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Technical Service Manual

High Flow Air/Oxygen Blender R203M01

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DESCRIPTION PAGE

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1.0 INTRODUCTION

NOTICE

Repair of this equipment must be performed by a qualified service technician experienced in repair of portable hand held medical equipment. Experience in procedures to rebuild air/oxygen microblenders is beneficial.

Maxtec products/material in need of factory repair shall be sent to:

Maxtec
Customer Service Department
2035 South 1070 West
Salt Lake City, Utah 84119
(Include RMA Number)

HOW TO USE THIS MANUAL

This manual provides the service technician with the basic information needed to maintain and service the Maxblend Series of air/oxygen blenders. The manual is divided into two main sections. The first of these sections pertains to the electronic monitoring portion of the device. The second of these sections pertains to the microblender portion of the device. The first section of the manual is divided into several sub-sections. The DIAGNOSTICS sub-section describes self-test and service diagnostics for checking the system functions of the electrical components of this device. The TROUBLESHOOTING sub-section provides a guide to assist the service technician in locating the source of any problem in the function of the oxygen monitor. The MONITOR REPLACEMENT PROCEDURES sub-section contains instructions for removal and replacement of the assemblies of the monitoring portion of the device that are considered field-replaceable. The FACTORY ADJUSTMENT PROCEDURES sub-section contains the field procedures needed to restore original specifications to the monitor portion of the device.

The second sub-section of this device contains instructions for performing a blender rebuild procedure and the test procedures necessary to verify the device is operating properly.

GENERAL TROUBLESHOOTING GUIDELINES

Trouble shooting the Maxblend should always begin by communicating with those who observed or experienced a problem with the unit. This may eliminate unnecessary trouble shooting steps. Once a general problem has been identified, refer to the troubleshooting guidelines in SECTION 3 to determine the proper corrective action to be taken.

After a component has been replaced, verify that the unit is operating properly by running the appropriate diagnostic procedure.

CAUTION

These instruments contain electronic components that are susceptible to damage by electrostatic discharge. When disassembling the instrument, work at a static control workstation; wear a static control wrist strap to discharge accumulated static charges from you and any tool you are using. Handle the circuit boards by nonconductive edges. Use anti-static container for transporting circuit boards.

Note: Illustrations and pictures may depict an older version but the repair operations remain the same as set forth in this service manual.

SECTION 1 – OXYGEN MONITOR SERVICE INFORMATION

2.0 DIAGNOSTICS

The monitoring assembly of the Maxblend contains a diagnostic system that monitors certain system functions and records their operational status. A series of tests are performed when the system is powered up or calibrated. The results are displayed on the L.C.D. module. The following paragraphs provide a description of each error code message. If no display is present upon power up, refer to SECTION 3 of this manual for troubleshooting assistance.

2.1 LCD Module and LED Test

When the batteries are installed for the first time or re-installed after replacing old ones, all LCD segments and LEDs are turned "ON" for 2 seconds.

2.2 Sensor Output Window Test

When a sensor is calibrated on air (20.9% O_2) the electronics looks for an output range of 7.00mV to 15.82mV. When a sensor is calibrated on HI SPAN gas (approx. 100% O_2) the electronics looks for an output range of 33.41mV to 75.51mV. If the sensor falls outside of these limits the display will read "CAL", then "Er" indicating a calibration error.

2.3 Attach Sensor Test

If the external sensor is disconnected from the monitor during operation, the display will blink the "ATTACH SENSOR" icon.

2.4 A to D Short Diagnostic Failure

If during operation the Analog to Digital converter see's an internal shorted input, the display will read "Er1".

2.5 A to D Over Range Diagnostic Failure

If during operation the Analog to Digital converter encounters an internal over range, the display will read "Er2".

2.6 Non Active Interrupt

If during operation a non-active interrupt occurs, the display will read "Er9".

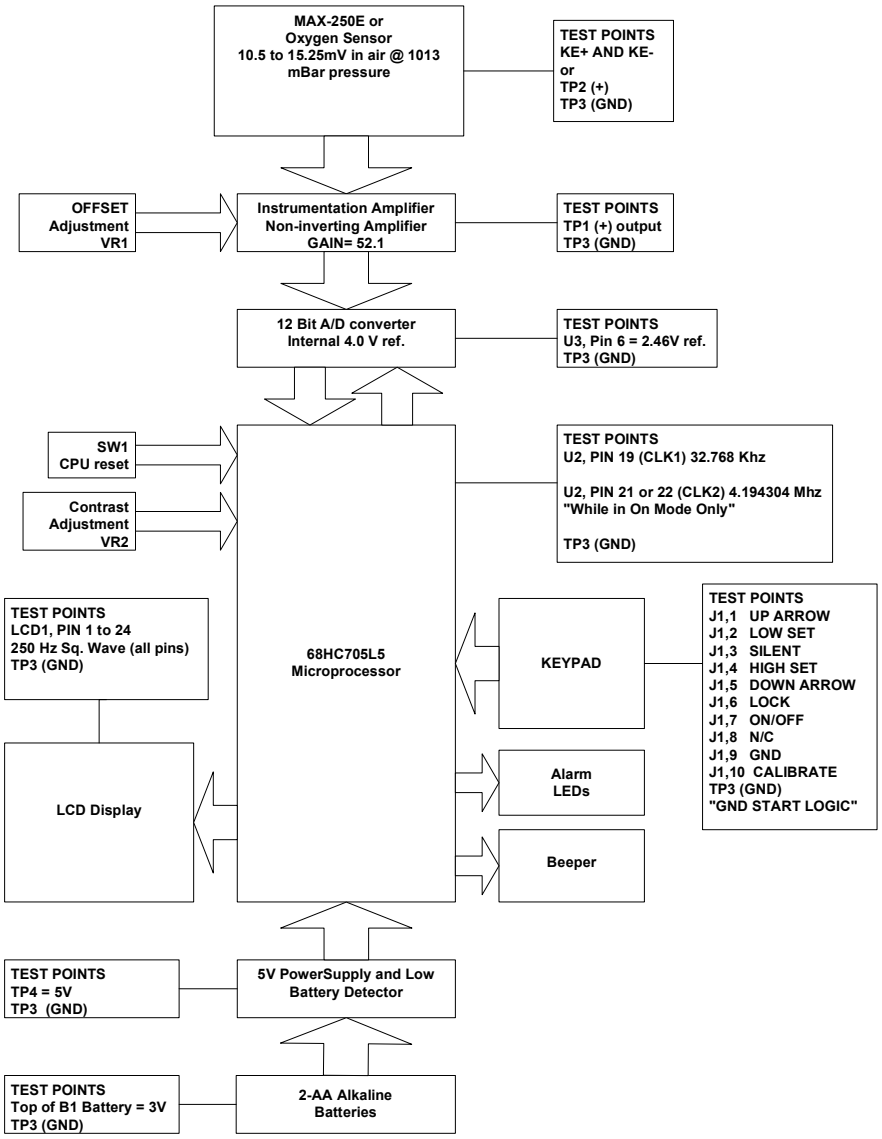
2.7 Low Battery Test

If during operation the battery voltage drops below 1.8 Volts, the "LOW BAT" icon will latch on and stay on until the batteries are replaced with new ones.

3.0 TROUBLESHOOTING

This section contains information to assist the Service Technician in locating electrical and sensor faults affecting the monitor's proper operation. The Block Diagram is intended to give an overall view of functionality and can be used as a quick quide and reference. It is intended that the troubleshooting of an monitor be kept to a modular repair with the three major modules being Batteries, Sensor and Main PCB. Since the Main PCB is manufactured as a 4 layer surface mount printed circuit board, chip level repair may be difficult. The only repairs discussed to this board will be through hole devices that can be soldered by an experienced service technician.

3.1 Electronic Monitor Block Diagram



3.2 Batteries and Power Distribution

The following table outlines the voltage distribution scheme within the monitor along with test points for each of the voltages

Table 3.2.1: Board Voltages

LOCATION	VOLTAGE	ACCEPTABLE RANGE
TP4, TP3(GND)	+5VDC	4.85-5.15 VDC
TOP OF B1+, TP3(GND)	+3V	1.85- 3.2 VDC
U3, PIN 6, TP3(GND)	2.46	2.45-2.47 VDC

The following table outlines the current draw on the batteries within the monitor.

Table 3.2.2: Board Current

MODE	CURRENT	ACCEPTABLE RANGE
SLEEP	.64mA	<.7mA
ON MODE, WORST CASE	6mA	<7mA

To test the current draw insert in series a current meter with the AA batteries. With the unit off the current draw should be less than .7mA. Now hold the off button down on the keypad, (this simulates On mode worst case). The current draw should be less than 7mA.. During normal operation while “ON” the monitor will cycle between current draws, with the average being approximately 2.32mA.

3.3 Sensors

The MAX-250 is a galvanic partial pressure sensor, that’s output voltage varies proportionally to the Oxygen being measured. The sensor is specific to oxygen. When no Oxygen is present there is no chemical reaction and therefore, no voltage output. The relationship between pressure and output voltage is exhibited in Table 3-3-2.

Table 3.3.1: Sensor Voltage Test Points

KE+,KE- or TP2, TP3	ACCEPTABLE RANGE
AT ROOM AIR	7.00 mV - 15.89 mV

Table 3.3.2: Sensor Output Voltage Verses Pressure

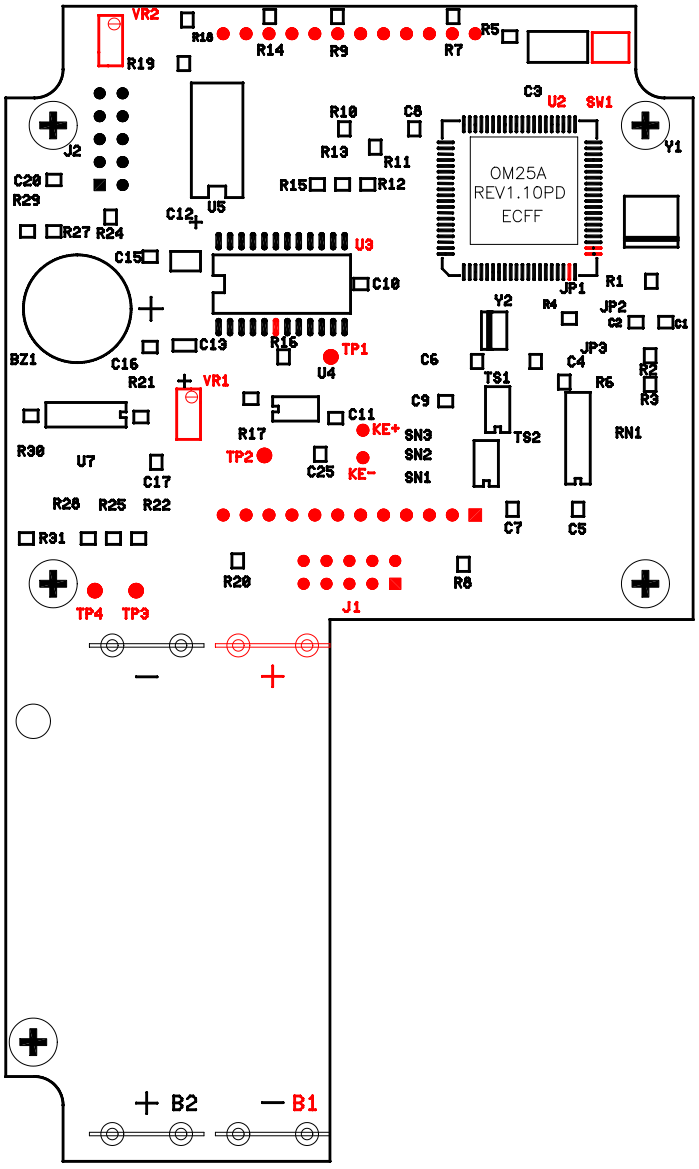
MAX-250 Sensor Output at Room Air over Various Pressures
Low mV=10.5mV x (Todays pressure in mbar/1013mbar)
Hi mV=15.25mV x (Todays pressure in mbar/1013mbar)

Pressure in (millibars)	Output Low mV	Output High mV	Pressure in (millibars)	Output Low mV	Output High mV	Pressure in (millibars)	Output Low mV	Output High mV	Pressure in (millibars)	Output Low mV	Output High mV
800	8.29	12.04	854	8.85	12.86	908	9.41	13.67	962	9.97	14.48
801	8.30	12.06	855	8.86	12.87	909	9.42	13.68	963	9.98	14.50
802	8.31	12.07	856	8.87	12.89	910	9.43	13.70	964	9.99	14.51
803	8.32	12.09	857	8.88	12.90	911	9.44	13.71	965	10.00	14.53
804	8.33	12.10	858	8.89	12.92	912	9.45	13.73	966	10.01	14.54
805	8.34	12.12	859	8.90	12.93	913	9.46	13.74	967	10.02	14.56
806	8.35	12.13	860	8.91	12.95	914	9.47	13.76	968	10.03	14.57
807	8.36	12.15	861	8.92	12.96	915	9.48	13.77	969	10.04	14.59
808	8.38	12.16	862	8.93	12.98	916	9.49	13.79	970	10.05	14.60
809	8.39	12.18	863	8.95	12.99	917	9.50	13.80	971	10.06	14.62
810	8.40	12.19	864	8.96	13.01	918	9.52	13.82	972	10.08	14.63
811	8.41	12.21	865	8.97	13.02	919	9.53	13.83	973	10.09	14.65
812	8.42	12.22	866	8.98	13.04	920	9.54	13.85	974	10.10	14.66
813	8.43	12.24	867	8.99	13.05	921	9.55	13.87	975	10.11	14.68
814	8.44	12.25	868	9.00	13.07	922	9.56	13.88	976	10.12	14.69
815	8.45	12.27	869	9.01	13.08	923	9.57	13.90	977	10.13	14.71
816	8.46	12.28	870	9.02	13.10	924	9.58	13.91	978	10.14	14.72
817	8.47	12.30	871	9.03	13.11	925	9.59	13.93	979	10.15	14.74
818	8.48	12.31	872	9.04	13.13	926	9.60	13.94	980	10.16	14.75
819	8.49	12.33	873	9.05	13.14	927	9.61	13.96	981	10.17	14.77
820	8.50	12.34	874	9.06	13.16	928	9.62	13.97	982	10.18	14.78
821	8.51	12.36	875	9.07	13.17	929	9.63	13.99	983	10.19	14.80
822	8.52	12.37	876	9.08	13.19	930	9.64	14.00	984	10.20	14.81
823	8.53	12.39	877	9.09	13.20	931	9.65	14.02	985	10.21	14.83
824	8.54	12.40	878	9.10	13.22	932	9.66	14.03	986	10.22	14.84
825	8.55	12.42	879	9.11	13.23	933	9.67	14.05	987	10.23	14.86
826	8.56	12.43	880	9.12	13.25	934	9.68	14.06	988	10.24	14.87
827	8.57	12.45	881	9.13	13.26	935	9.69	14.08	989	10.25	14.89
828	8.58	12.46	882	9.14	13.28	936	9.70	14.09	990	10.26	14.90
829	8.59	12.48	883	9.15	13.29	937	9.71	14.11	991	10.27	14.92
830	8.60	12.50	884	9.16	13.31	938	9.72	14.12	992	10.28	14.93
831	8.61	12.51	885	9.17	13.32	939	9.73	14.14	993	10.29	14.95
832	8.62	12.53	886	9.18	13.34	940	9.74	14.15	994	10.30	14.96
833	8.63	12.54	887	9.19	13.35	941	9.75	14.17	995	10.31	14.98
834	8.64	12.56	888	9.20	13.37	942	9.76	14.18	996	10.32	14.99
835	8.65	12.57	889	9.21	13.38	943	9.77	14.20	997	10.33	15.01
836	8.67	12.59	890	9.23	13.40	944	9.78	14.21	998	10.34	15.02
837	8.68	12.60	891	9.24	13.41	945	9.80	14.23	999	10.35	15.04
838	8.69	12.62	892	9.25	13.43	946	9.81	14.24	1000	10.37	15.05
839	8.70	12.63	893	9.26	13.44	947	9.82	14.26	1001	10.38	15.07
840	8.71	12.65	894	9.27	13.46	948	9.83	14.27	1002	10.39	15.08
841	8.72	12.66	895	9.28	13.47	949	9.84	14.29	1003	10.40	15.10
842	8.73	12.68	896	9.29	13.49	950	9.85	14.30	1004	10.41	15.11
843	8.74	12.69	897	9.30	13.50	951	9.86	14.32	1005	10.42	15.13
844	8.75	12.71	898	9.31	13.52	952	9.87	14.33	1006	10.43	15.14
845	8.76	12.72	899	9.32	13.53	953	9.88	14.35	1007	10.44	15.16
846	8.77	12.74	900	9.33	13.55	954	9.89	14.36	1008	10.45	15.17
847	8.78	12.75	901	9.34	13.56	955	9.90	14.38	1009	10.46	15.19
848	8.79	12.77	902	9.35	13.58	956	9.91	14.39	1010	10.47	15.20
849	8.80	12.78	903	9.36	13.59	957	9.92	14.41	1011	10.48	15.22
850	8.81	12.80	904	9.37	13.61	958	9.93	14.42	1012	10.49	15.23
851	8.82	12.81	905	9.38	13.62	959	9.94	14.44	1013	10.50	15.25
852	8.83	12.83	906	9.39	13.64	960	9.95	14.45	sea level		
853	8.84	12.84	907	9.40	13.65	961	9.96	14.47			

3.4 Main P.C.B. (Printed Circuit Board)

Figure 3.4.1 shows the bottom side of the Main PCB. Highlighted in RED are the test points and important locations. Most components on the board are non-serviceable items except the LCD module and Battery terminals. See the replacement procedures for more information on these items.

Figure 3.4.1 Main PCB



3.5 Troubleshooting Guides

For each of the following symptoms, please reference the corresponding statements.

"The LCD is blank"

- Check the batteries in the unit. They may have been installed wrong or have no charge capacity. Replace as needed. Battery charge should be greater than 1.8 VDC total.
- Check the battery terminals. They may be bent or corroded, preventing the batteries from making contact. Replace as needed, (See replacement procedure 4-5).
- Check VR2 (contrast adjustment) on Main PCB. It may have a cold solder joint or may have been twisted hard enough to break the solder traces it is connected to. Fix broken traces with a soldering iron.
- Check board voltage test points. If they do not measure within the acceptable range, (See table 3-2-1) replace Main PCB, (See replacement procedure 4-4).

"Batteries are going dead extremely fast"

- Visually inspect battery terminals making sure that they have not been bent and are creating a dead short across the batteries.
- Check board current draw. If not within the acceptable range, (See table 3-2-2) replace Main PCB, (See replacement procedure 4-4) or send back to the factory for repair.

"LCD has missing segments or just looks weird"

- Visually inspect the display looking for cracks. This usually indicates the unit has been dropped breaking the glass. Replace the LCD module. (See replacement procedure 4-2).
- Verify that all pins on the LCD module are receiving a signal with an oscilloscope. Fix bad traces with a soldering iron or send to the factory for repair.

"The Display is Fluctuating or drifts after monitor was calibrated"

- First make sure you have calibrated correctly to the procedure outlined in the operation manual. Make sure the sample gas is being delivered to the sensor under the required constant pressure and flow. Check for any leaks in the sampling system. Replace the sensor, (See the replacement procedure 4-3).
- Visually inspect the battery compartment for a leaking battery. The battery may have leaked acid onto the Main PCB causing Un-repairable damage. Replace the Main PCB, (See replacement procedure 4-4).

"The Display keeps reading CAL Er whenever I Try to Calibrate"

- First make sure you are calibrating correctly to the procedure outlined in the operation manual. If this is being followed correctly, then the internal diagnostic is saying the attached sensor is not providing the proper voltage output within the required calibration window for the monitor to work correctly. Replace the sensor, (See replacement procedure 4-3).

“I have a Maxblend and the display keeps reading 0.00, sometimes intermittently. I have tried a new sensor”

- Check the Sensor Voltage test points. If 0.00 VDC replace the sensor cable, (See the replacement procedure 4-1).

“I have a Maxblend and the “ATTACH SENSOR” icon keeps coming on, sometimes intermittently. I have tried a new sensor”

- Check the Sensor Voltage test points. If 0.00 VDC replace the sensor cable, (See the replacement procedure 4-1).

“The keypad seems to work intermittently; sometimes I can’t turn the unit on”

1. Check that the keypad connector is firmly seated to the mating connector on the Main PCB. If the pins do not look fully seated, place a slotted screw driver underneath the connector and pry the two connectors together.

