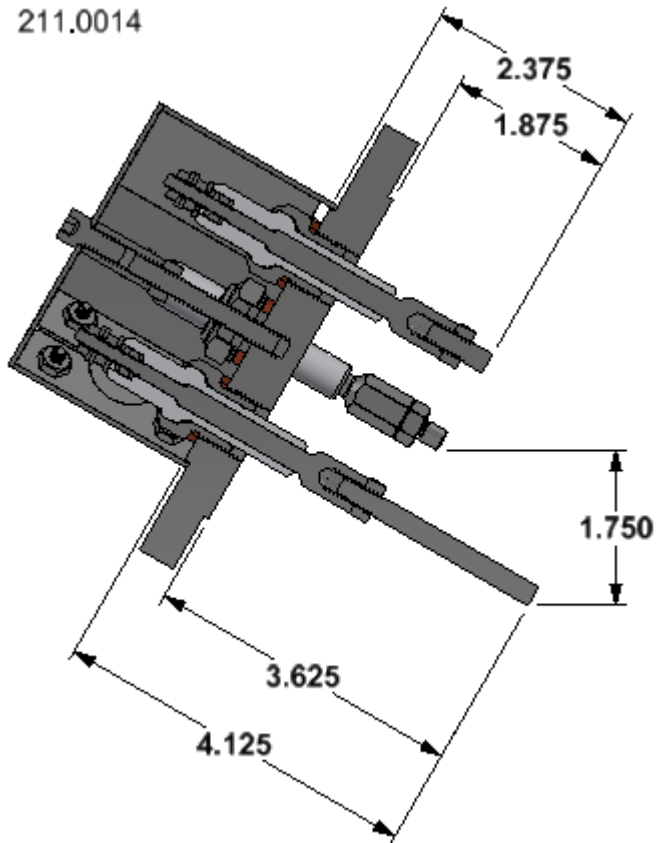
11. LWCO ON and LWCO OFF LEVELS

The LWCO ON level is set by the LWCO Probe (1). The LWCO ON level is at the same level as the top face of the bottom sight glass nut.

The LWCO OFF level is set by the LWCO OFF, Probe (2). The LWCO OFF, Probe (2) is 1.750 inch above the LWCO ON, Probe (1).



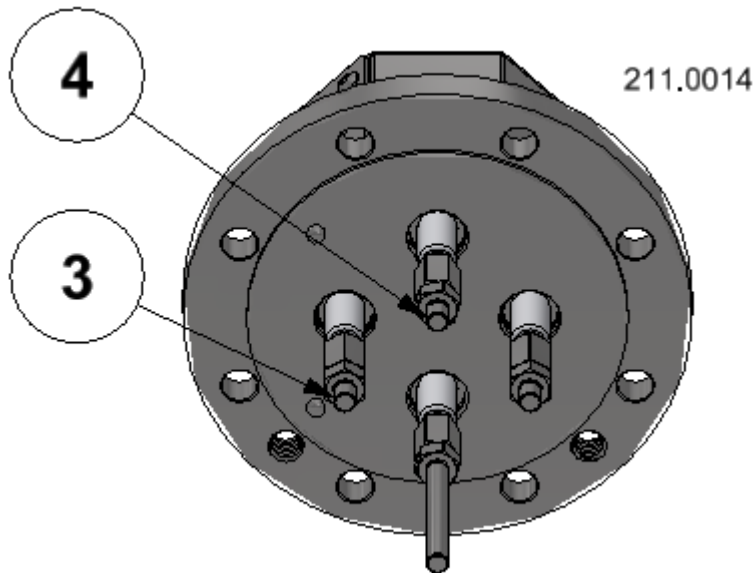
- | | | |
|----|----------|---------|
| 1. | LWCO ON | PROBE 1 |
| 2. | LWCO OFF | PROBE 2 |