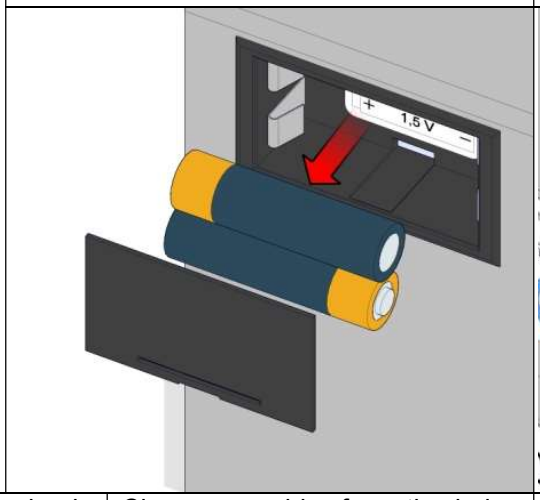
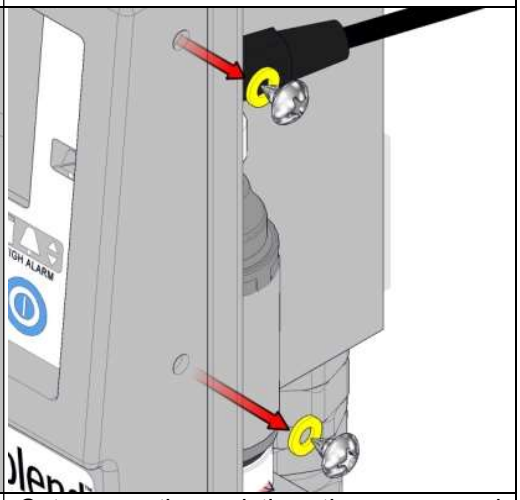
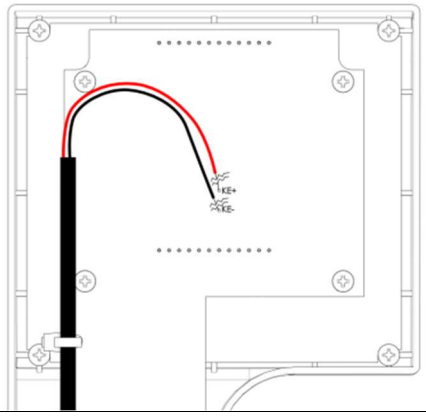
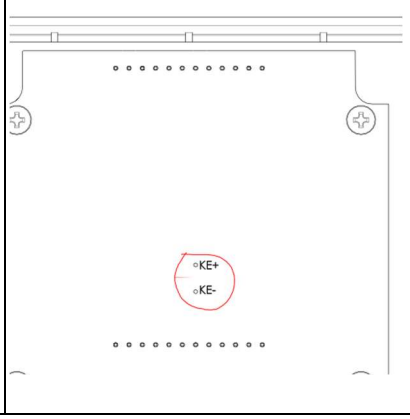
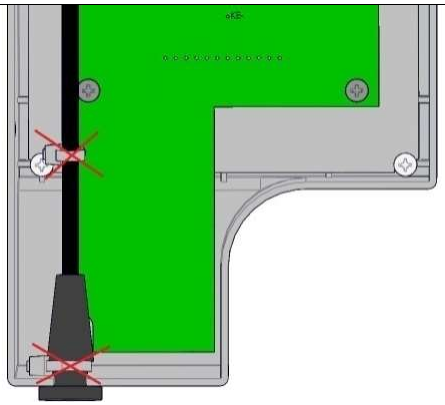
4.0 REPLACEMENT PROCEDURES

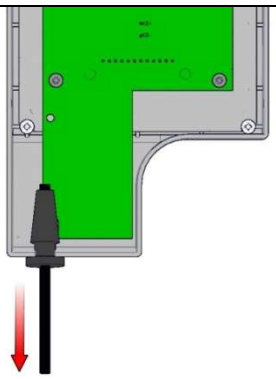
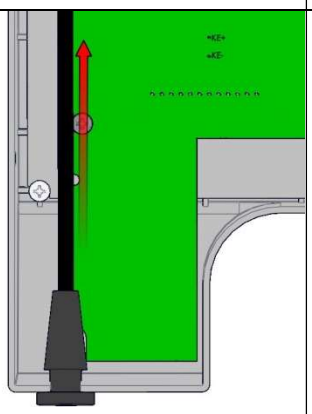
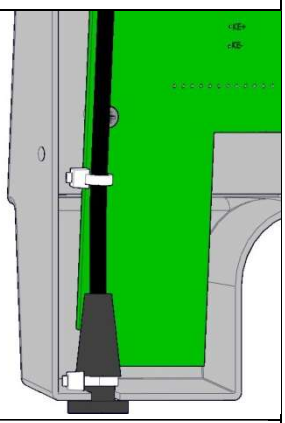
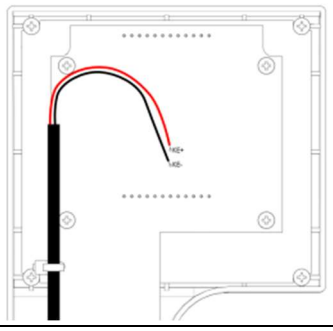
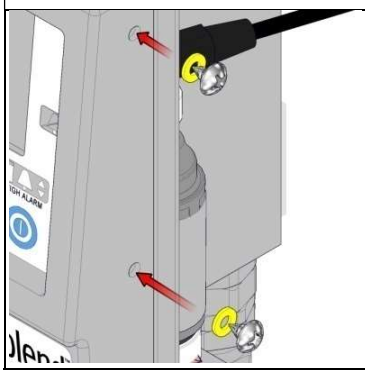
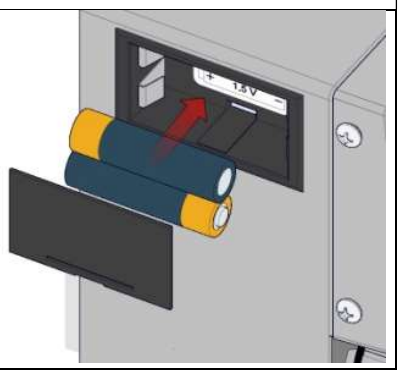
The following section contains repair procedures that can be performed in the field with the appropriate replacement parts. Any repair procedure not included in this section should be performed by the manufacturer.

4.1 External Coiled Cable Replacement Procedure

Replacement parts needed: (1) R212P86 Sensor Cable, (1) RP61P01 Cable Tie, (1) RP95P02 Cable Grommet

- **For replacement parts contact the Maxtec Service Department at: 1-866-4MAXTEC or 1-800-327-9857**

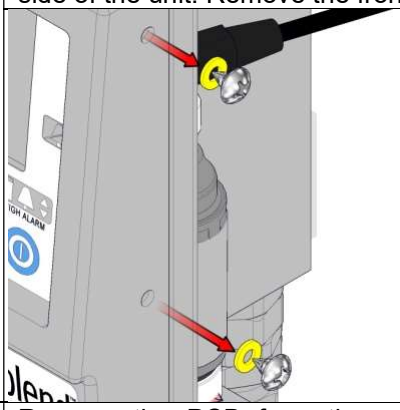
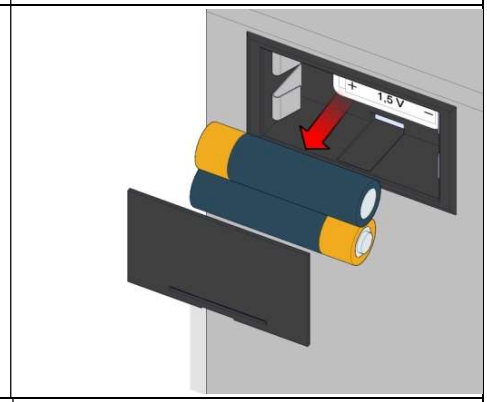
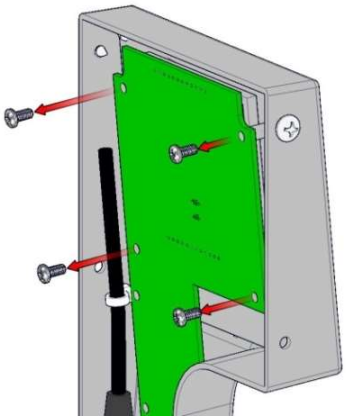
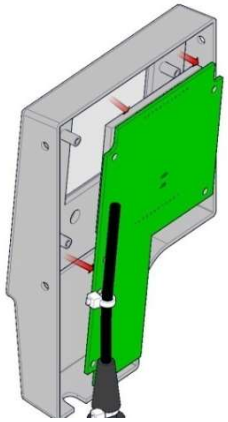
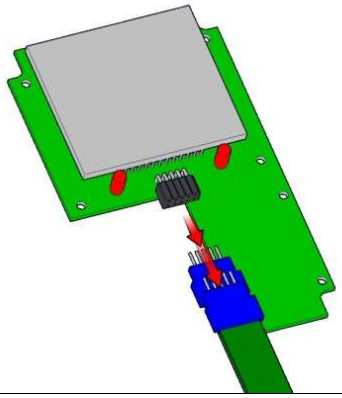
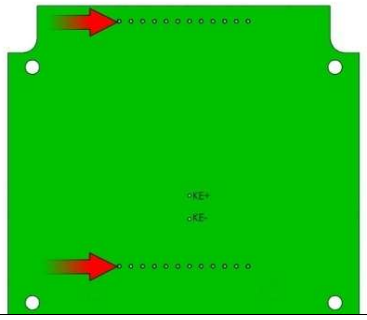
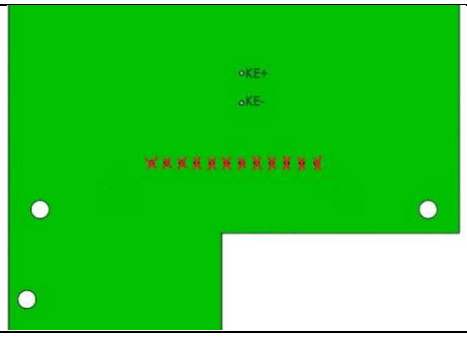
<table>
<tr><td rowspan="2">Tools Required:
Soldering Iron, Solder, Solder wick, Solder sucker, wire cutters, Philips screw driver, LocTite 444 or similar</td><td>Remove the batteries from the unit.</td><td>Remove the four case screws from the side of the unit and remove the front cover.</td></tr>
<tr><td> 
</td><td>  </td></tr>
<tr><td>Remove the red and black wire leads from the printed circuit board using wire cutters.</td><td>Clean any solder from the holes labeled 'KE+' and 'KE-' with the solder wick or solder sucker.</td><td>Cut away the existing tie wraps and remove from the grommet and cable.</td></tr>
<tr><td> 
</td><td> 
</td><td>  </td></tr>
</table>

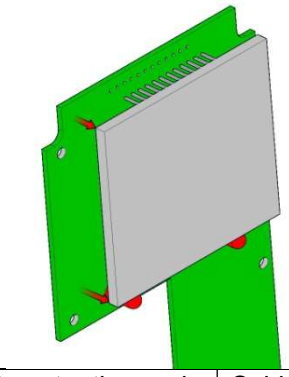
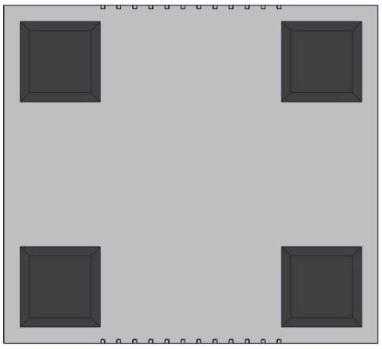
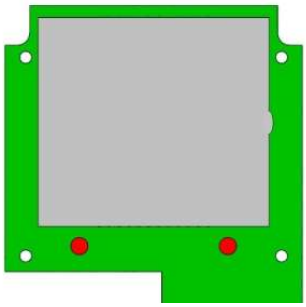
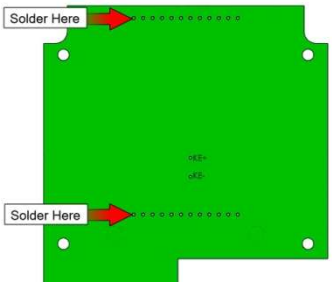
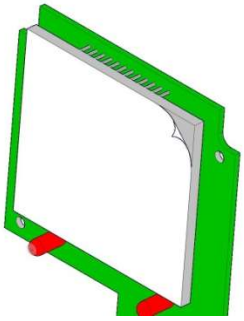
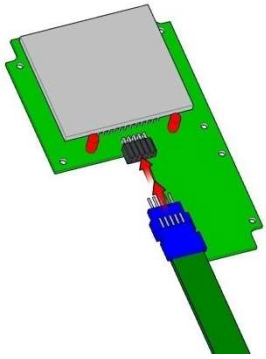
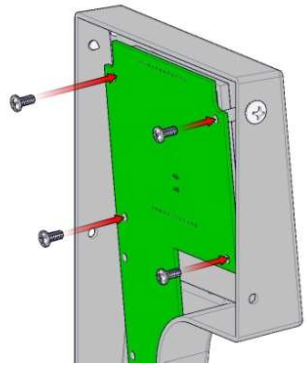
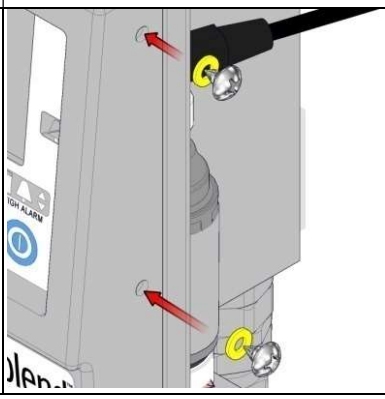
Pull the cable through the existing grommet and remove.	Thread the new cable through the existing grommet. (With water or alcohol, wet the outer insulation to act as a lubricant). Pull the cable through approximately with 4 inches of black insulation extending into the case	Loop a new tie wrap around the new cable and through the hole in the circuit board. Loop another tie wrap around the grommet and tighten. Cut off the tails of the tie wraps using wire cutters.
		
Apply a few drops of LocTite 414 to the tie wrap and grommet.	Solder the red wire to 'KE+' and the black wire to 'KE-'.	
Reattach front cover with 4 screws.	Place batteries back into battery compartment.	
		

4.2 LCD Replacement Procedure

Replacement parts needed: (1) R212P10 LCD module, (1) RP92P14 Rubber bumpers

- **For replacement parts contact the Maxtec Service Department at: 1-866-4MAXTEC or 1-800-327-9857**

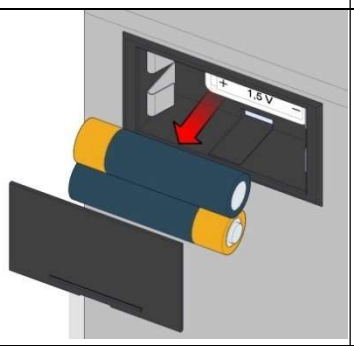
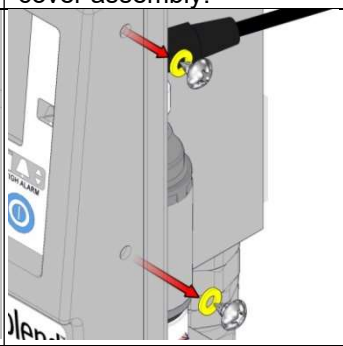
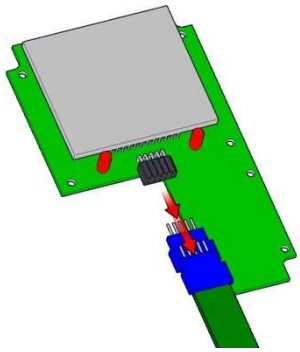
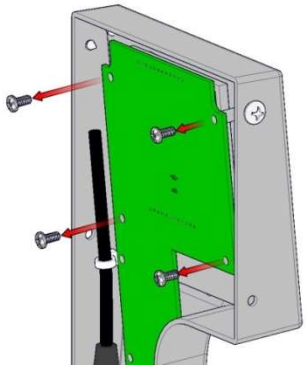
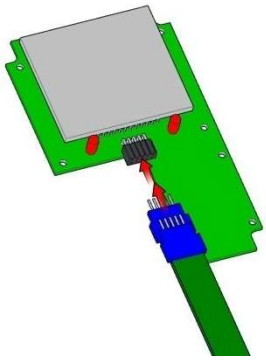
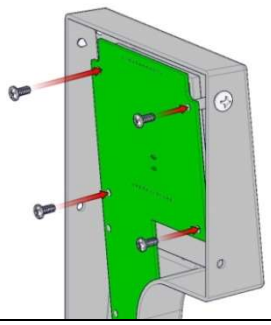
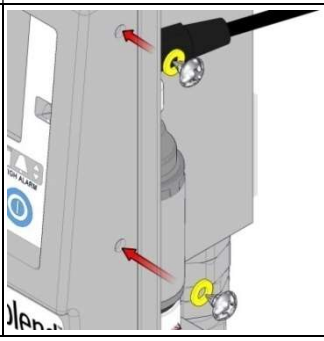
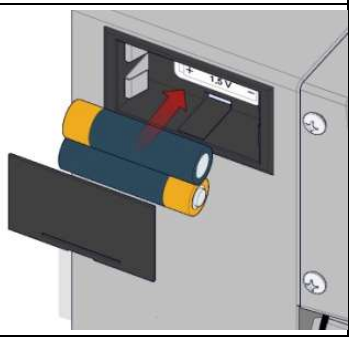
Tools Required: Soldering Iron, Solder, Solder wick, Solder Sucker, and Philips screw driver.	Remove the four case screws from the side of the unit. Remove the front cover.	Remove the batteries from the unit.
		
Remove the 4 PCB mounting screws.	Remove the PCB from the enclosure. Cable may still be attached; slide the grommet out of the groove.	Disconnect the key pad ribbon connector from the PCB.
		
Identify the 2 rows of 12 solder pads used for soldering the LCD to the main PCB.	With the solder sucker remove all solder surrounding the through-hole pin from the LCD module to the main PCB. Remove the bottom row first.	Remove all the solder from the top row pins. Use the solder wick to help remove any remaining solder.
		

Gently pry on the LCD while freeing all pins left soldered to the main PCB with the soldering iron. The LCD should free itself from the PCB. (Note in some cases silicon adhesive may need to be cut away from the underside of the LCD module with a sharp blade).		Apply the 4 rubber bumpers to the underside of the LCD module as shown.
		
Place the LCD back onto the main PCB making sure the LCD filler tab is located on the right side. This will provide correct orientation.	Solder the LCD module to the main PCB.	Remove the Mylar protective film from the face of the LCD module.
		
Re-connect the keypad connector making sure it is firmly seated to the mating connector on the PCB.	Replace the main PCB with the 4 Phillips screws on to the front cover. Replace the AA alkaline batteries while viewing the LCD module. The first 2 seconds is a LCD diagnostic mode that turns all segments "ON". Verify all segments are on.	Replace the front cover (with PCB) with 4 Phillips screws.
		