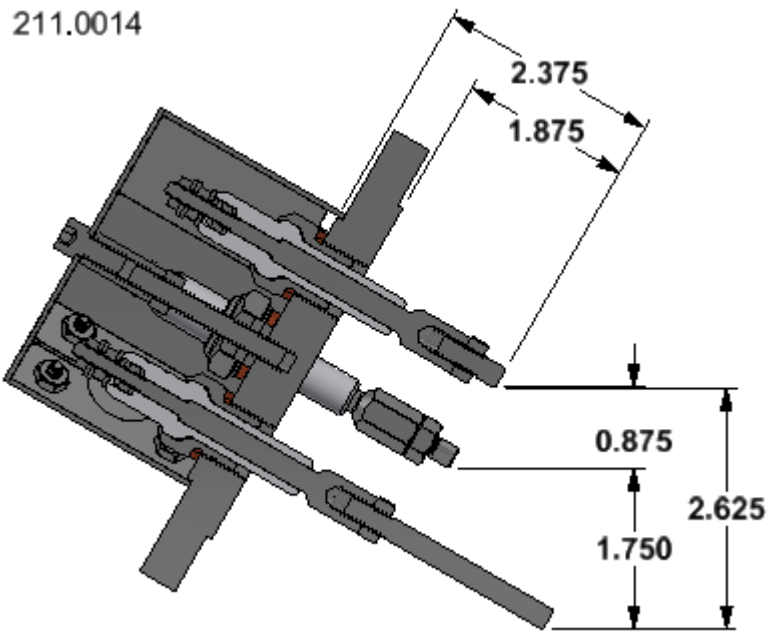
12. FEED ON and FEED OFF LEVELS

The FEED ON level is set by the FEED Probe (3). The FEED ON level is at the same level as LWCO OFF, Probe (2) or above

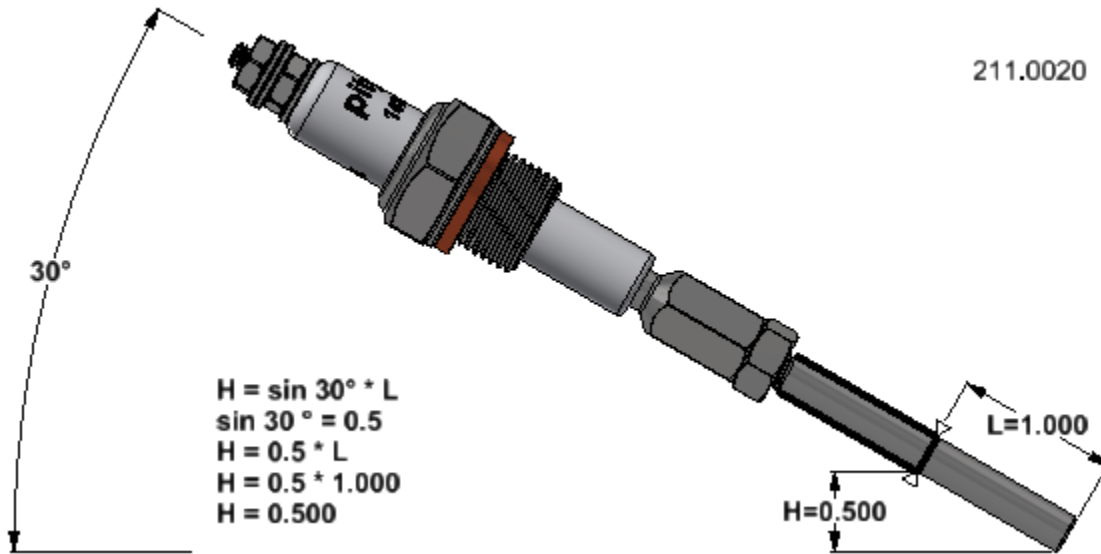
The FEED OFF level is set by the FEED OFF, Probe (4). The FEED OFF, Probe (4) is 0.875 to 1 inch above the FEED ON, Probe (3).



3	FEED ON	PROBE 3
4	FEED OFF	PROBE 4



13. LEVEL - HEIGHT SETTINGS



The probes are installed in the water column flange, at 30°.

The probes are sealed with a copper gasket ring type.

The Level Heights are adjusted by cutting and/or extending the probe lengths as per formula:

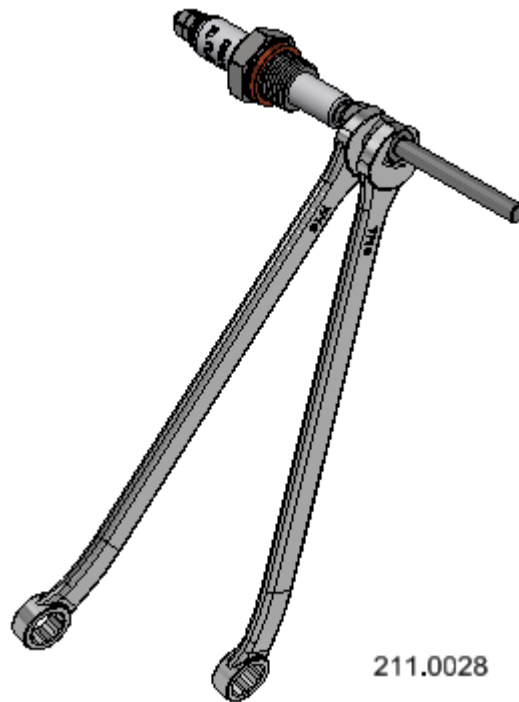
$$H = \sin 30^\circ * L \quad \text{inch}$$

$$H = 0.5 * L \quad \text{inch}$$

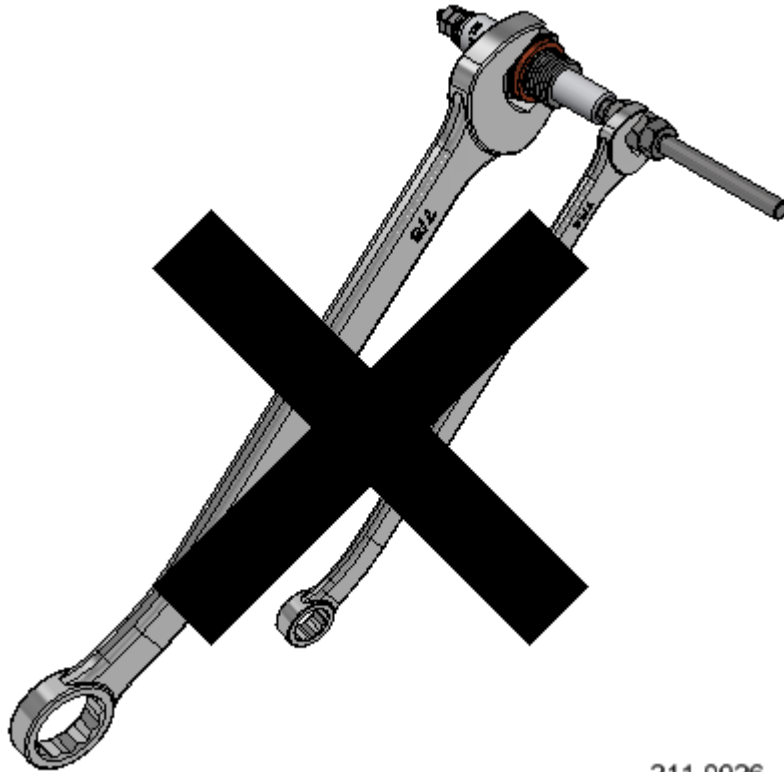
$$L = 2 * H \quad \text{inch}$$

H	-Change in Level Height
L	-Change in Probe Length
Sin 30°	-Trigonometry (sin of 30° angle = 0.5)
30°	-Installation angle of the side flange