4.3 Main printed circuit board replacement procedure

Replacement parts needed: (1) R212P30-001 printed circuit board

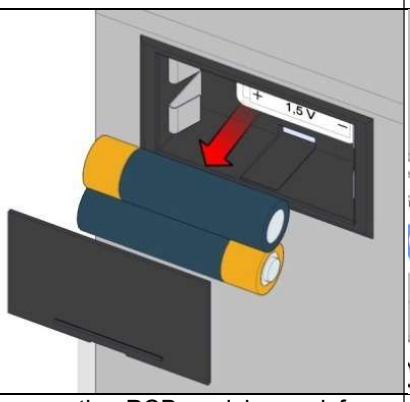
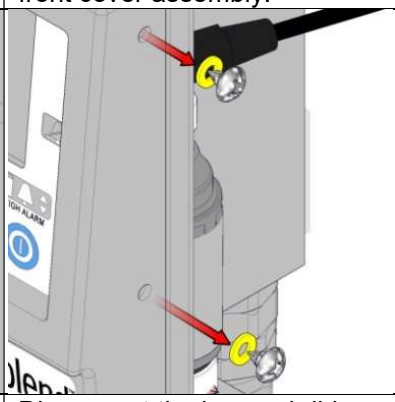
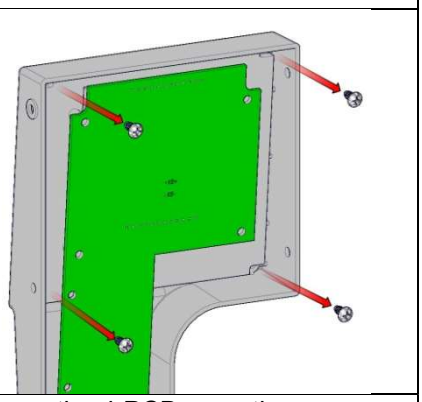
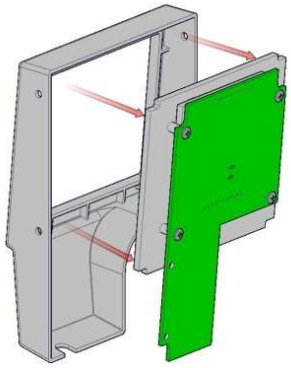
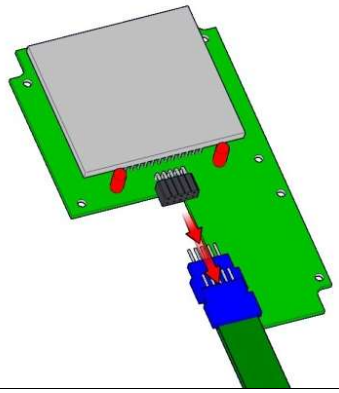
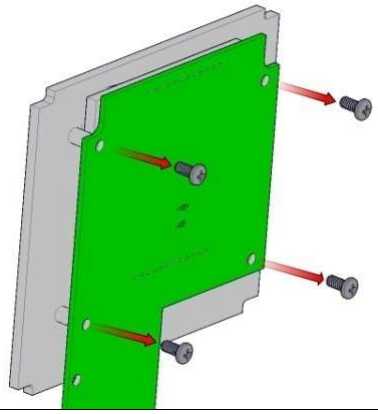
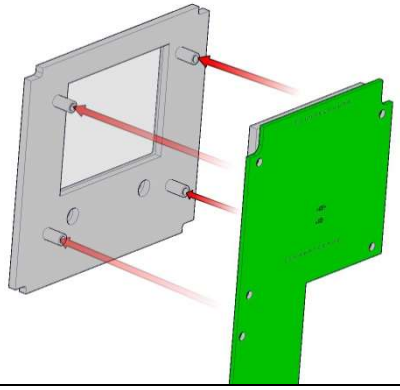
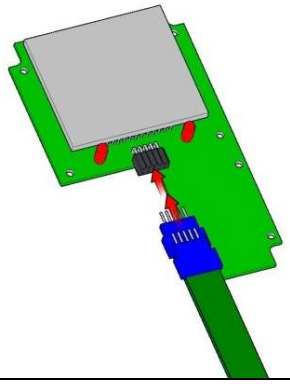
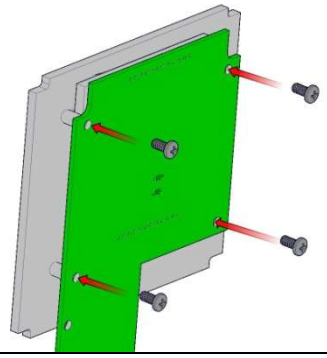
- **For replacement parts contact the Maxtec Service Department at: 1-866-4MAXTEC or 1-800-327-9857**

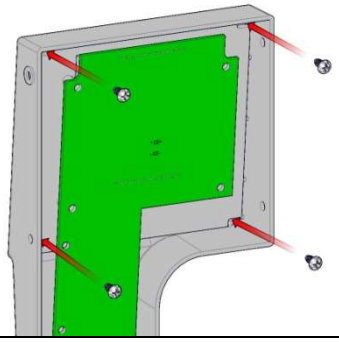
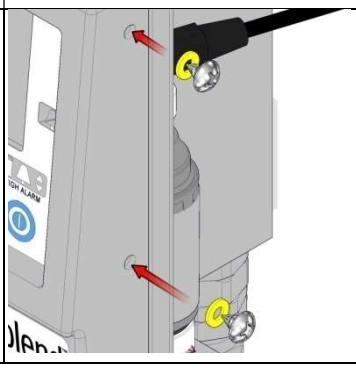
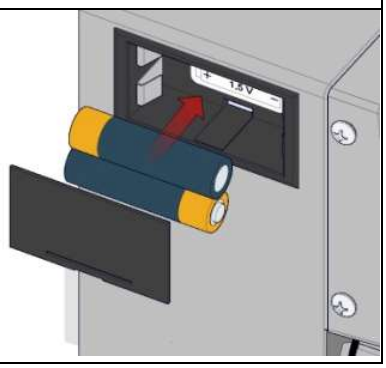
Tools Required: Soldering Iron, Solder, Solder wick, wire cutters and Philips screw driver.	Remove the batteries from the unit.	Remove the four case screws from the sides of the front cover. Remove the front cover assembly.
		
Disconnect the ribbon cable connectors of the touch pad from the old PCB. Disconnect the two power cables that connect to the battery compartment.	Remove the 4 main PCB mounting screws. Remove the old PCB, power cable, and the sensor cable from the enclosure.	Re-connect the new PCB to the Keypad connector making sure it is firmly seated to the mating connector on the PCB. Reconnect the power cables. (Be sure to connect red to red and black to black.)
		
Replace the main PCB onto the front cover with the 4 Philips screws.	Reinstall the front cover with the remaining four Philips screws and washers.	Reinstall the batteries.
		

4.4 Touchpad replacement procedure

The following procedure should be performed when a unit has returned with a broken touch pad.

- **For replacement parts contact the Maxtec Service Department at 1-866-4MAXTEC or 1-800-748-5355.**

Remove the batteries from the unit.	Remove the four case screws from the sides of the front cover. Remove the front cover assembly.	Remove the 4 screws holding down the key pad.
		
Remove the PCB and keypad from the enclosure. Sensor cable may still be attached; slide the grommet out of the groove. Detach power cables.	Disconnect the key pad ribbon connector from the PCB.	Remove the 4 PCB mounting screws.
		
Remove the keypad from the assembly.	Connect the keypad connector to the PCB.	Replace the keypad and reassemble it to the circuit board using the 4 PCB screws.
		

Reassemble the PCB and touch pad onto the front cover with the 4 Philips screws. Reconnect the power cables (red to red, black to black)	Reinstall the front cover with the 4 front panel screws and washers.	Reinstall the batteries.
		

5.0 FACTORY ADJUSTMENT PROCEDURE

Equipment Required:

- Digital Multi meter
- Shorting clip
- Small slotted screwdriver
- Phillips screwdriver.
- Red finger nail polish

5.1. Offset pot adjustment

The offset adjustment was set at the factory and should never require adjustment. In the event that the adjustment has been changed use the following procedure to correct the setting.

5.1.1 Disconnect all sample systems to the monitor and sensor.

5.1.2 Remove batteries from the unit.

5.1.3 Install batteries into the battery clips, being careful to observe correct polarity.

5.1.4 Install the shorting clip from KE+ to KE-.

5.1.5 With the voltmeter set for DC millivolts, attach the RED lead to TP1 and the BLACK lead to TP3.

5.1.6 Use the small slotted screwdriver and adjust VR1 up until the display on the voltmeter reads above 40 millivolts. Then turn it back down until the reading reads 0.02 or 0.01 millivolts. Do not turn the pot below 0.01 millivolts, as the gain of the operational amplifier (U4) will be affected.

5.1.7 Paint the adjustment knob VR1 with red fingernail polish to detect tampering. Remove the shorting clip and batteries from the unit.

6.0 SPARE AND REPLACMENT PARTS

Part numbers for field-replaceable items for the MaxBlend (monitoring portion only) are listed below, along with part numbers for related hardware and cables.

ITEM	DESCRIPTION	PART NUMBER
1	Key Pad	R212P17
2	LCD Display	R212P10
3	Front Cover	
4	Rear Cover	
5	Battery Compartment	R100P18
6	Main PCB w/ cables	R212P30-001
7	Sensor Cable	R212P86
8	Sensor MAX-250E External	R125P03-002
9	Cable Grommet	RP95P02
10	Cable Tie	RP61P01
11	Rubber Bumpers	RP92P14

SECTION 2 – HIGH FLOW MICROBLENDER SERVICE INFORMATION

7.0 OVERVIEW OF THE OPERATION OF A 3800 HIGH FLOW MICROBLENDER

The interior components of the MaxBlend are part of a Bird 3800 High Flow Microblender. The High Flow MicroBlender mixes medical grade compressed air and oxygen to provide a pressurized gas source ranging from 21% to 100% oxygen. The two 50 ± 5 PSIG (3.52 ± 0.35 kg/cm^2) gas sources enter through the diameter indexed (DISS) air and oxygen inlet connectors located on the bottom of the blender. (The inlet fittings may also be French/AFNOR fittings or NIST fittings) Each inlet connector incorporates a 30 micron particulate filter. From the filter the gases travel through the duckbill check valve which prevents possible reverse gas flow from either the air or oxygen supply systems.

7.1 Balance Module

The two gases (air and oxygen) then enter the two-stage Balance Module. The purpose of this module is to equalize the operating pressure of the air and oxygen gas sources before they enter the Proportioning Module. The diaphragms respond to the difference in gas pressures and direct the movement of each ball valve assembly contained within the air and oxygen chambers. The movement of each ball valve adjusts the amount of gas flowing through the Balance Module, equalizing the air and oxygen pressures.

7.2 Proportioning Module

From the Balance Module the gases flow into the Proportioning Module and are mixed according to the oxygen percentage selected on the external control knob. This Module consists of a double ended valve positioned between two valve seats.

One valve seat controls the passage of air and the other valve seat controls the passage of oxygen into the gas outlet(s). At this point the two gases have been blended according to the oxygen percentage selected on blender control knob.

With the control knob at the counter clockwise position (21%), the double ended valve will completely close off the flow of oxygen allowing only the air to flow. By adjusting the control knob to the full clock-wise (100%) position the flow of air is blocked, permitting only the flow of oxygen though the blender outlet.

7.3 Alarm/Bypass

The alarm feature provides for an audible alarm if the source gas pressures differ by 20 PSI (1.41 kg/cm^2) or more. The primary purpose of the alarm is to audibly warn the operator of an excessive pressure drop or depletion of either source gas. The alarm will also activate in the event in an increase in source gas pressure. Should both gas pressures (oxygen or medical air) increase or decrease simultaneously, and a 20 psi (1.41 kg/cm^2) differential is not seen, there will not be an audible alarm. If either source gas pressure drops, the output pressure of the blender will drop similarly, since the source gases are always balanced to that of the lower pressure.

The bypass function operates in unison with the alarm. The alarm bypass poppet responds directly to the air supply and the oxygen supply.

When the two source gases are near equal in pressure, the alarm bypass poppet is positioned over the bypass channel, blocking the flow of both gases to the alarm. The poppet will remain seated for unequal pressures up to 20 psi (1.41 kg/cm^2). Once a 20 psi (1.41 kg/cm^2) difference activates the poppet, the higher gas pressure will compress a spring. The gas will then flow into the alarm channel.

The gas with the higher pressure will also flow directly to the blender outlet port bypassing the Balance and Proportioning Modules. The gas is also directed to the reed alarm, thus creating an audible noise. The oxygen concentration will be that of the gas at the higher pressure. The blender in the alarm/bypass mode will deliver the oxygen (100%) of air (21%) until the bypass mechanism resets when the source gas pressures are restored to a differential of approximately 6 psig (0.42 kg/cm^2).

Some characteristics of the alarm/bypass system of the Maxblend differ from other blender models. If the Maxblend is set at 21% and the oxygen source pressure is reduced sufficient to produce a 20 PSI (1.41 kg/cm^2) or greater differential, the unit will not alarm because it will continue to deliver 21% concentration according to the setting. If the control is moved slightly from the 21% setting, the alarm will sound. Conversely, the pressure differential alarm will not sound when set to 100% and the air source pressure is reduced by 20 PSI (1.41 kg/cm^2) or more.

If the Maxblend is left connected to source gases but is not being used, the unit will alarm if a 20PSI or greater pressure differential occurs. The alarm will sound because the Maxblend bleeds 3 LPM of gas to the oxygen sensor port when it is connected to either gas supply. It is recommended to disconnect the Maxblend when it is not used for an extended period of time to avoid this alarm condition.

7.4 Gas Outlets

A gas outlet (located on the bottom) is utilized for unmetered applications in the range of 3-30 LPM. The flow of gas is automatically initiated by connecting a pneumatic device to the outlet port (such as a bubble jar or hose). A check valve is unseated upon connection allowing the mixed gases to flow through the primary outlet.

An additional gas outlet is located on the left side of the MaxBlend and is designed to deliver metered gas through a flow meter. Mixed gas may be delivered within specified accuracy tolerance from this outlet at 0-30 LPM.

8.0 WARNINGS, CAUTIONS AND NOTES

The MaxBlend air/oxygen blender should be operated by trained, qualified medical personnel under the direct supervision of a licensed physician. Before clinical application, the WARNINGS, CAUTIONS, and NOTES should be read and understood. All Warnings, cautions, and notes are located in the High Flow Maxblend User Manual (R203M06-001)

9.0 CLINICAL TROUBLESHOOTING

Problem	Potential Cause	Corrective Action
Oxygen concentration discrepancy between blender setting and oxygen monitor (greater than 3%)	Monitor is out of calibration	Calibrate the monitor
	The Blender is out of calibration.	Recalibrate or service further as necessary (See section 10)
	High Flow bleed muffler obstructed causing restriction of fixed bleed.	Remove obstruction and verify bleed flow is within tolerance.
	Gas supply contaminated.	Check source gases with a calibrated O2 analyzer to confirm O2 is 100% and Air is 21%
Alarm Sounding	Inlet pressure difference of 20 PSI (1.41 kg/cm^2) or more.	Correct pressure difference.
	Alarm Module not calibrated properly.	Recalibrate or service further as necessary (See Section 10.0).
	Inlet gas contamination, alarm module malfunction.	Disassemble, clean, reassemble, calibrate, install inlet filter/water trap on air line, and correct cause of gas contamination.
High Flow MicroBlender in bypass. No Alarm	Reed plate in Cap assembly (P/N 05436) improperly installed or damaged	Remove and replace
	Alarm gas orifice is obstructed.	Remove obstruction from orifice.
High Flow MicroBlender accurate only when inlet gas pressures are equal.	Balance module not functioning properly.	Disassemble balance module, clean, replace diaphragm(s), reassemble and test.

10.0 SERVICE, REPAIR AND CALIBRATION

10.1 Service/Calibration Tools

Special tools may be required for the service disassembly and assembly of the MaxBlend. These products may be obtained from Bird Products Corporation under the following individual part numbers or as the High Flow MicroBlender Tool Kit (P/N 03852).

PART NO.	DESCRIPTION
00631	Lubricant
03850	Alignment Assembly Tool (2)
03849	Spanner Wrench
03851	Lubricant Grease
03884	Vibra-Tite Thread locking Compound
10101	Tube Assembly, Leak Test
10102	Tube Assembly, Pressure Test
10108	Fitting, Bleed Test
10138	Blender Alarm Tool

Additional tools and supplies recommended for service/repair (not available from Bird Products Corporation or Maxtec):

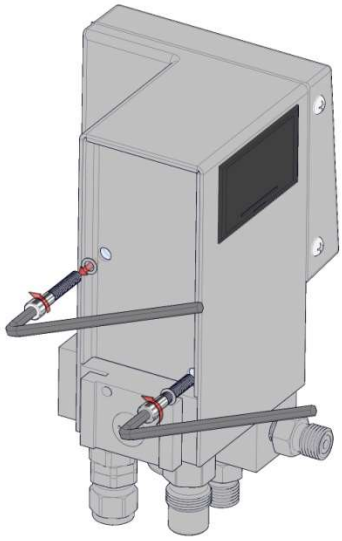
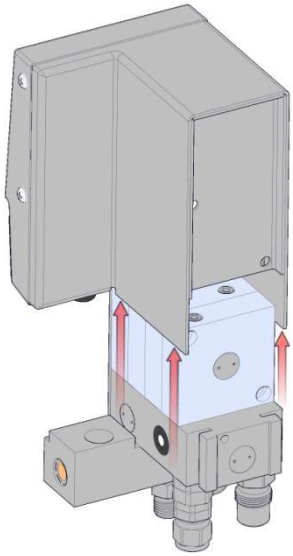
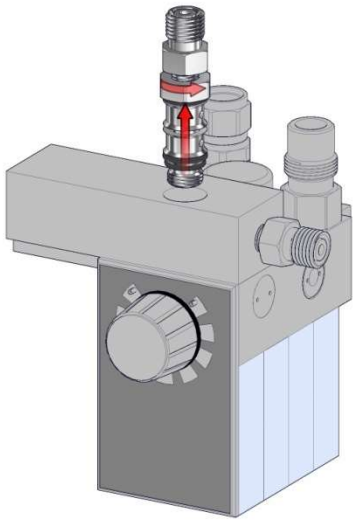
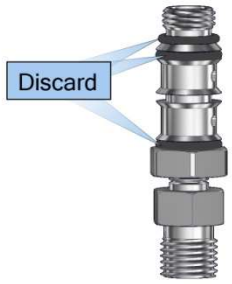
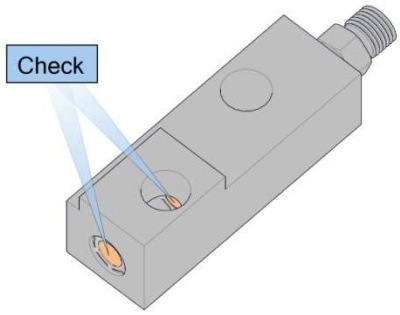
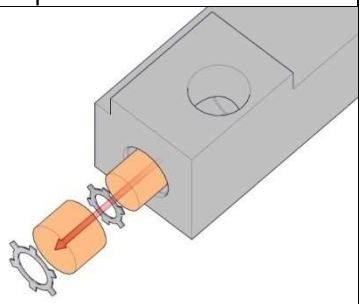
0-10 LPM Flow meter (1/2 LPM increments)
5/32” Allen wrench
9/32” hex nut driver
11/16” open end or adjustable wrench
Small needle nose pliers
Torque wrench (to 120 in/lbs)
1/8” Allen wrench
¾” open end or adjustable wrenches (2)
7/32” Allen wrench
Isopropyl alcohol

A Maintenance Kit for the Maxblend is available by ordering the P/N R200P02. This kit includes all parts necessary for periodic preventative maintenance.

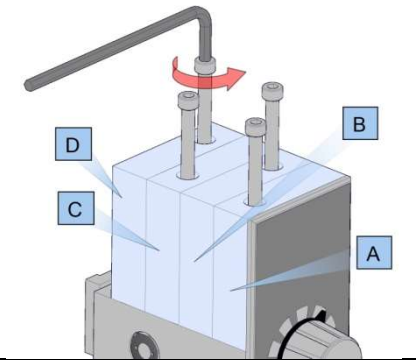
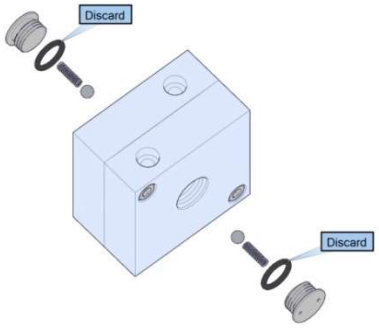
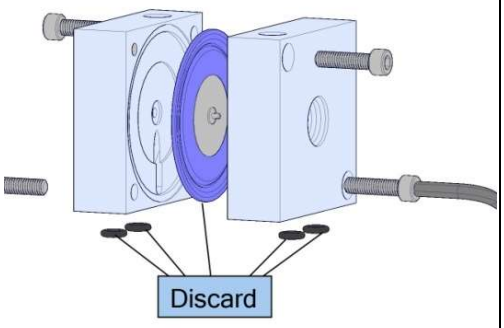
Maxtec recommends using an ultrasonic cleaner for cleaning all components. However, cleaning with an all-purpose liquid cleaner and rinsing with clear, warm water may be substituted. Both methods require thorough blow drying all passages before final assembly. When using an ultrasonic cleaner, follow the manufacturer’s instructions.

10.2 Disassembly Procedure (For Rebuilds)

10.2.1 Oxygen Monitor Disassembly (Front and Top Overassembly)

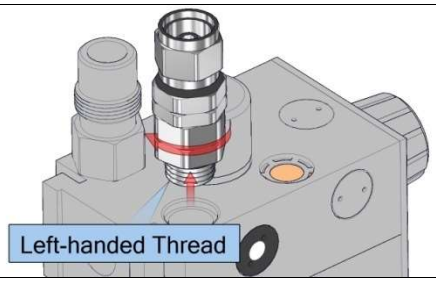
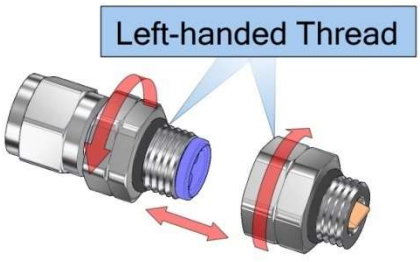
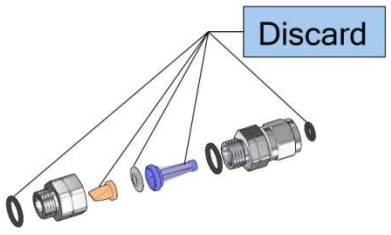
With a 5/32” Allen wrench, remove the two rear screws holding the outer casing of the Maxblend. Set aside screws and washers.	Remove the monitor assembly from the microblender assembly.	Remove the sensor manifold by removing the bottom outlet. Unscrewing the outlet will separate the sensor manifold from the blender.
		