14. PROBE JAM NUT

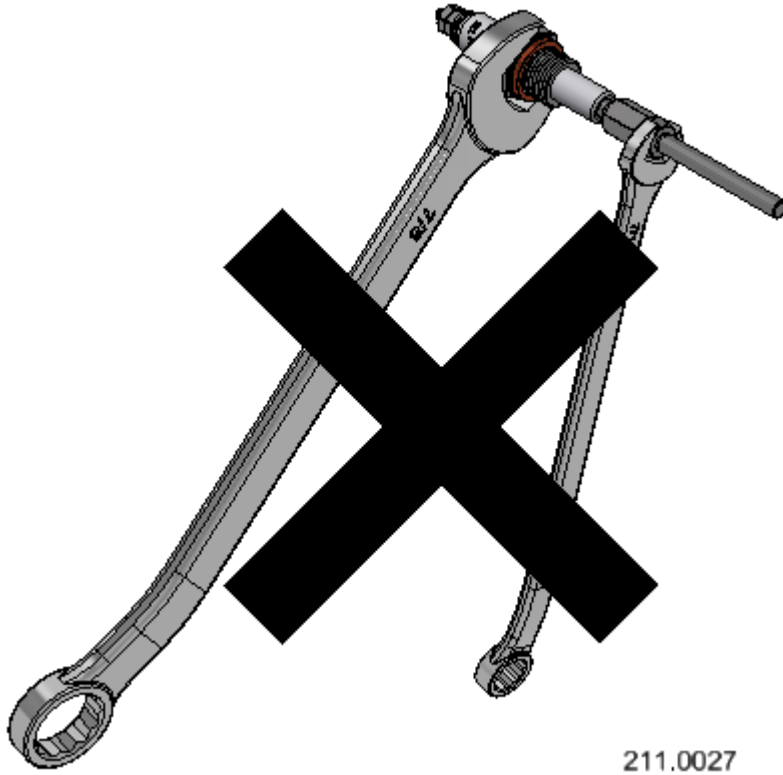


- Use 20ftlb torque to tighten the jam nut.



211.0026

- **DO NOT HOLD THE PROBE SHELL TO TURN THE CENTRAL ELECTRODE**

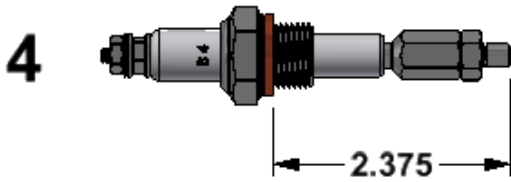


- DO NOT HOLD THE PROBE SHELL TO JAM THE JAM NUT.