Remove and discard the three (3) o-rings from the bottom outlet.	Check the two mufflers contained in the sensor manifold. Check mufflers for contamination or disintegration.	Replace mufflers **if necessary** by removing the star retainer(s). Use a small screwdriver or needle-nose pliers. Note: interior muffler replacement part is not part of the standard replacement kit.
		

10.2.2 Balance Block Disassembly – Top of MicroBlender

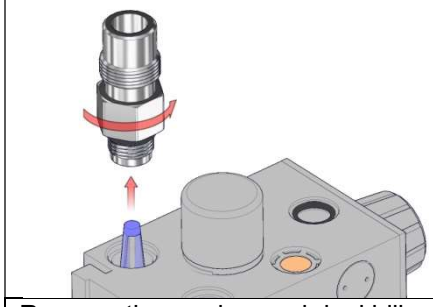
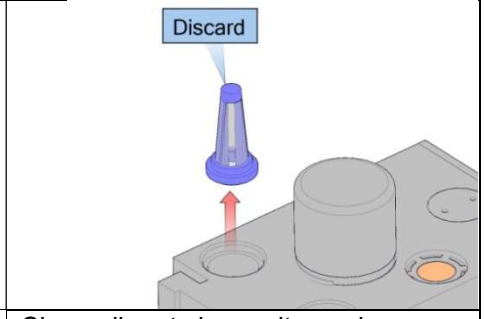
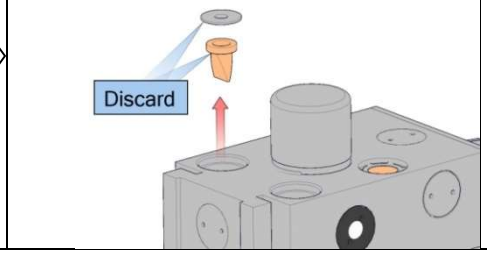
With a 5/32" Allen wrench remove top four screws securing the two balance block assemblies to the valve block**. NOTE: The balance block assemblies are nearly identical and interchangeable. For ease of assembly, the blocks may be labeled (A, B, C, and D).** **However, assembly "CD" is slightly different.**	Using the spanner wrench, remove the caps (2 each) from the balance block assembly. Remove the O-rings from the caps and discard them. **Note: Poppet spring and ball will be loose following removal of balance block cap. Remove them and set them aside. Labeling the part (or a container with the part) may be beneficial for reassembly.**	With a 5/32" Allen wrench, remove each of (4) screws securing each pair of blocks. Remove the diaphragms and O-rings and discard them. Clean all parts in an ultrasonic cleaner. Ensure all passages are blown completely dry before beginning reassembly. Be sure that the poppet seat areas are perfectly clean.
		

10.2.3 Oxygen Inlet Disassembly (Bottom Rear of MicroBlender Assembly)

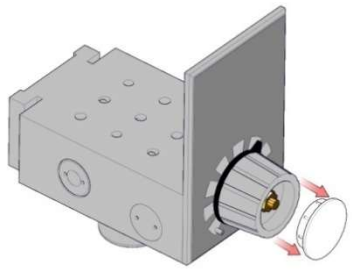
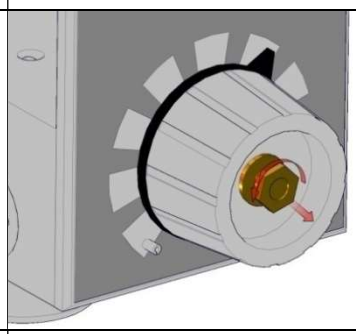
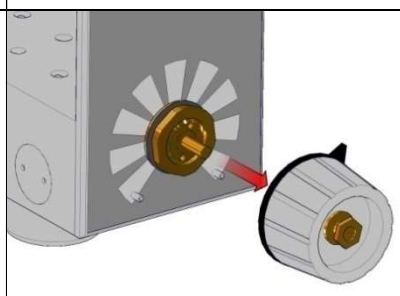
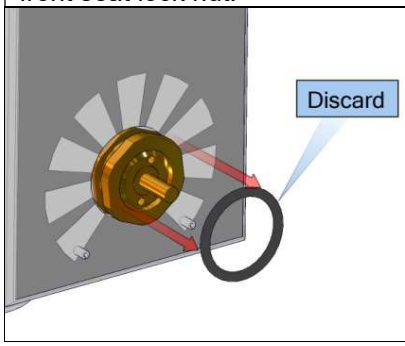
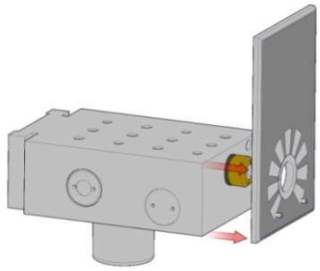
Note: This assembly threads into the block with a left-handed thread. A single groove on a nut indicates left hand threads.

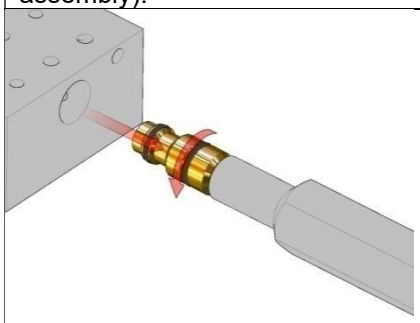
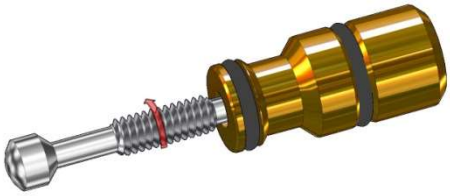
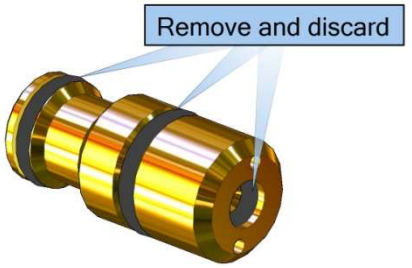
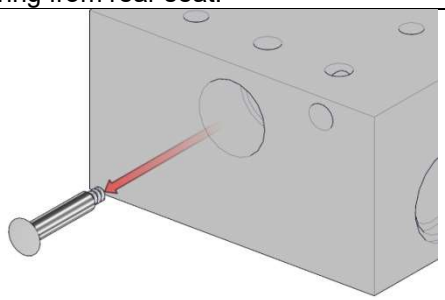
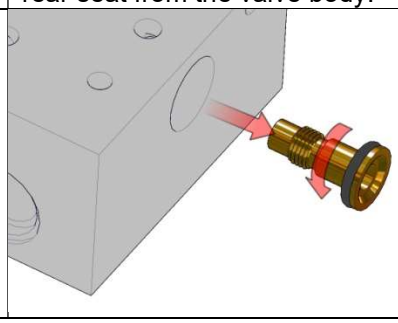
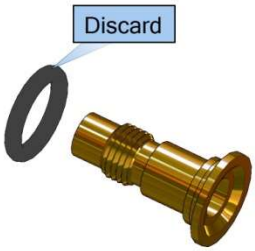
With a ¾" open end wrench, remove the oxygen inlet assembly from the valve block.	Using a second ¾" open end wrench, separate the O_2 connector from the filter retainer.	Remove the filter, duckbill check valve, washer and O-rings and discard them. The filter may have to be grasped with pliers to remove it.
		
Clean all parts in an ultrasonic cleaner. Ensure all passages are blown completely dry before beginning reassembly.		

10.2.4 Air Inlet Disassembly (Bottom Rear of MicroBlender Assembly)

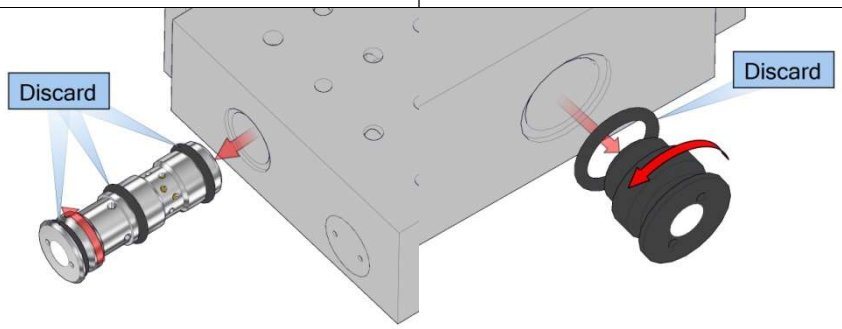
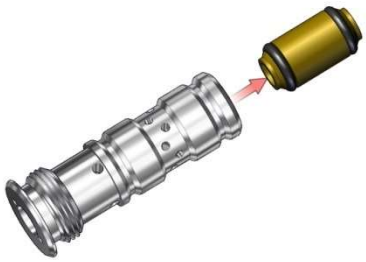
With a ¾" open end wrench, remove the air inlet assembly with O-ring.	Remove and discard O-ring.	Remove the inlet cone filter located in the valve block and discard. Carefully use pliers if necessary.
		
Remove the washer and duckbill check valve from the valve block assembly. Discard check valve and washer. (See image on Right)		Clean all parts in an ultrasonic cleaner. Ensure all passages are blown completely dry before beginning reassembly.

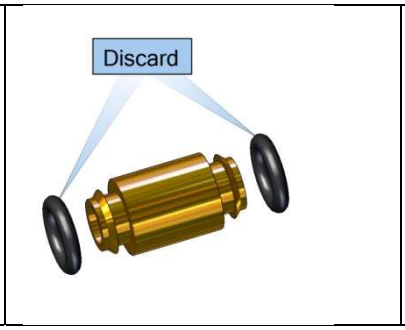
10.2.5 Control Knob (Front and Rear Seat Valve) Disassembly

With thin blade screwdriver or knife, remove gray cover plate from knob assembly.	Using a 9/32" nut-driver, loosen small nut.	Remove knob assembly from the front valve stem.
		
Remove and discard O-ring from the front seat lock nut.	Using an 11/16" open end wrench, remove front seat lock nut.	Remove front plate by gently separating it from the block assembly.
		

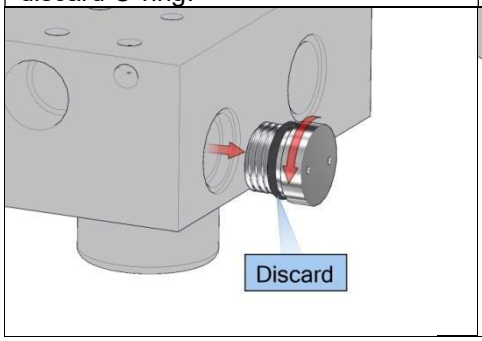
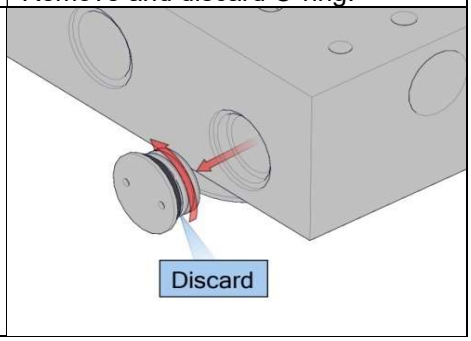
Using spanner wrench remove front seat (incorporating the valve stem assembly).	Rotate valve stem counter clockwise to remove from the front seat.	Remove O-rings and discard.
		
Carefully remove poppet valve and spring from rear seat.	Using a 1/8” Allen wrench, remove the rear seat from the valve body.	Discard O-ring on rear seat of valve body.
		
Clean all parts in an ultrasonic cleaner. Ensure all passages are blown dry before beginning reassembly.		

10.2.6 Bypass Disassembly (Both Side, Rear of Microblender)

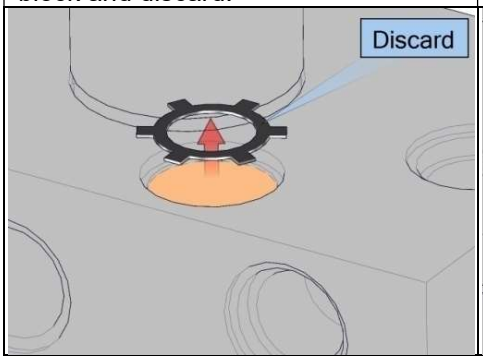
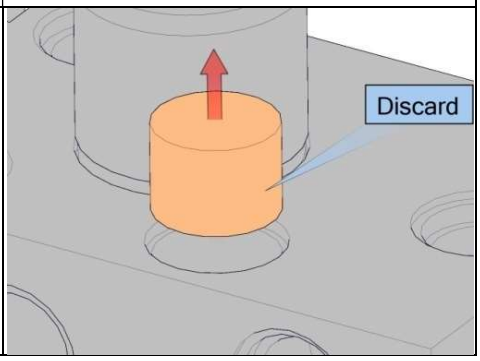
Using a spanner wrench unscrew bypass sleeve from left rear side of valve block. Remove and discard O-rings.	From right rear side of block, unscrew bypass seat. Remove and discard O-ring. **Note: If spring is still in cavity, carefully remove it.**	Carefully pull out bypass poppet valve from the bypass sleeve. Remove spring too. **Note: Use care to avoid scratching of cylinder in which poppet valve operates.**
		

From poppet valve, remove and discard O-rings. **CAUTION: Carefully inspect internal surface of sleeve for any signs of wear and damage to the special impregnated Teflon coating.** ⇨		Clean all parts with an ultrasonic cleaner. Ensure all passages are blown completely dry before beginning reassembly.

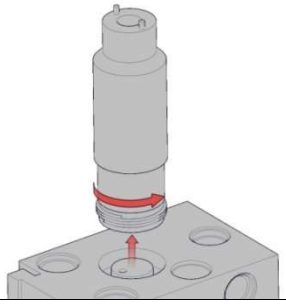
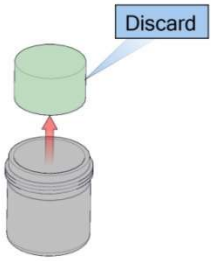
10.2.7 Outlet Caps Disassembly

Using spanner wrench, remove outlet cap and O-ring from valve block from **right** side of blender. Remove and discard O-ring.	Using spanner wrench, remove outlet cap and O-ring from valve block from **left** side of blender. Remove and discard O-ring.
	

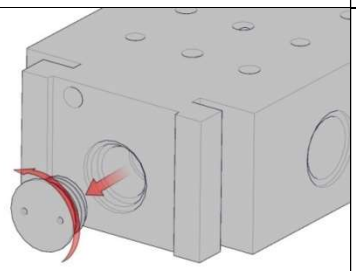
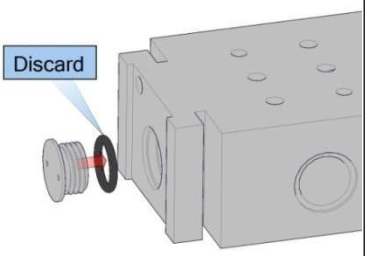
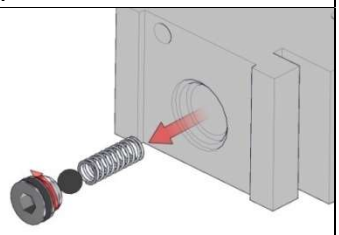
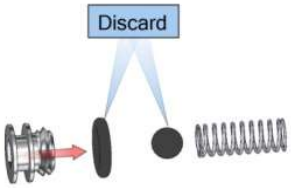
10.2.8 Muffler Disassembly (Bottom, Middle of Microblender)

With a small screwdriver, carefully lift star retainer from bottom of valve block and discard.	Remove muffler carefully with a pointed probe and discard.
	

10.2.9 Alarm Retainer Cap Disassembly (Bottom, middle of microblender)

Using blender alarm wrench, unscrew alarm cap.	Remove diffuser foam and discard.	Remove spring.
		

10.2.10 Alarm Check Valve Disassembly (Rear of Microblender)

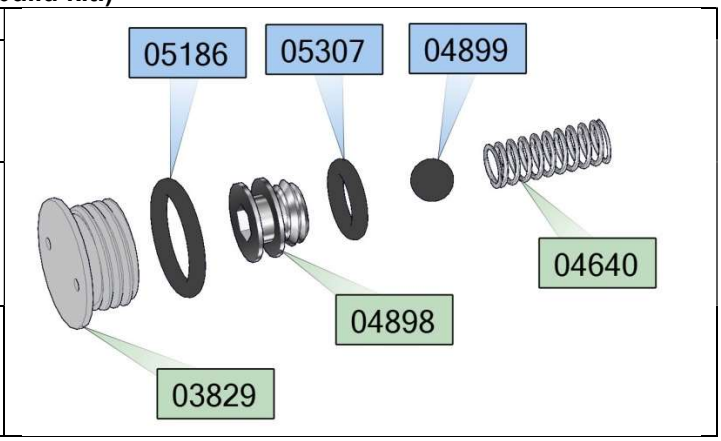
With spanner wrench, remove cap from rear of valve block.	Remove and discard O-ring from cap.	Using a 5/32” Allen wrench, remove check-ball retainer, rubber check-ball and spring.
		
Remove and discard O-ring and rubber check-ball. ⇨		Clean all parts with an ultrasonic cleaner. Ensure all passages are blown completely dry before beginning reassembly.

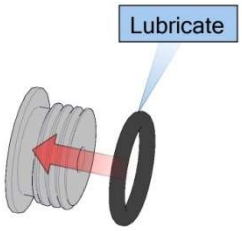
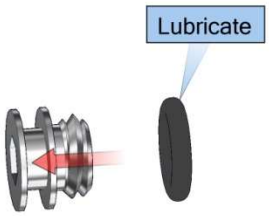
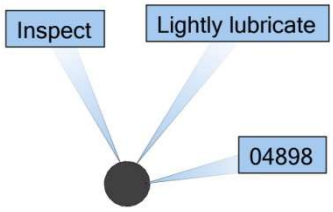
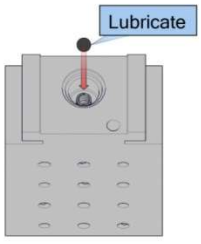
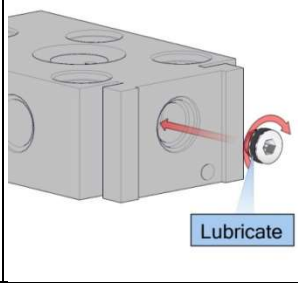
10.3 Reassembly Procedure (For Rebuilds) & Test Procedure

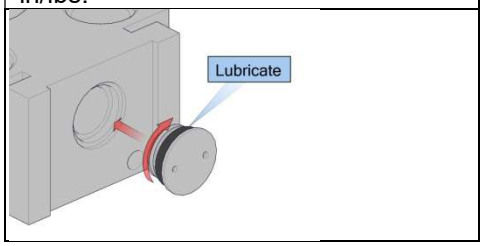
10.3.1 Alarm Check Valve Reassembly

Replacement Parts (Items with blue labels come in a rebuild kit.)

Part No.	QTY	Description
04899	1	Rubber Check ball
05186	1	O-ring
05307	1	O-ring



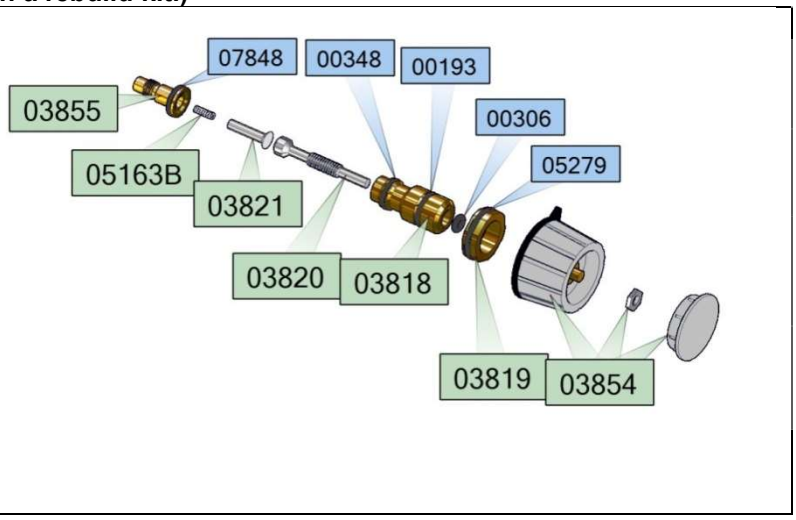
Using lubricant, lubricate O-ring and install on cap.	Using lubricant, lubricate O-ring and install in groove in check-ball retainer.	Inspect the new rubber check-ball is clean and not damaged by scratches or nicks or flat spots. Lubricate lightly with lubricant.
		