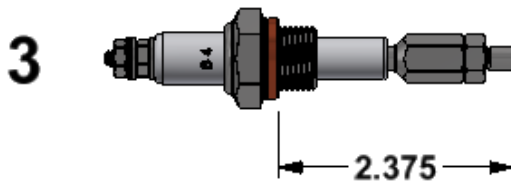
15. PROBES FACTORY LENGTHS

MARK ON FLANGE

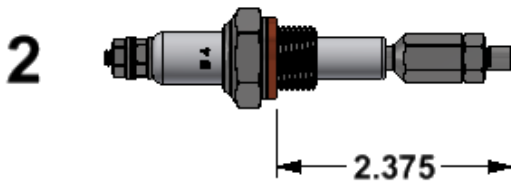
FUNCTION



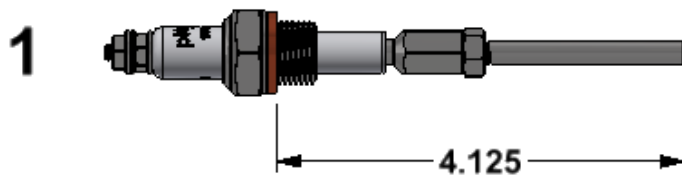
FEED OFF PROBE 4



FEED ON PROBE 3



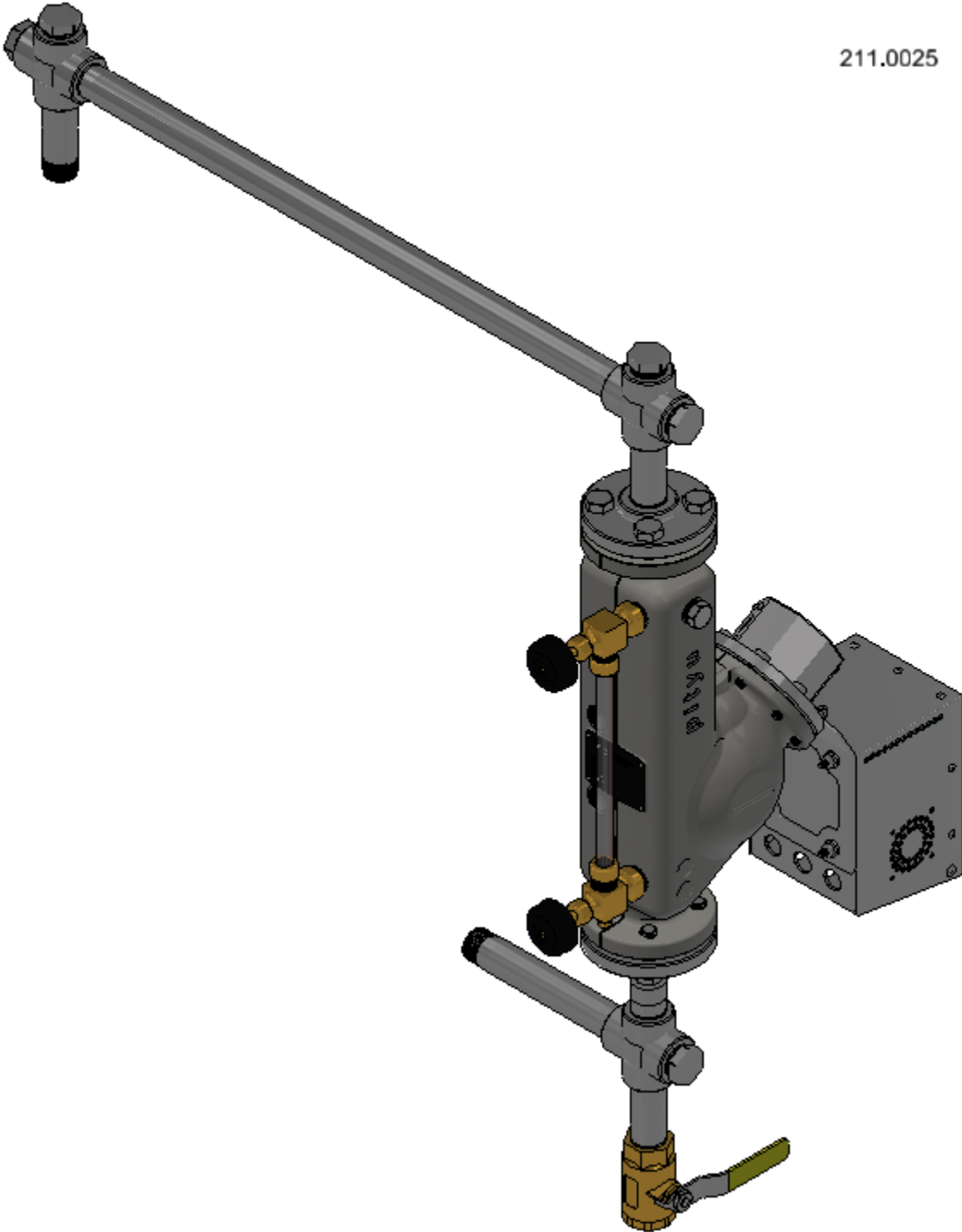
LWCO OFF PROBE 2



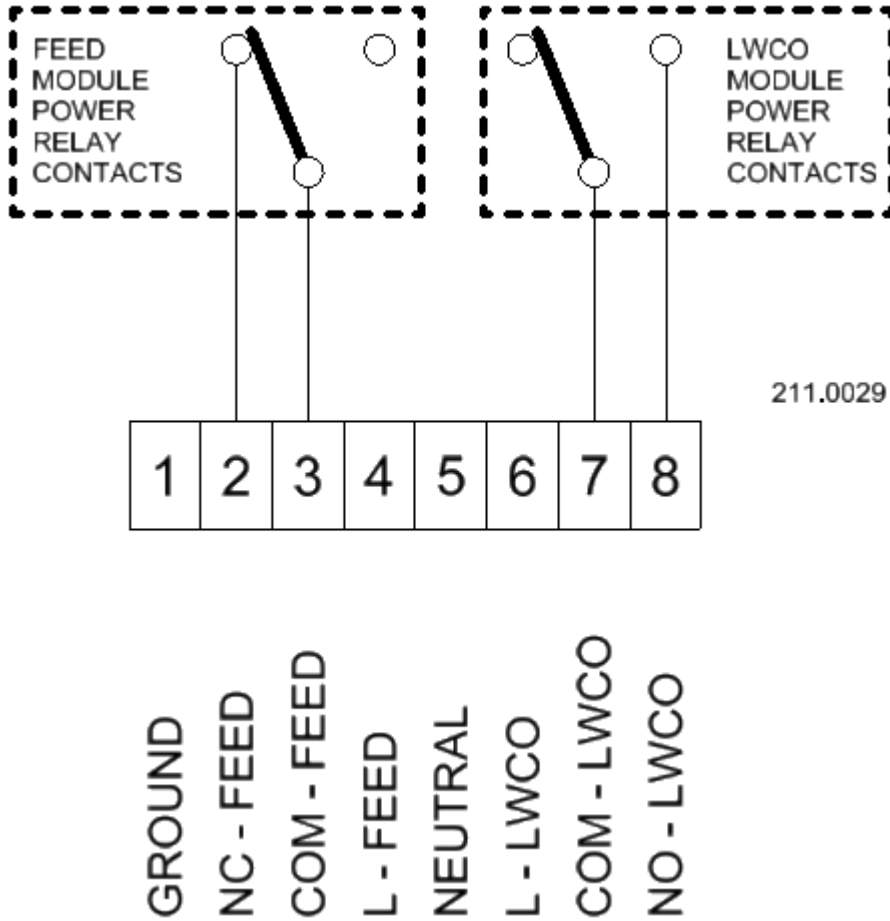
LWCO ON PROBE 1

211.0021

16. TYPICAL PIPING



17. WIRING DIAGRAM



18. MAINTENANCE

SCHEDULE:

- **DAILY:**
 - Blow down the control when the boiler is in operation. Known and well-established blow down procedures should be followed. Due to water quality and or local codes, more frequent blow down may be needed.
 - During the blow down the LWCO control must come ON, LWCO LED Red is ON, and the burner must shut down. If the burner does not shut down TURN THE POWER OFF MANUALLY and check the wiring.
 - During the blow down the FEED control must come ON, FEED LED Red is ON, and the FEED pump starts to feed. If the feed pump does not turn ON, check the wiring.
 - Blow down the sight glass.
 - Observe the LED visual indicators for correct function.
- **MONTHLY:**
 - Open the equalizing line inspection ports by removing the 1-inch NPT plugs.
 - Inspect the inside of the equalizing lines.
- **YEARLY:**
 - Disassemble and inspect the control and the equalizing lines annually
 - Clean the water side of the control
 - Clean the probes
 - Clean the inside of the equalizing lines
 - Change the control's flange gasket
 - If the probes are disassembled from the flange, change the probes gaskets.

19. TROUBLESHOOTING

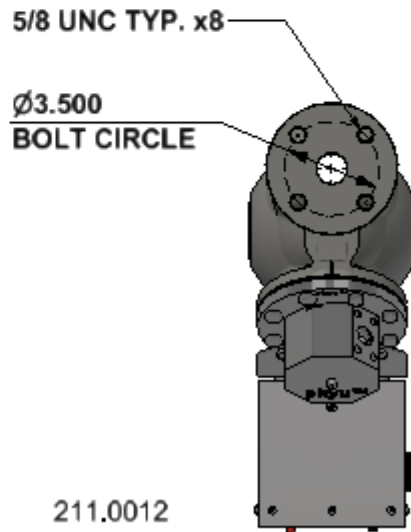
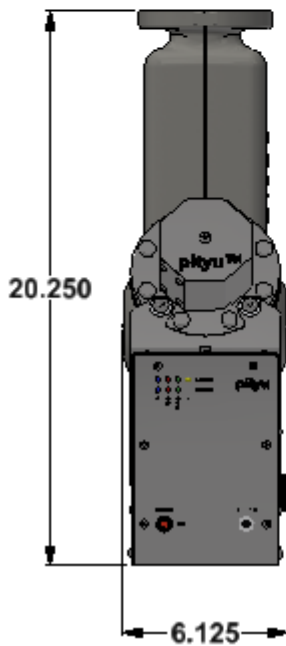
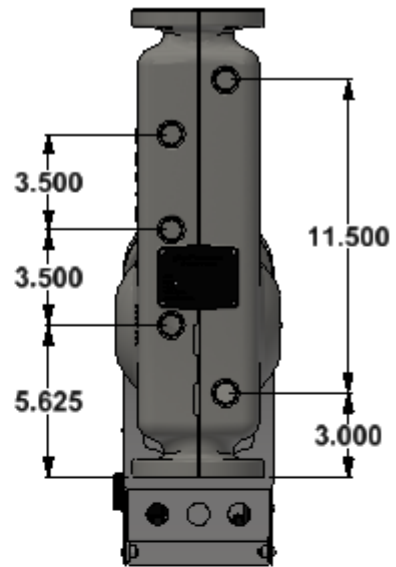
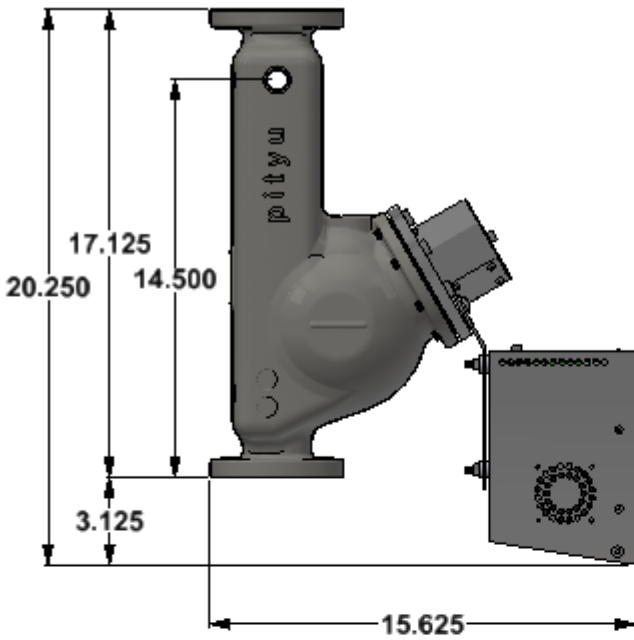
-LWCO CONTROL

- LWCO LED Blue does not turn ON
 - Check the power supply to the LWCO control
- LWCO LED Blue is ON, but the LWCO LED Red does not turn ON
 - Check the power supply to the LWCO COM terminal
 - Check the LWCO control
- LWCO LED Blue is ON, but the LWCO LED Green does not come ON
 - Check the power supply to the LWCO COM terminal
 - Check the LWCO control
 - Check the LWCO probe (2)
 - Check the LWCO Probe (2) wiring
- LWCO Frequent Cycling
 - Check the LWCO Probe (2)
 - Check the LWCO Probe (2) wiring