Position blender resting on front surface, with rear of valve block facing upwards.	Install spring, place lubricated rubber check-ball on spring.	Using a 3/16” Allen wrench, install check valve retainer. Make certain that the O-ring is lightly lubricated with lubricant prior to install retainer. Torque to 30 in/lbs.
		

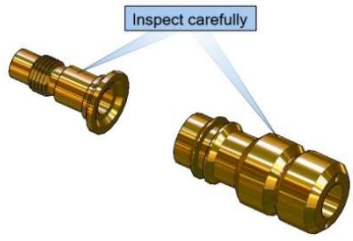
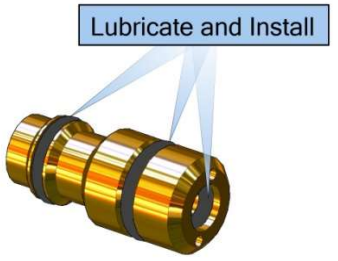
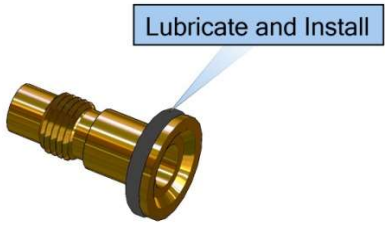
Using Spanner wrench install cap with lubricated O-ring. Torque to 30 in/lbs.


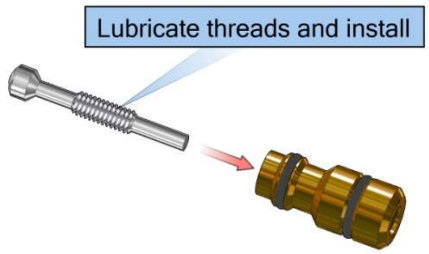
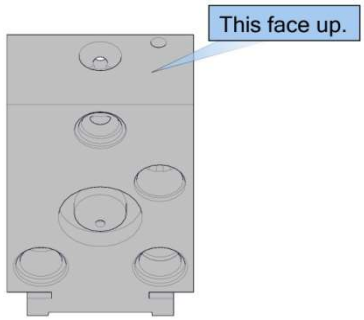
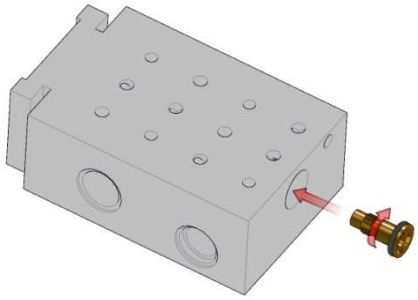
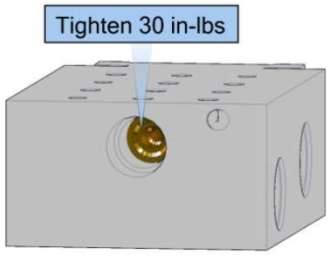
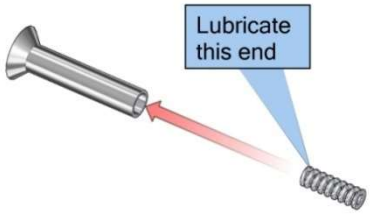
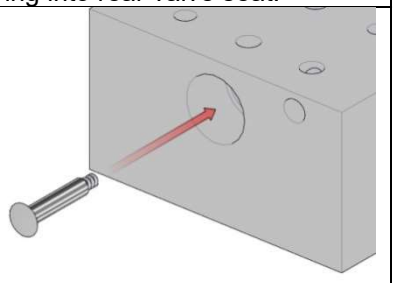
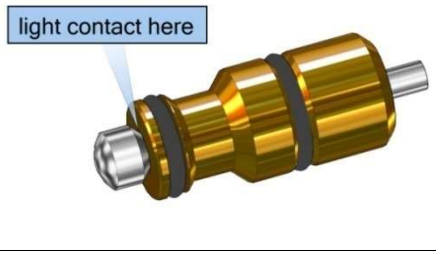
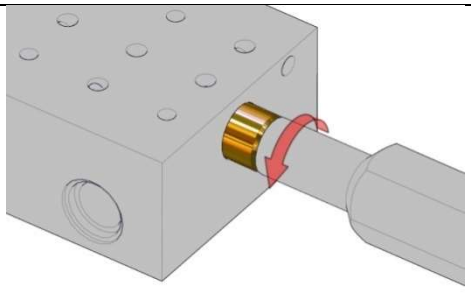
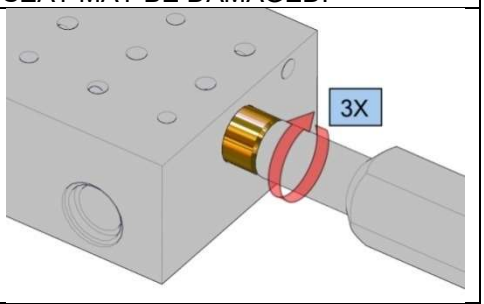
10.3.2 Control Knob/ Front and Rear Seat Valve Reassembly

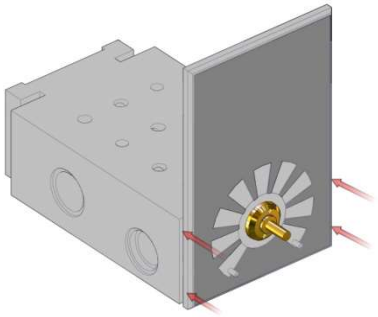
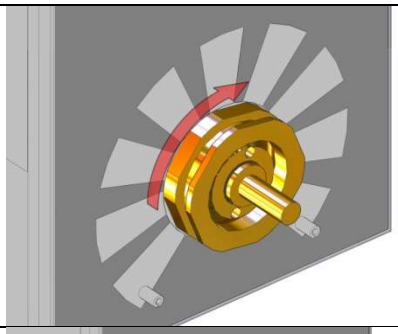
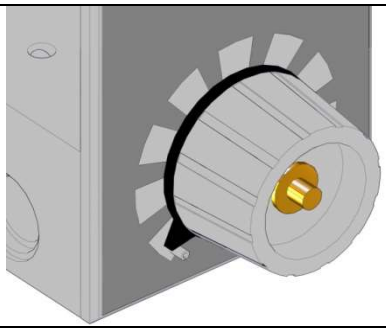
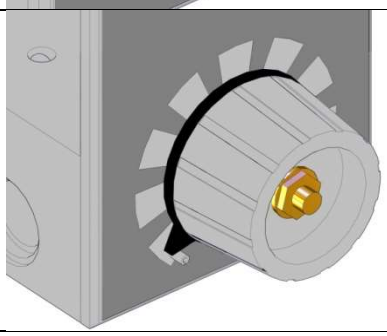
Replacement Parts (Items with blue labels come in a rebuild kit.)

Part No.	QTY	Description
00193	1	O-ring
00306	1	O-ring
00348	1	O-ring
05279	1	O-ring
07849	1	O-ring



Inspect front and rear valve seats carefully. They should be void of chamfer, nicks or wear and have a sharp edge. **CAUTION: Any damage to seats may prevent proper calibration.**	Lightly lubricate o-rings with lubricant and install on the front seat	Lightly lubricate o-ring with lubricant and install on rear seat
		

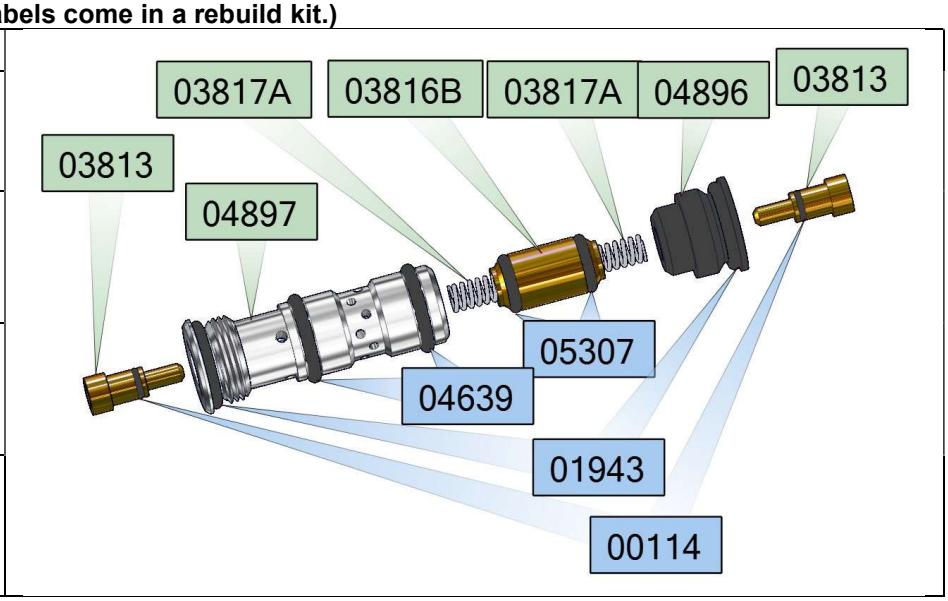
Lubricate threads on valve stem with lubricant grease and carefully install valve stem into front seat. Rotate stem clockwise until light contact is made with front seat.	Position blender with front surface facing upwards.	Install rear valve seat with lubricated O-ring through the front port.
		
Using a 1/8” Allen driver and torque wrench, secure rear seat in place, with a torque tension of 30 in/lbs.	Lightly lubricate one end of the spring with lubricant grease and insert lubricated end into rear valve stem.	Using a pair of small, slim needle nose pliers, carefully place rear valve stem with spring into rear valve seat.
		
Verify that the front valve stem is hand tightened until light contact is made with the front seat.	Place the front valve seat assembly in the threaded hole. With spanner wrench, exert slight pressure and rotate **COUNTER-CLOCKWISE** until initial thread engagement is found. This initial thread engagement is easily recognizable by the assembly dropping slightly and making a distinguishable “click”.	Then rotate **CLOCKWISE <u>three</u>** full turns. WARNING: DO NOT PRESSURIZE SYSTEM UNLESS THE VALVE SEAT HAS 3 FULL TURNS OF THE THREADS ENGAGED. THE SEAT CAN BE FORCEFULLY EJECTED BY GAS PRESSURE IF NOT SUFFICIENTLY ENGAGED. DO NOT EXCEED 3 FULL TURNS OR REAR SEAT MAY BE DAMAGED.
		

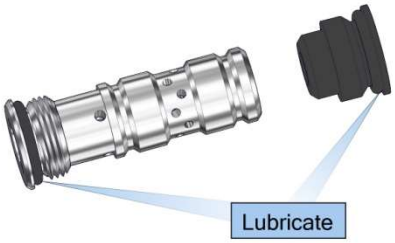
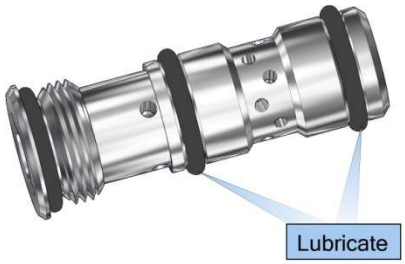
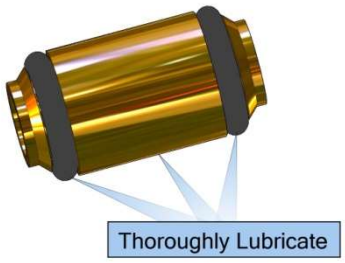
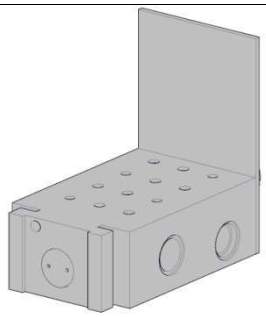
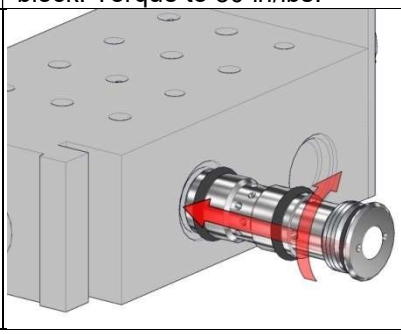
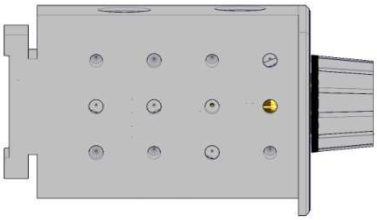
Align and gently push the two pins of the front plate assembly into the two dowel pin holes in the valve block front surface.	Install nut with the wide shoulder against the front plate, and secure nut using an 11/16" open end wrench. **DO NOT install O-ring in groove at this time.**	Install control knob with black pointer against 21% O2 stop, at left side of valve block.
		
Using a 9/32" nut driver lightly tighten collet nut on control knob assembly to valve stem. ⇨		

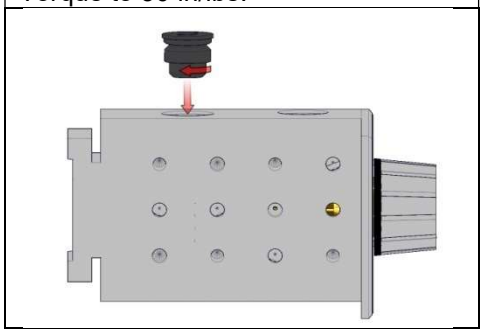
10.3.3 Alarm Bypass Assembly

Replacement Parts (Items with blue labels come in a rebuild kit.)

Part No.	QTY	Description
00114	2	O-ring (replacement is optional)
01943	2	O-ring
04639	2	O-ring
05307	2	O-ring



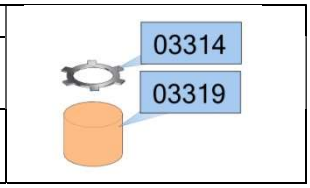
Using lubricant, lubricate (2) O-rings. Install one O-ring on bypass seat cap and one O-ring on sleeve.	Using lubricant, lubricate (2) O-rings and install on sleeve.	Thoroughly lubricate (2) O-rings and the poppet (almost dripping) with lubricant grease and install one in each groove at end of bypass poppet shoulder.
		
Insert one spring and the bypass poppet into the sleeve. Verify that the poppet aligns with the adjuster. CAUTION: Be careful not to damage the poppet valve o-rings.	Carefully insert 1/8” Allen wrench through into bypass poppet valve. Push bypass poppet against spring and check for smooth movement and recoil action.	Install the second spring into the bypass poppet.
		
Position blender resting flat on the bottom side. Verify all O-rings (from previous steps) are lubricated.	Insert assembled bypass sleeve into the valve block. Use the spanner wrench to secure the sleeve into the block. Torque to 30 in/lbs.	Position blender to rest on bypass sleeve side.
		

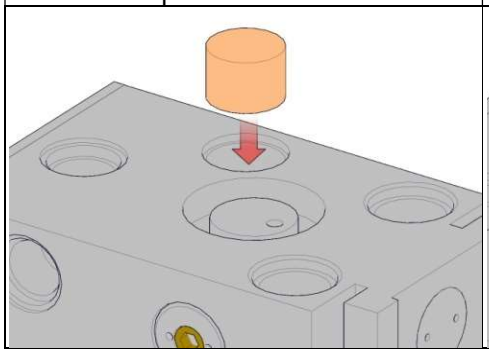
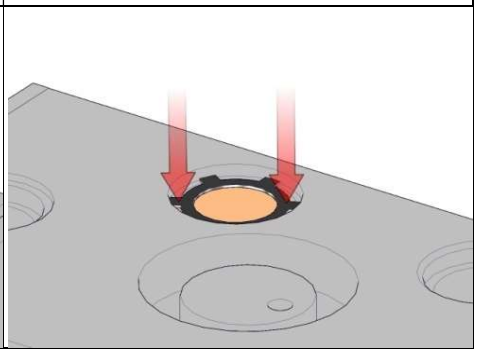
Install bypass seat with lubricated O-ring. Use the spanner wrench to secure the seat to valve block. Torque to 30 in/lbs.


10.3.4 Muffler Reassembly

Muffler Replacement Parts (Items with blue labels come in a rebuild kit.)

Part No.	QTY	Description
03314	1	Star Retainer
03319	1	Muffler

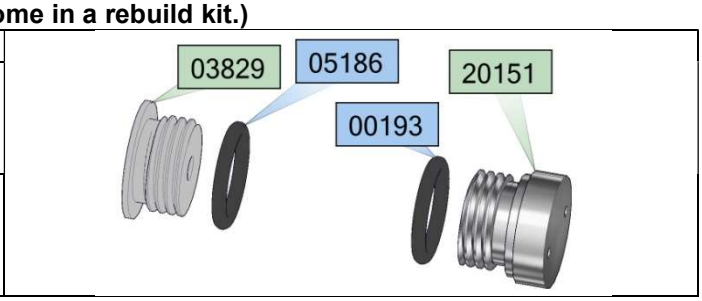


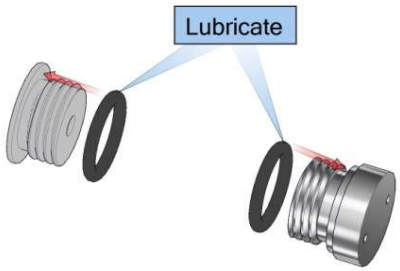
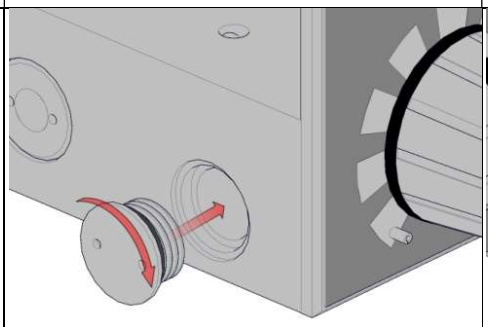
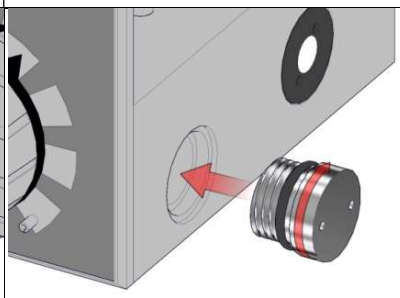
Install one (1) muffler into the valve block bleed port.	With a small screwdriver, secure the star retainer over the muffler.
	

10.3.5 Right and left Outlet Cap Reassembly

Outlet Cap Replacement Parts (Items with blue labels come in a rebuild kit.)

Part No.	QTY	Description
05186	1	O-ring
00193	1	O-ring

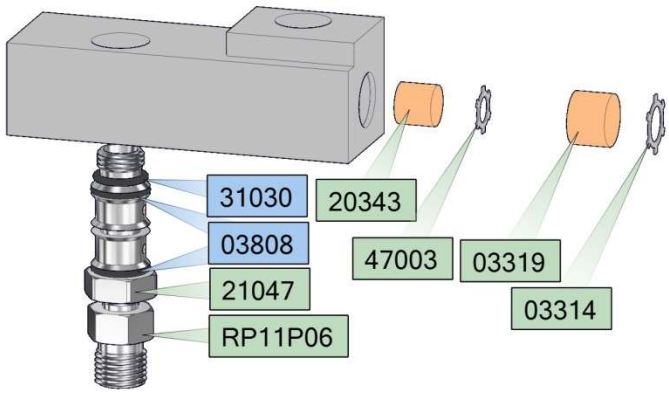


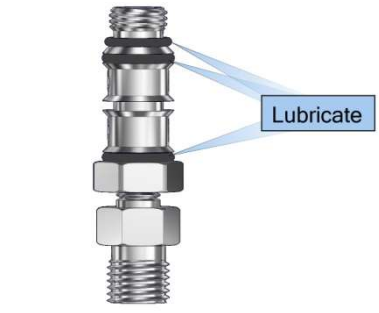
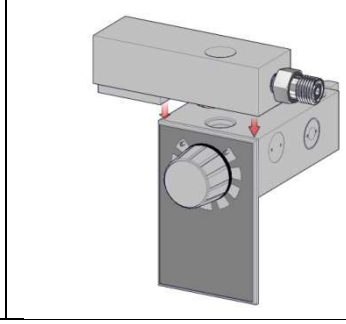
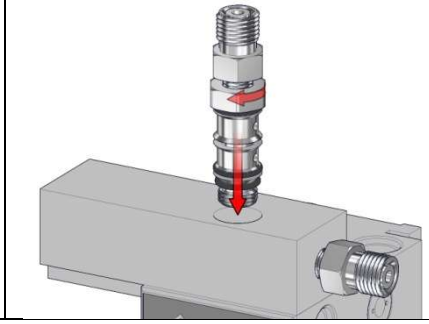
Lightly lubricate and install (2) O-rings on right outlet cap and the left outlet cap.	Insert the Left outlet cap using the spanner wrench.	Insert the Right outlet cap using the spanner wrench.
		

10.3.6 Bottom Outlet Reassembly

Bottom Outlet Replacement Parts (Items with blue labels come in a rebuild kit.)

Part No.	QTY	Description
03808	2	O-ring
31030	1	O-ring
03319	1	Muffler (Replacement only if necessary)
03314	1	Star Retainer (Replacement only if necessary)
20343	1	Small Muffler (Replacement only if necessary – sold separately)
47003	1	Small Star Retainer (Replacement only if necessary – sold separately)

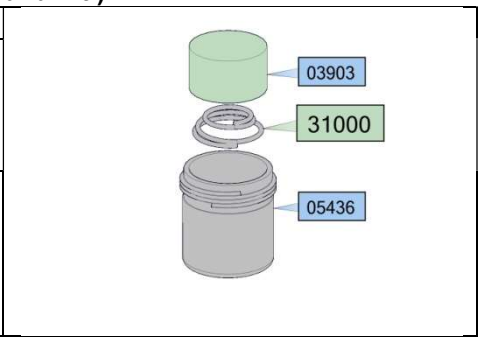


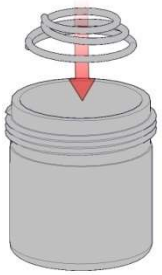
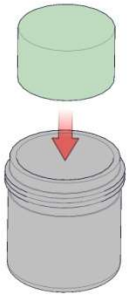
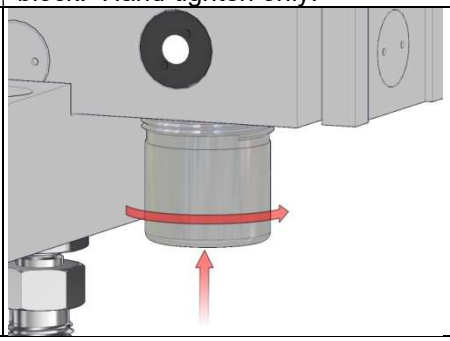
Lightly lubricate and install (3) O-rings on bottom outlet fitting	Turn the blender up-side down and position Sensor Manifold on the bottom of the blender with the sensor port facing down.	Fasten the sensor manifold to the blender by attaching the outlet fitting through the bottom hole and threading it into the blender. Use a 3/4” wrench to secure the manifold.
		

10.3.7 Alarm Cap Reassembly

Replacement Parts (Items with blue labels come in a rebuild kit.)

Part No.	QTY	Description
05436	1	Alarm Cap
03903	1	Diffuser

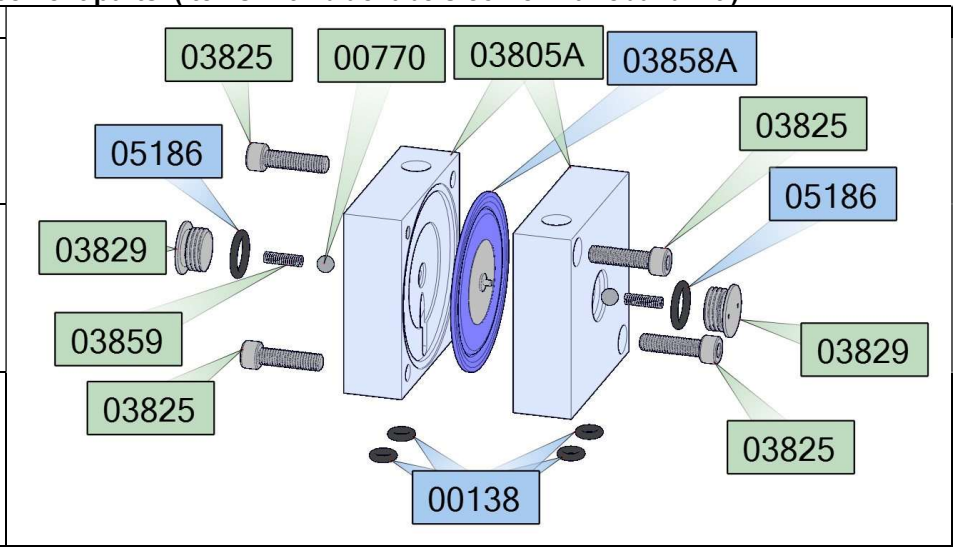


Install spring with its wide base on top of reed inside alarm cap.	Place diffuser into alarm cap above spring.	From below valve block, carefully install alarm cap assembly into valve block. Hand-tighten only.
		

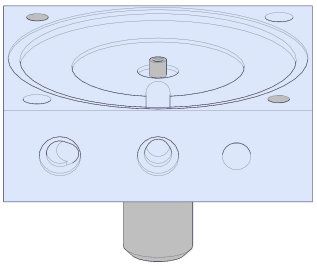
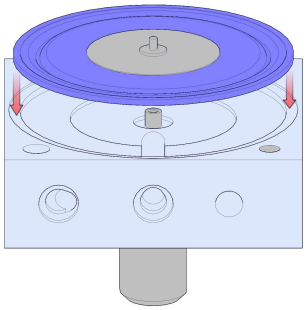
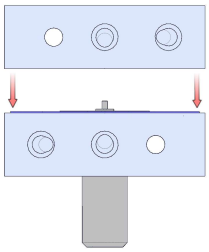
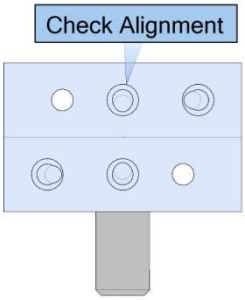
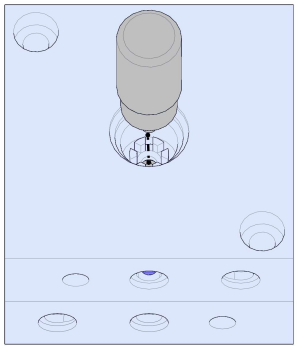
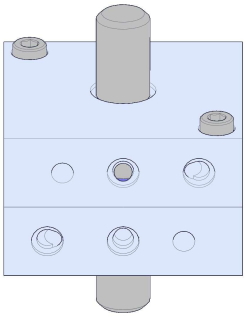
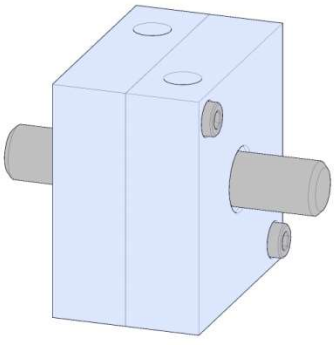
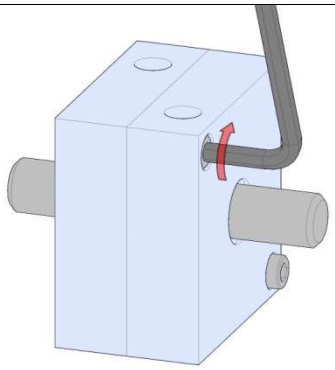
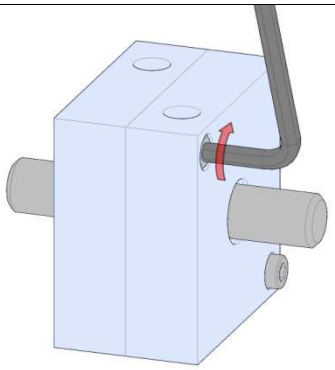
10.3.8 Balance Block Sub-Assembly

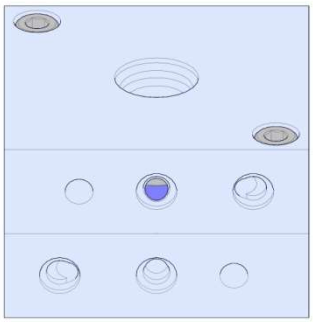
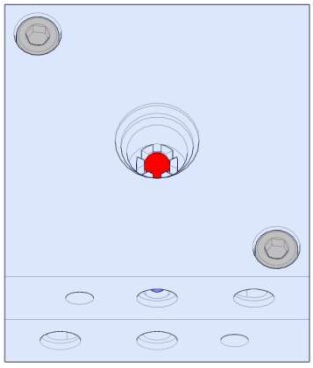
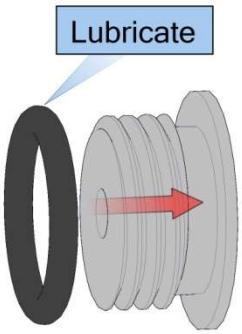
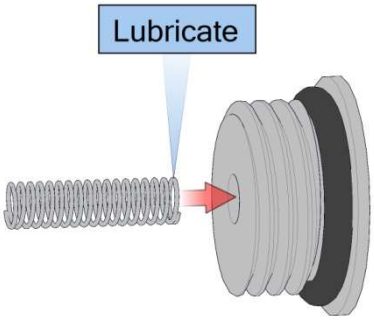
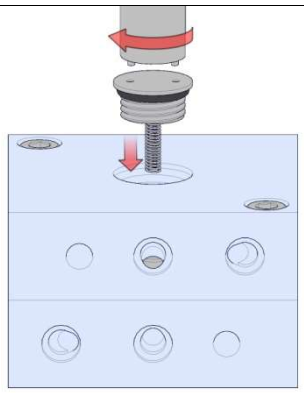
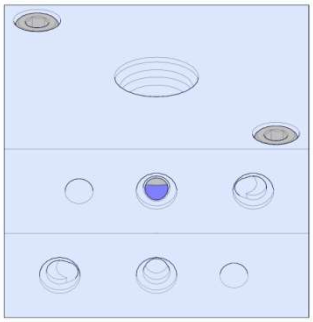
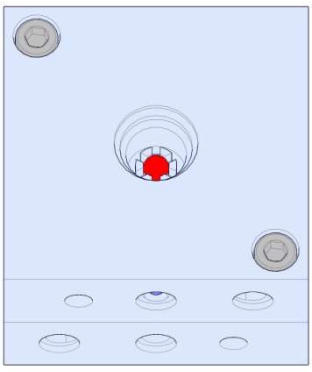
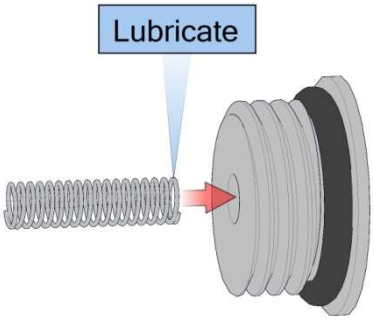
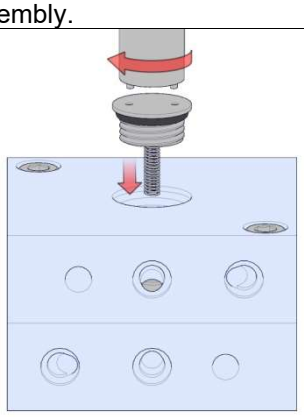
Front Balance Block assembly replacement parts. (Items with blue labels come in a rebuild kit.)

Part No.	QTY	Description
00138	4	O-ring
03858A	1	Diaphragm
05186	2	O-ring



10.3.8.1 Front Balance Block Reassembly

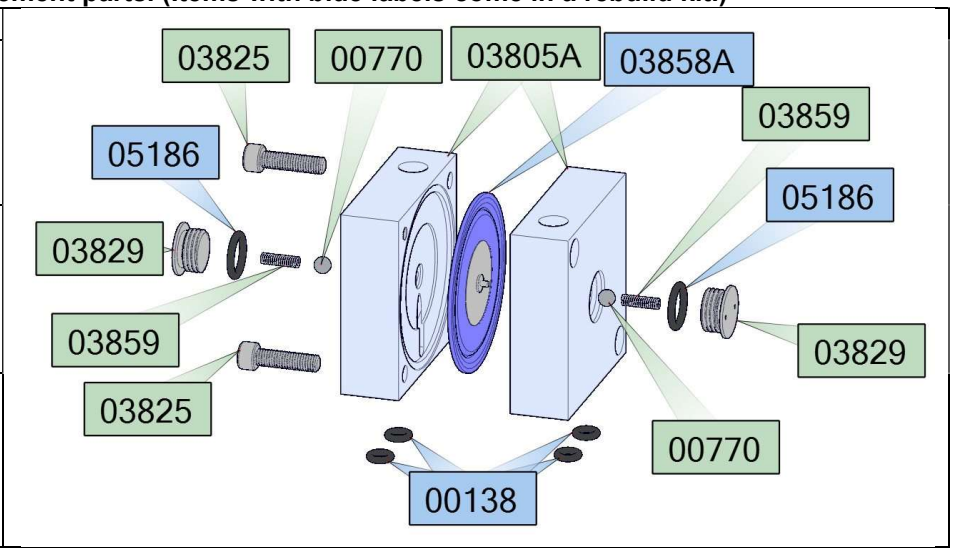
Holding the diaphragm alignment tool in hand, place the “A” Block onto the alignment tool with the diaphragm cavity facing up.	Place the diaphragm into the cavity.	Place the “B” block on top of the assembly with the diaphragm cavity facing down.
		
Align block assemblies for proper gas flow. Three holes on each side of each block, top and bottom must be aligned.	Insert the second diaphragm alignment tool into Block “B”, making sure the poppet pin on the diaphragm seats into the alignment tool.	Fasten block “A” and “B” together loosely with 2 screws.
		
Holding the 2 diaphragm alignment tools in place, lay the entire assembly one of its surfaces on a flat surface. This will align blocks properly for mating with valve block.	Using a 5/32” Allen wrench, tighten the previously installed two (2) screws holding blocks “A” and “B” together. Torque to 60 in/lbs	Install and tighten, using a 5/32” Allen Wrench, remaining two (2) screws to opposite side of “A” and “B” block assembly. Torque to 60 in/lbs.
		

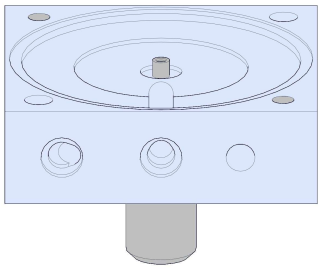
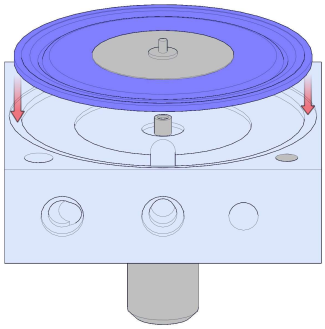
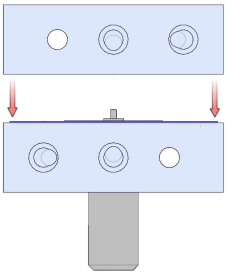
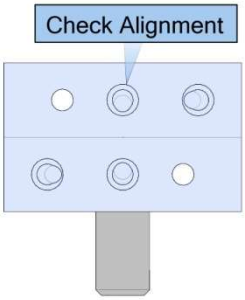
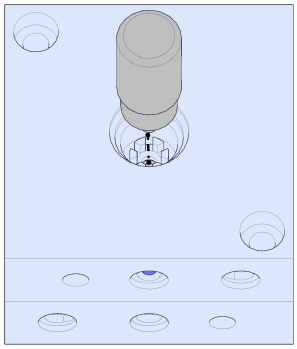
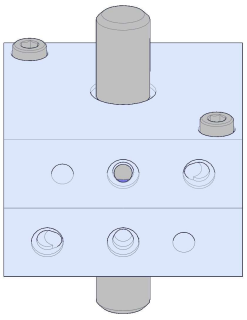
Remove both diaphragm alignment tools and place “A” and “B” block assembly on its side.	Place ball into seat.	Lightly lubricate O-ring with lubricant and install on Balance Block Cap. **Repeat this with the other Balance Block Cap.**
		
Place a very small amount of lubricant grease on one end of the spring, then install lubricated end into the balance block cap.	Install cap and spring into block assembly and tighten in place using spanner wrench. Torque to 30 in/lbs.	Place block assembly “AB” on opposite side.
		
Place the 2nd ball into its seat.	Place a very small amount of lubricant grease on one end of the second spring, then install the lubricated into the second balance block cap.	Install cap and spring into the block assembly and tighten in place using the spanner wrench. Torque to 30 in/lbs. Place the block aside for final assembly.
		

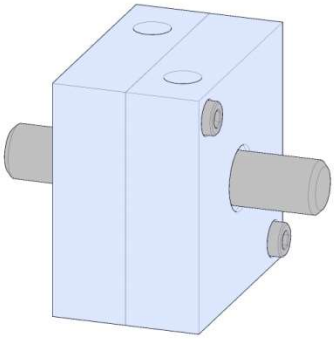
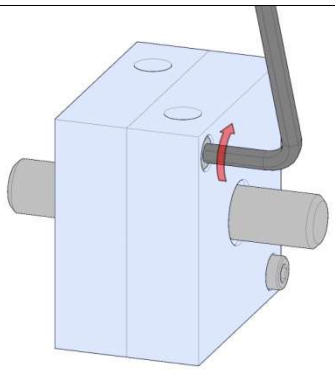
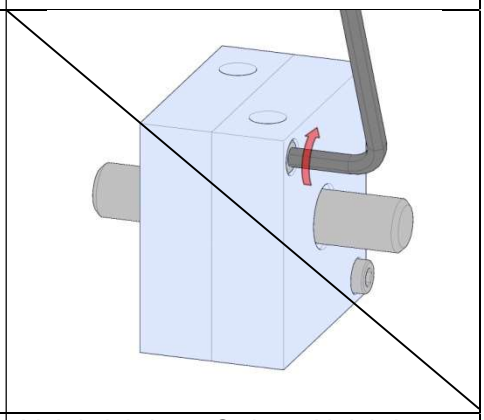
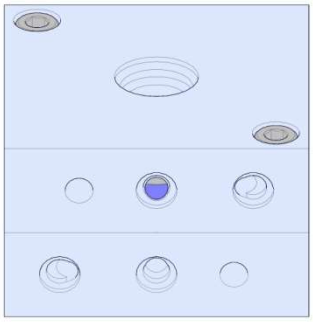
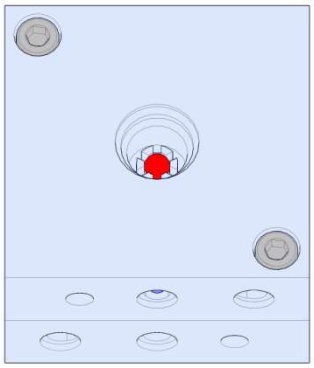
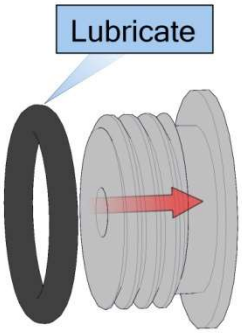
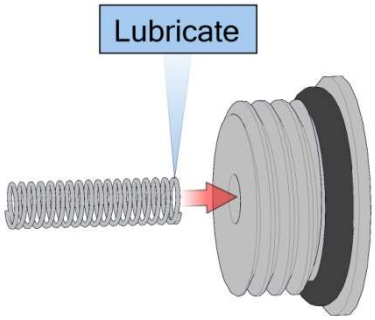
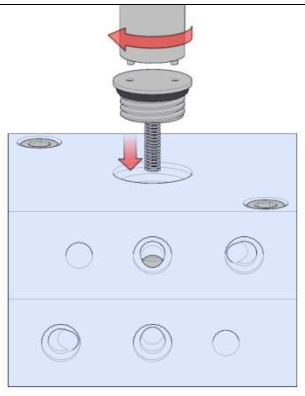
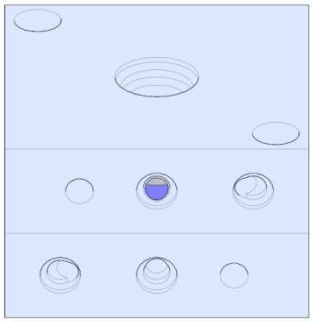
10.3.8.2 Rear Balance Block Reassembly

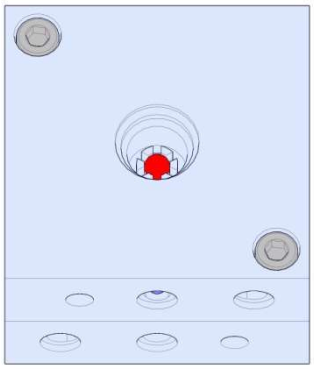
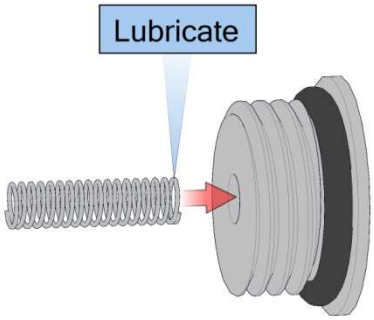
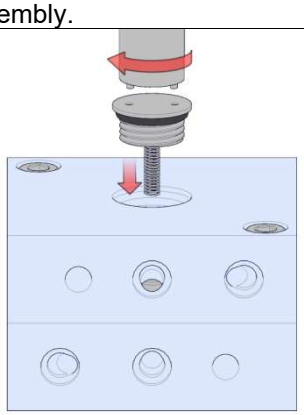
Rear Balance Block assembly replacement parts. (Items with blue labels come in a rebuild kit.)

Part No.	QTY	Description
00138	4	O-ring
03858A	1	Diaphragm
05186	2	O-ring

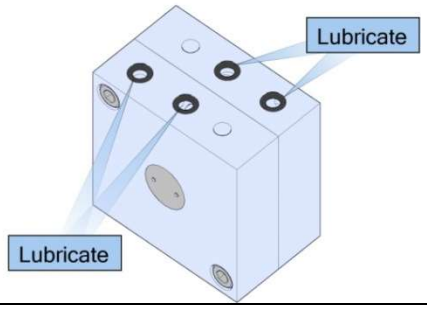
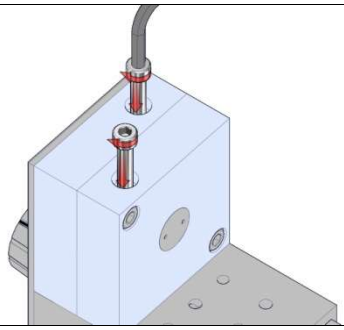
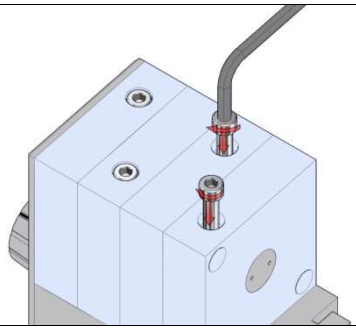


Holding the diaphragm alignment tool in hand, place the “C” Block onto the alignment tool with the diaphragm cavity facing up.	Place the diaphragm into the cavity.	Place the “D” block on top of the assembly with the diaphragm cavity facing down.
		
Align block assemblies for proper gas flow. Three holes on each side of each block, top and bottom must be aligned.	Insert the second diaphragm alignment tool into Block “D”, making sure the poppet pin on the diaphragm seats into the alignment tool.	Fasten block “C” and “D” together loosely with 2 screws.
		

Holding the 2 diaphragm alignment tools in place, lay the entire assembly one of its surfaces on a flat surface. This will align blocks properly for mating with valve block.	Using a 5/32” Allen wrench, tighten the previously installed two (2) screws holding blocks “C” and “D” together. Torque to 60 in/lbs	DO NOT attach the other two screws on the opposite side at this time.
		
Remove both diaphragm alignment tools and place “C” and “D” block assembly on its side.	Place ball into seat.	Lightly lubricate O-ring with lubricant and install one Balance Block Cap. **Repeat this with the other Balance Block Cap.**
		
Place a very small amount of lubricant grease on one end of the spring, then install lubricated end into the balance block cap.	Install cap and spring into block assembly and tighten in place using spanner wrench. Torque to 30 in/lbs.	Place block assembly “CD” on opposite side.
		

Place the 2nd ball into its seat.	Place a very small amount of lubricant grease on one end of the second spring, then install the lubricated into the second balance block cap.	Install cap and spring into the block assembly and tighten in place using the spanner wrench. Torque to 30 in/lbs. Place the block aside for final assembly.
		

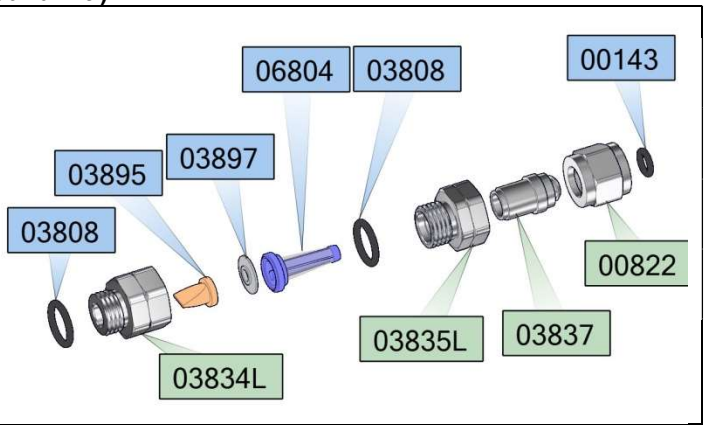
10.3.8.3 Balance Block Reassembly to Blender

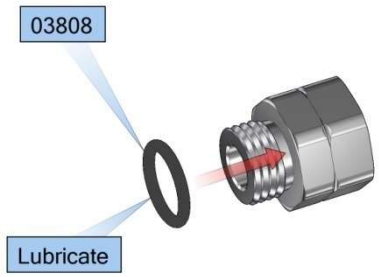
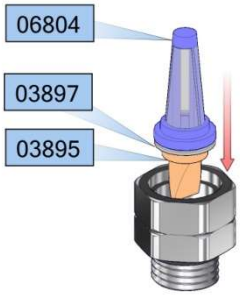
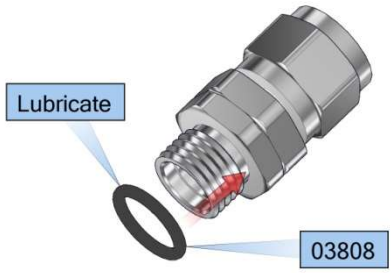
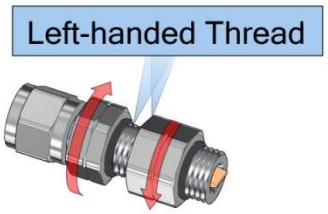
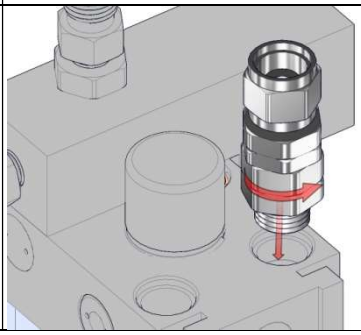
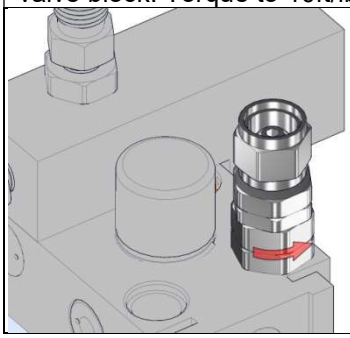
Assemble four lubricated O-rings each, to two balance block assemblies.	Using a 5/32” Allen wrench and a torque wrench, secure the Front balance block (block “AB”) to the valve block with two screws. Tighten screws to 60 in/lbs.	Using a 5/32” Allen wrench and a torque wrench, secure the Rear balance block “CD” to the valve block. Tighten screws to 60 in/lbs.
		
Note: Align balance block assemblies squarely with valve block prior to tightening in place.		

10.3.9 Oxygen Inlet Reassembly

Replacement Parts (Items with blue labels come in a rebuild kit.)

Part No.	QTY	Description
00143	1	O-ring
03808	2	O-ring
03895	1	Duckbill Check Valve
03897	1	Washer
06804	1	Inlet Cone Filter

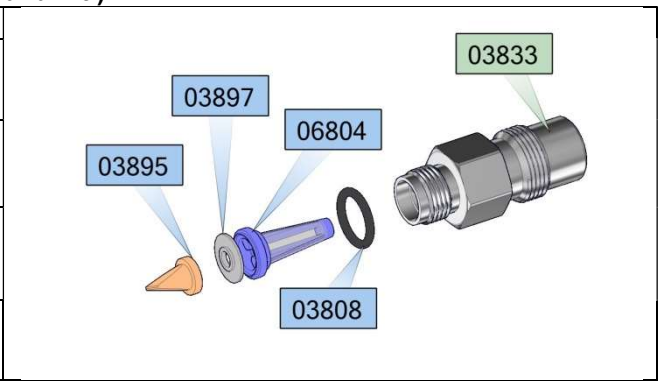


Lightly lubricate O-ring (03808) with lubricant and assemble to O_2 connector.	Insert duckbill check valve, washer, and cone filter into O_2 connector. **NOTE: Step on washer fits into duckbill check-valve.**	Lightly lubricate O-ring (03808) with lubricant and assemble to O_2 filter retainer.
		
Using (2) ¾" open end wrenches, tighten the O2 connector to the filter retainer. Torque to 10 ft/lbs.	Take non-lubricated O-ring (00143) and assemble to tail piece.	Hand tighten oxygen inlet assembly into valve block port. Note: This assembly threads into the block with a left hand thread. Turn Counter-Clockwise to tighten. Single groove on nut indicated left hand thread.
		
With ¾" wrench, secure assembly to valve block. Torque to 10ft/lbs.		
		

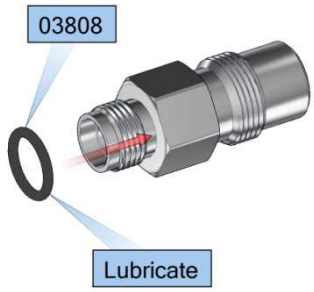
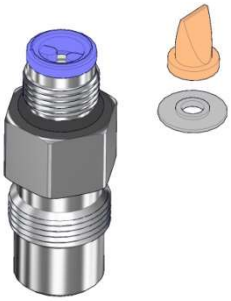
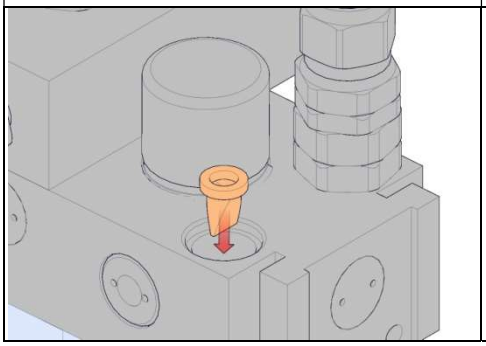
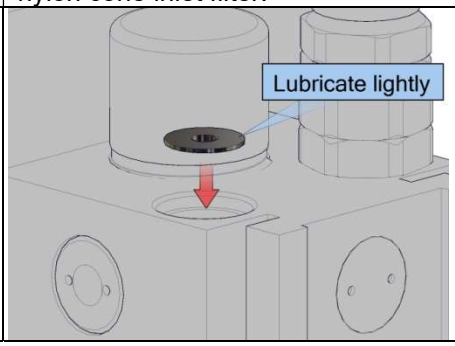
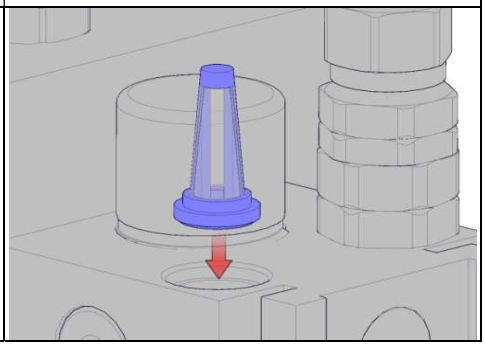
10.3.10 Air Inlet Reassembly

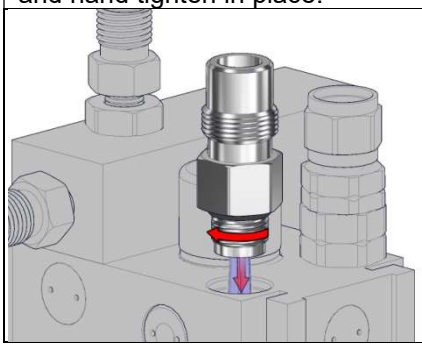
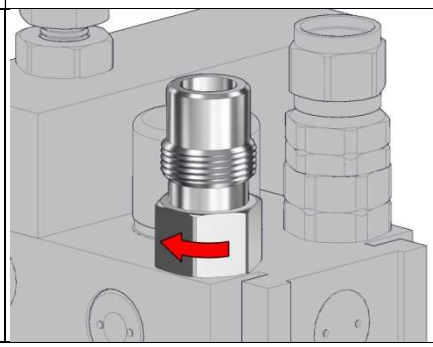
Replacement Parts (Items with blue labels come in a rebuild kit.)

Part No.	QTY	Description
03808	1	O-ring
03895	1	Duckbill Check Valve
03897	1	Washer
06804	1	Inlet Cone Filter



Clean all parts in an ultrasonic cleaner. Ensure all passages are blown completely dry before beginning reassembly.

Install lightly lubricated O-ring with lubricant on air inlet connection.	Place inlet cone filter inside air inlet.	Set air inlet aside with duckbill check valve and washer for final assembly to valve block.
		
Install duckbill check valve in air inlet port with bill facing inside cavity.	Place washer on top of duckbill check valve. Raised step fits into duckbill. Note: Lightly lubricate both sides of washer to prevent binding or twisting between duckbill check valve and nylon cone inlet filter.	Place large diameter end of nylon cone inlet filter into air inlet port on valve block.
		

Install air inlet fitting with lubricated O-ring into air inlet port on valve block and hand tighten in place.	Using a ¾" wrench, secure air inlet into valve block. Torque to 10ft/lbs.	
		

10.4 Set-up Procedure for Testing

The Maxblend should be tested in a system which closely duplicates the conditions for use for which the blender was designed. Illustrated below is a schematic diagram of the system that should be used to test the Maxblend.

10.4.1 Calibration Tools/Equipment

Thin Bladed Screwdriver or Knife	1/8" Allen Wrench	9/32" Nut Driver
Bird Spanner Wrench (P/N 03849)	11/16" Open End Wrench	Oxygen Regulator (2 Stage, Adjustable 0-80 PSIG)
Air Regulator (2 Stage, Adjustable 0-80 PSIG)	Oxygen Flow meter (0-35 LPN)	90° Elbow Adapter (P/N 00066)
1" Crooked Neck Pole or equivalent	Oxygen Analyzer (analyzer should read in tenths to ensure accuracy of calibration	Female Post Bracket (P/N 04322)
Oxygen Sampling Hose (P/N 07572)	Hex Nut (P/N 00822)	Tapered Nipple (P/N 00680)
Flow meter Adapter (P/N 00673)	1 1/8" open end wrench	7/8" open end wrench

10.4.2 Air/Oxygen Setup

- The gas supplies must be clean and dry and have the ability to generate 80 PSIG for both air and oxygen inlet pressures.
- When high pressure tanks are utilized, blow potential debris from the valve; quickly open and close each valve to prevent debris from entering the test equipment.
- Connect recommended adjustable air and oxygen regulators to each gas supply securing it with a 1 1/8" open end wrench.
- Turn the oxygen and air regulator control knobs to full counterclockwise closed position.
- Secure the air and oxygen high pressure hoses to each regulator using applicable open end wrenches.

10.4.3 Oxygen Analyzer Setup/Calibration

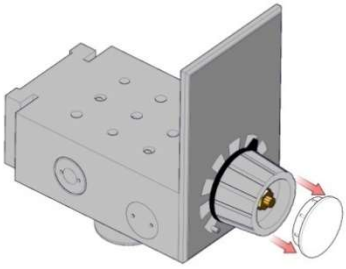
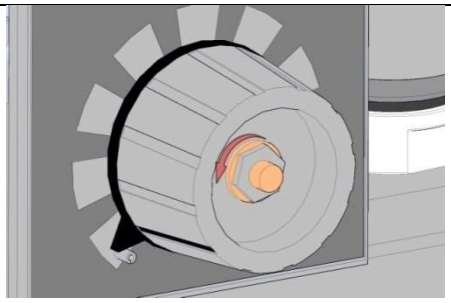
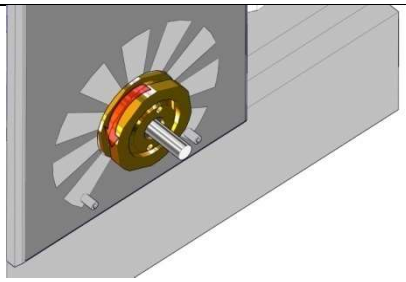
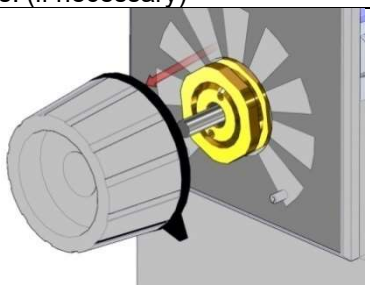
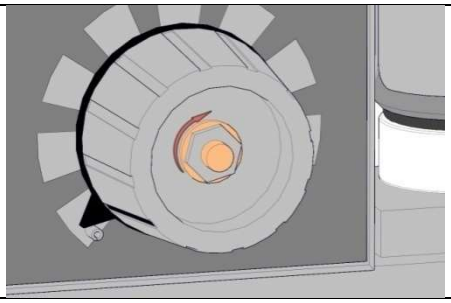
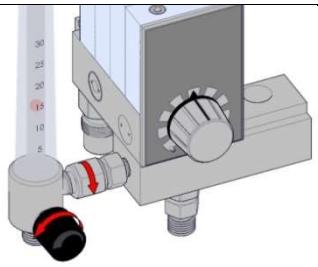
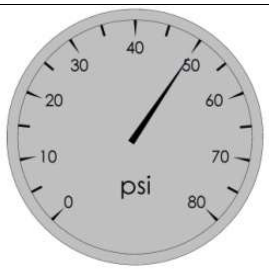
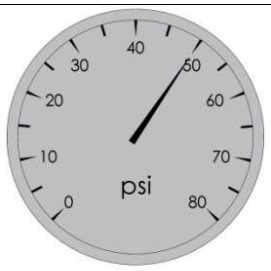
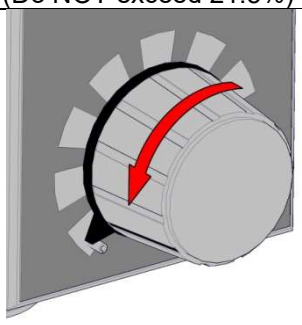
- The accuracy of the calibration of the microblender portion of the Maxblend will depend heavily upon the accuracy of the oxygen analyzer.
- Calibrate the oxygen analyzer in room air by exposing the oxygen sensor to room air and pushing the calibration button with the analyzer set to calibrate at room air.
- In instances where you are measuring concentrations near 100% oxygen, calibrate the analyzer by exposing the oxygen sensor to 100% medical grade oxygen. Push the calibration button with the analyzer set to calibrate at 100%.

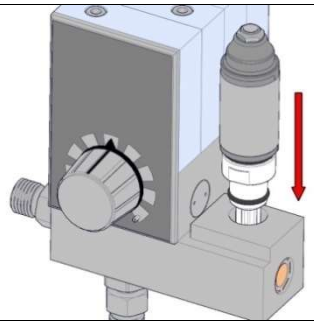
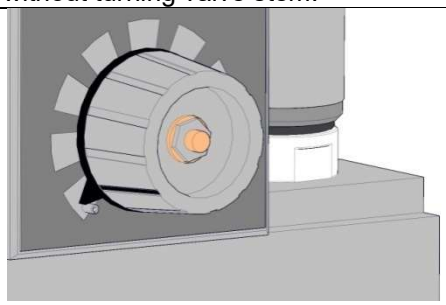
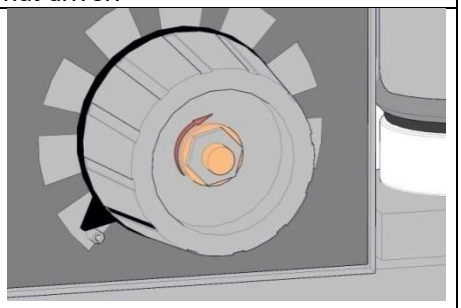
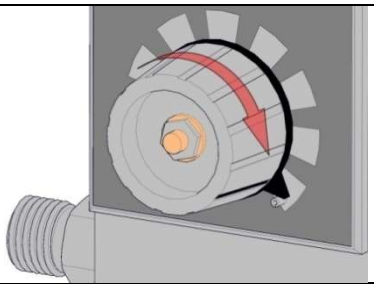
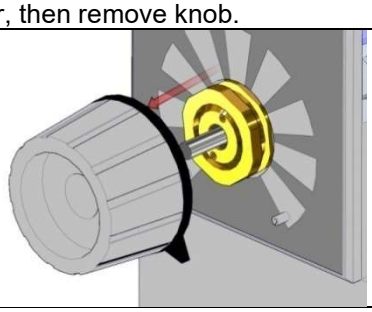
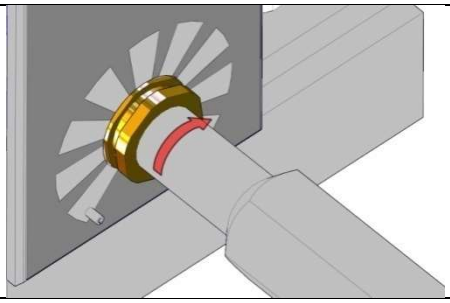
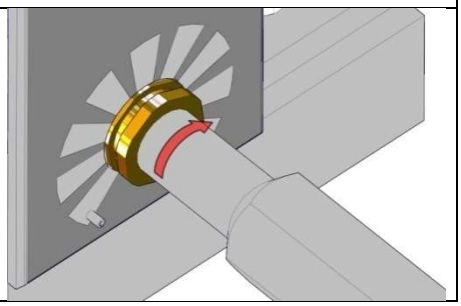
10.4.4 Test Equipment Setup

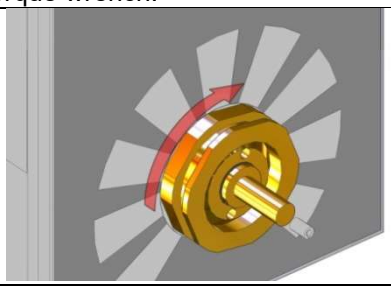
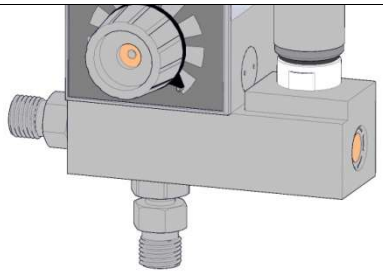
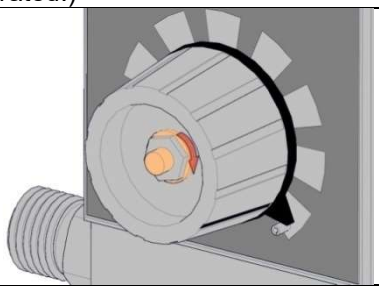
- Secure a female post bracket (P/N 04322) to a 1 inch diameter pole.
- Install the built in male post bracket on the Maxblend into the female post bracket on the pole.
- Using 7/8” and 11/16” open end wrenches, secure the air and oxygen high pressure hoses to the Maxblend inlets.
- Attach and secure flow meter, in upright position, to left side outlet. Note: Insure flow meter is turned OFF.
- Secure tapered nipple and hex nut to flow meter outlet.
- Attach one end of connecting hose to flow meter and other end to bifurcation. Ensure one-way valve is secured into remaining large opening of bifurcation. Attach remaining outlet of bifurcation to oxygen analyzer probe.
- The system is now ready for calibration.

10.5 Calibration Procedure

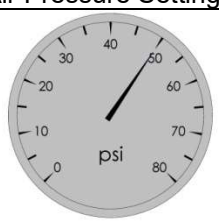
10.5.1 Proportioning Valve

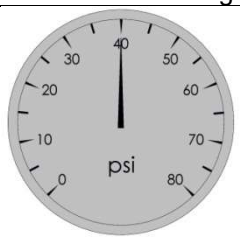
Remove the control knob cap (if necessary).	With a 9/32” nut driver, loosen collet nut sufficiently until the knob may be removed.	Loosen the front plate lock nut. (if necessary)
		
Remove control knob and carefully rotate valve stem with fingers counter clockwise so valve just seats. (if necessary)	Place knob on valve stem shaft with black pointer at 21% stop, and secure with 9/32” nut driver.	Turn air and oxygen sources ON. Attach and adjust flow meter (attach to outlet) to 15 LPM.
		
Verify air regulator is set to 50 PSIG.	Verify oxygen regulator set to 50 PSIG.	Rotate control knob slowly until oxygen concentration on analyzer stabilizes between 21.1% and 21.5% (Do NOT exceed 21.5%)
 AIR	 Oxygen	

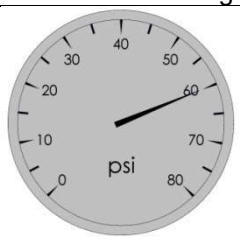
Insert the Max250E sensor into the oxygen sensor port. Connect sensor cable to analyzer portion of the MaxBlend.	Hold knob securely with fingers and loosen collet nut, rotate black pointer counterclockwise to 21% stop without turning valve stem.	Check oxygen concentration for correct reading and tighten collet nut securely to valve stem using 9/32" nut driver.
		
Recheck oxygen concentration after tightening lock nuts and repeat previous steps if necessary.	Carefully roate control knob fully clockwise to 100% stop position. DO NOT force.	Hold knob securely with fingers and loosen collet nut with 9/32" nut driver, then remove knob.
		
With the spanner wrench, carefully rotate the front seat in a clockwise direction until the rear stem lightly touches its seat. Note" This can be detected by a sudden increase in resistance to further rotation. CAUTION: Rotating the front seat pas this point may damage the rear seat and/or rear stem.	Observe the oxygen percentage and allow the analyzer to stabilize before continuing.	The oxygen concentration should exceed 99.5%, ideally reaching 100%. If it doesn't, verify the rear stem is seated by slightly roating the front seat further clockwise. DO NOT force.
		

Tighten the front plate locknut to secure the front plate to the valve block assembly with an 11/16" torque wrench.	Install control knob with black pointer at the 100% stop.	Using a 9/32" nut driver, tighten the collet nut on the control knob to the valve stem. (The end points are now calibrated.)
		

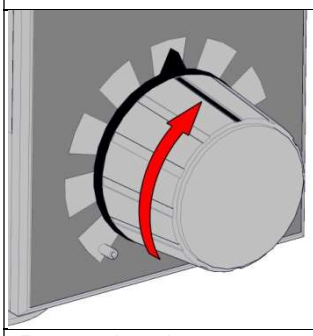
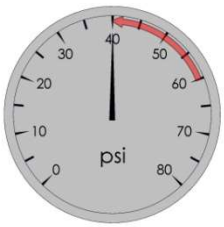
Perform the following checks of %O2 at the settings listed in the table below. Verify that the %O2 Concentration is within the limits specified and ensure that the air and oxygen inlet pressures are specified pressure setting. Ensure that the knob is at the specified knob setting.

Knob Setting	O2 Pressure Setting	Air Pressure Setting	% Concentration
21			**21.0-22.0**
30			**27.0-33.0**
60			**57.0-63.0**
90			**87.0-93.0**
100			**99.0-100**

Knob Setting	O2 Pressure Setting	Air Pressure Setting	% Concentration
30			**27.0-33.0**
60			**57.0-63.0**
90			**87.0-93.0**

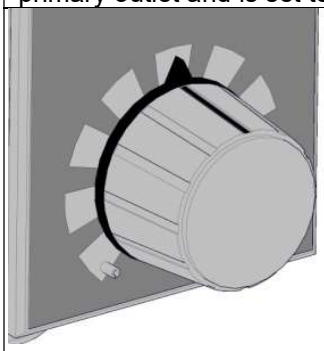
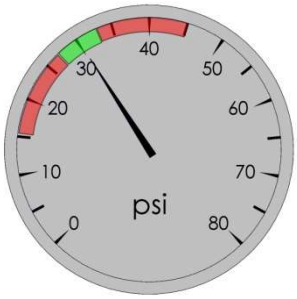
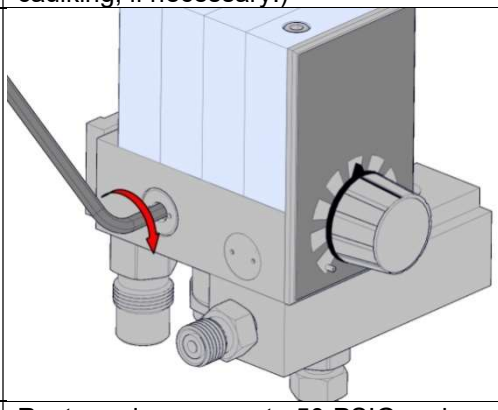
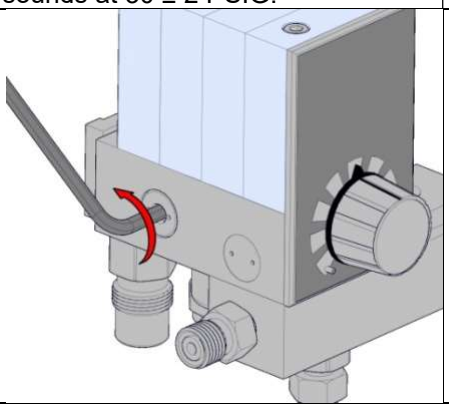
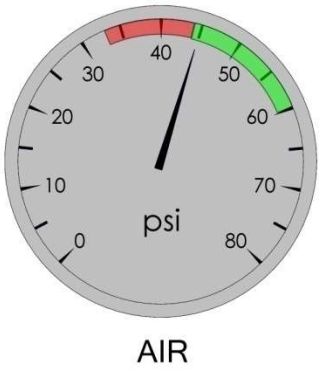
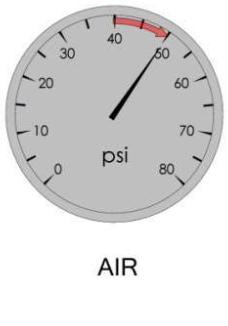
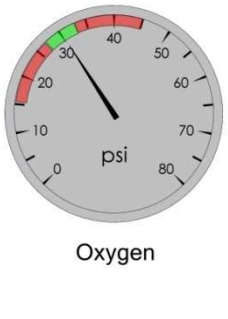
Knob Setting	O2 Pressure Setting	Air Pressure Setting	% Concentration
30			**27.0-33.0**
60			**57.0-63.0**
90			**87.0-93.0**

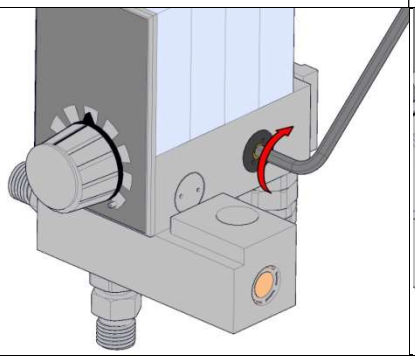
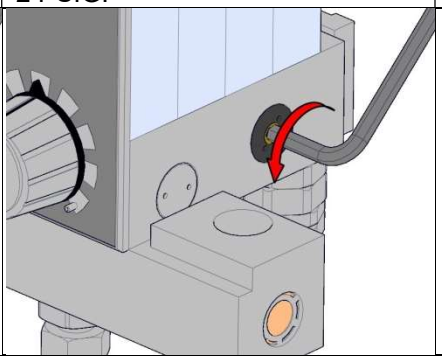
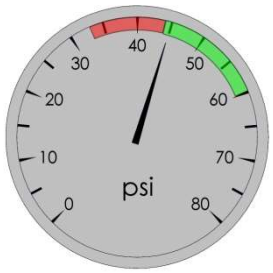
If concentrations meet specifications continue to next procedure. If concentrations do not meet specifications repeat the Front and Rear Seat Leak Test (See section 10.3.8).

Adjust control knob to 60% oxygen setting and set air/oxygen pressure to 50 PSIG.	Increase air pressure from 50 PSIG (3.52 kg/cm^2) to 60 PSIG (4.22 kg/cm^2). O2% on oxygen analyzer should read 57%-63%.	Lower air pressure from 60 PSIG (4.22 kg/cm^2) to 40 PSIG (2.81 kg/cm^2). O2% on oxygen analyzer should read 57-63%.
	 AIR	 AIR
Return the air pressure to 50 PSIG (3.52 kg/cm^2).	Increase oxygen pressure from 50 PSIG (3.52 kg/cm^2) to 60 PSIG (4.22 kg/cm^2). O2% on oxygen analyzer should read 57%-63%.	Lower oxygen pressure from 60 PSIG (4.22 kg/cm^2) to 40 PSIG (2.81 kg/cm^2). O2% on oxygen analyzer should read 57-63%.
 AIR	 Oxygen	 Oxygen

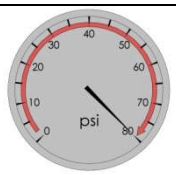
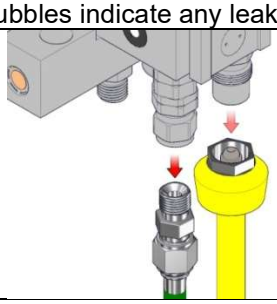
10.5.2 Alarm Calibration

The alarm system is designed to sound an audible tone if the inlet pressures differ by 20 PSIG or more, such as if either source gas failed.
When the Maxblend is in the alarm phase, the remaining or higher pressure gas is routed to the blender outlet. Some gas will also flow through the alarm reed valve creating an audible tone. This gas then exits out the bottom of the blender module.

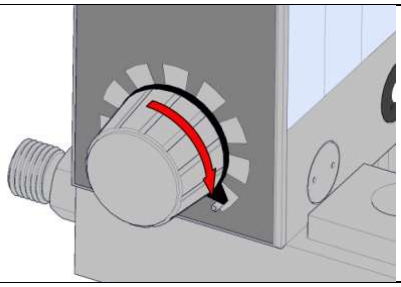
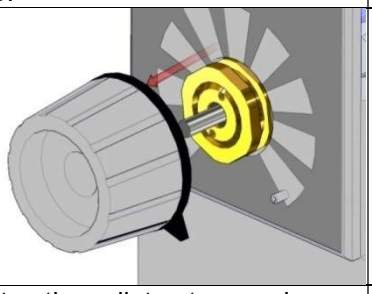
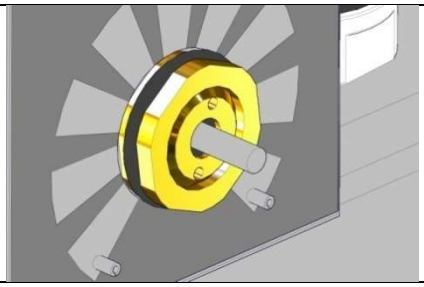
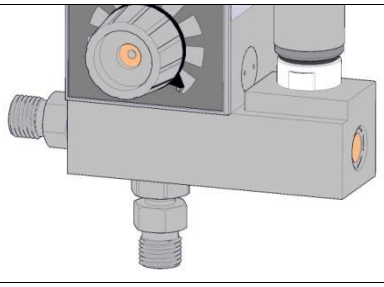
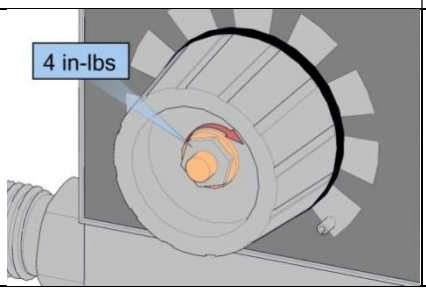
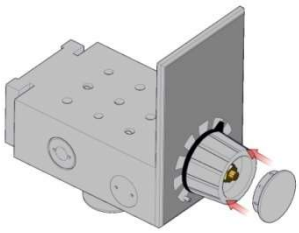
Ensure air and oxygen regulators are adjusted to a static 50 PSIG, align control knob indicator to 60%, ensure flow meter is connected to primary outlet and is set to 15 LPM	Reduce air pressure until the audible alarm sounds. The air pressure should read 30 ± 2 PSIG	If alarm sounds above this pressure, rotate adjuster clockwise on the left side of the blender, with a 1/8” Allen wrench until alarm sounds at 30 ± 2 PSIG. (Remove caulking, if necessary.)
		
If Alarm sounds blow this pressure, rotate adjuster counterclockwise on the left side of the blender with a 1/8” Allen wrench until alarm sounds at 30 ± 2 PSIG.	Raise air pressure slowly. Alarm/bypass should reset to normal function when pressure reaches 44 PSIG or above.	Restore air pressure to 50 PSIG and reduce oxygen pressure until the audible alarm sounds. The oxygen pressure must be 30 ± 2 PSIG.
		 

If alarm sounds above this pressure, rotate adjuster clockwise on the right side of the blender, with a 1/8” Allen wrench until alarm sounds at 30 ± 2 PSIG.	If Alarm sounds blow this pressure, rotate adjuster counterclockwise on the right side of the blender with a 1/8” Allen wrench until alarm sounds at 30 ± 2 PSIG.	Raise oxygen pressure slowly. Alarm bypass should reset to normal function when pressure reaches 44 PSIG or above.
		 Oxygen

10.5.3 Inlet Check Valve Leak Test

Disconnect oxygen hose assembly from gas source. Remove all connections from blender outlets to ensure that there is no outlet flow from blender.	
Place free end of oxygen supply hose under water to check for leakage past oxygen inlet check valve. Gradually increase air supply pressure from 0 to 80 PSIG.	 AIR
Reconnect oxygen hose assembly to gas source. Disconnect air hose assembly from gas source.	
Place free end of air supply hose under water to check for leakage past air inlet check valve. Gradually increase oxygen supply pressure from 0 to 80 PSIG.	 Oxygen
Replace duckbill check valves in inlets if bubbles indicate any leakage.	
Disconnect both high pressure lines from blender, remove blender from test assembly. Calibration is complete.	

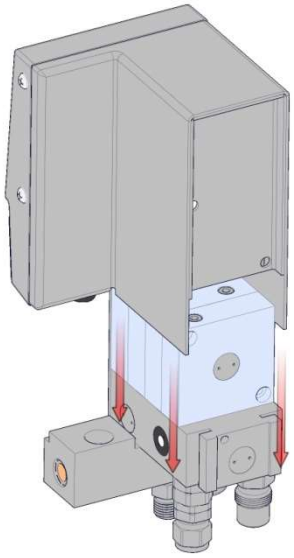
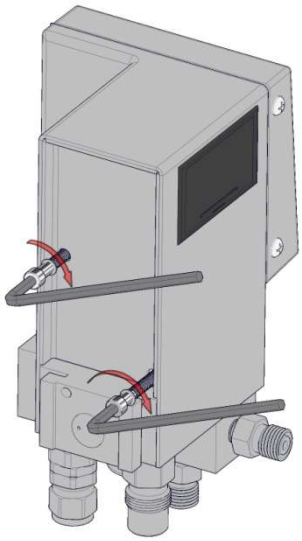
10.5.4 Installation of Control Knob Friction O-ring

Rotate control knob fully to 100% position. Check O_2 Concentration	Using a 9/32” nut driver, loosen collet nut and remove control knob.	Install O-ring on front seat lock nut.
		
Push control knob onto front valve stem, seating it fully on the locknut O-ring with the black pointer at the 100% position. Be careful not to rotate valve stem.	Tighten the collet nut securely, using a 9/32” socket. Torque to 4 in-lbs.	Recheck 100%-21% O_2 Concentration. Snap control knob cap into the control knob.
		

10.5.5 Blender Alarm Bypass Check

Blender Adjustment	Blender Response
1. Connect 50±5 PSIG (3.52±.035kg/cm^2) air/oxygen source gases. Adjust control knob to 60%. Connect flow meter to auxiliary outlet (left side). Set flow to 5 LPM minimum.	1. Alarm/Bypass should not activate.
2. Connect an oxygen flow meter to auxiliary outlet (left side) and disconnect 50 PSIG (3.52kg/cm^2) air source from blender. Note: The blender must be flowing gas for the alarm to activate.	2. Audible alarm.
3. Reconnect 50 PSIG (3.52±.035kg/cm^2) air source to blender.	3. Audible alarm stops. Verify oxygen concentration (57% to 63%) with an oxygen analyzer.
4. Disconnect 50 PSIG (3.52±.035kg/cm^2) oxygen source from blender.	4. Audible alarm
5. Reconnect 50 PSIG (3.52±.035kg/cm^2) oxygen source from blender.	5. Audible alarm stops. Verify oxygen concentration (57% to 63%) with an oxygen analyzer (the oxygen monitor assembly.)
6. Set oxygen flow meter to 1 LPM	6. Oxygen analyzer should read 57% to 63% when measured from the flow meter outlet.

10.5.6 Oxygen Monitor Reassembly (Front and Top Overassembly)

Slide the Oxygen Monitor Assembly over the top of the microblender assembly.	Using a 5/32” Allen wrench fasten the oxygen monitor assembly to the microblender assembly using two bolts. (Also include two washers.
	

11.0 CLEANING AND STERILIZATION

Blenders manufactured by Bird Products Corporation are compatible with ethylene oxide gas sterilization. (The electronics portion of the blend is not compatible with ethylene oxide gas sterilization.
CAUTIONS:

- DO NOT steam autoclave or otherwise subject the Maxblend to temperatures over 145°F (62°C).
- DO NOT immerse assembled High flow Microblender into liquid decontamination agents.
- DO NOT use any strong solvent or abrasive cleaners on labels

12.0 MAINTENANCE AND SERVICE POLICY

Caution: The High flow Maxblend should be serviced or calibrated by a Maxtec trained hospital/dealer service technician.

The High flow Maxblend should be subject to a regular maintenance and service program, including periodic accuracy checks between normal overhauls. Although the frequency of these tests will vary depending on degree and severity of service, it is recommended that they be performed at least once every six (6) months under the best of conditions. Elastomer components such as diaphragms and O-rings are designed to function satisfactorily for a minimum of 2 years. The need for cleaning and replacement will depend on gas line conditions and will be indicated by the blender not meeting its specification performance. Maxtec recommends that complete maintenance be performed at least every two (2) years. Elastomer components will not function indefinitely, and the probability of their causing malfunctions increases progressively after 2 years of use.

13.0 REPLACMENT PARTS

Part Number	Description	