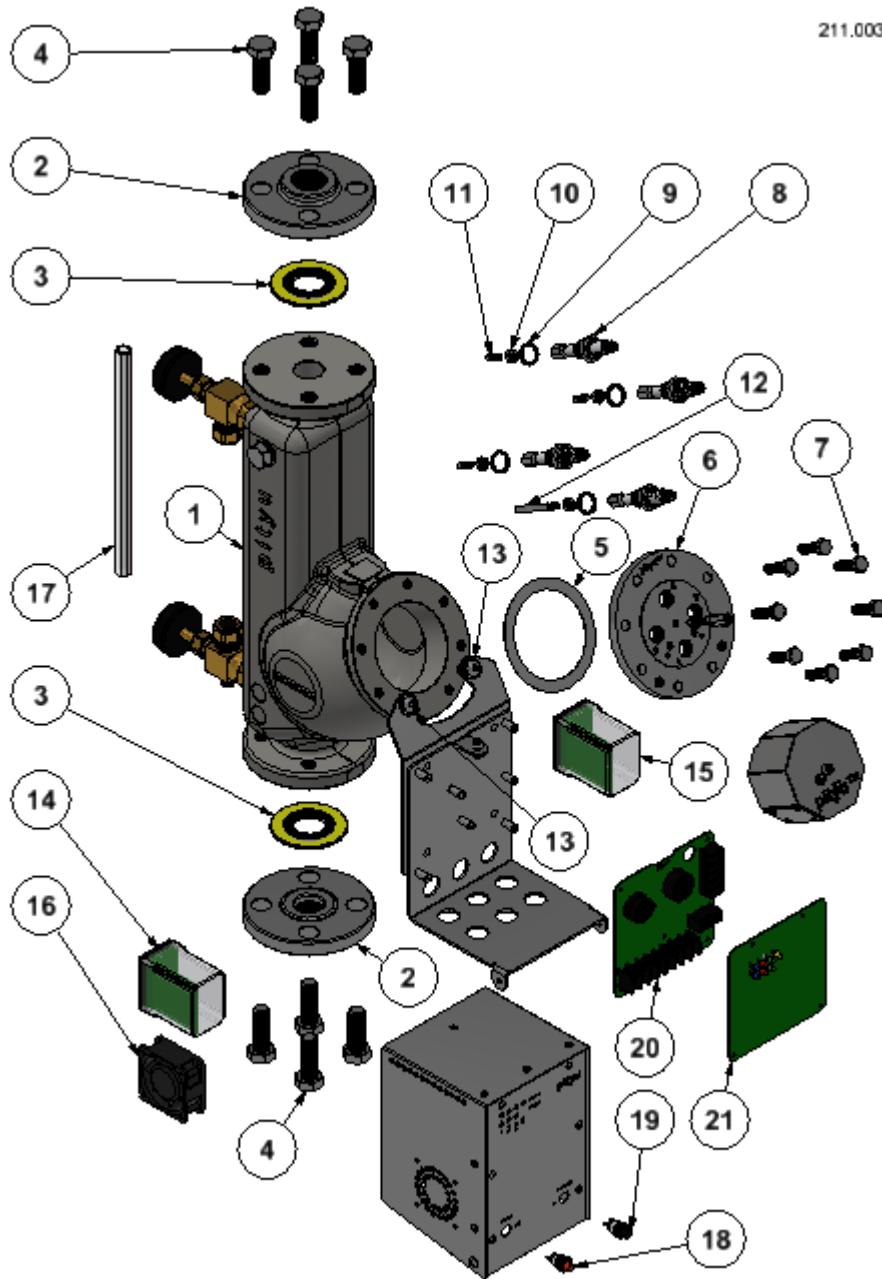
-FEED CONTROL

- FEED LED Blue does not turn ON
 - Check the power supply to the FEED control
- FEED LED Blue is ON, but the FEED LED Red does not turn ON
 - Check the power supply to the FEED COM terminal
 - Check the FEED module
- FEED LED Blue is ON, but the FEED LED Green does not come ON
 - Check the power supply to the FEED COM terminal
 - Check the FEED control
 - Check the FEED probe (2)
 - Check the FEED Probe (2) wiring
 - Check the FEED Probe (2)
 - Check the FEED Probe (2) wiring
- FEED Frequent Cycling
 - Check the FEED Probe (2)
 - Check the FEED Probe (2) wiring

20. DIMENSIONS



21. PARTS



22. PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
1	1	121.0809	BOTTLE	
2	2	106.0075	FLANGE 1" NPT CLASS 300	
3	2	107.0105	GASKET	
4	8	101.0051	SCREW	
5	1	107.0080	GASKET	
6	1	106.0070	FLANGE OEM	
7	8	101.0034	SCREW	
8	4	108.0062	PROBE HOLDER	
9	4	107.0088	GASKET	
10	4	102.0027	JAM NUT	
11	3	108.0075	PROBE	
12	1	108.0075-L	PROBE	
13	2	109.0003	INSULATOR	
14	1	112.0710	FEED 1 MODULE	
15	1	112.0711	LWCO 1 MODULE	
16	1	251.0001	FAN	
17	1	224.0227	SIGHT GLASS OD 5/8 x L10 ¼	
18	1	116.0002-G1	PUSH BUTTON LWCO MR	
19	1	116.0001-G1	PUSH BUTTON SOUND RESET	
20	1	112.0704	PCB BACK PANEL	
21	1	112.0705	PCB LID	

23. CERTIFICATIONS

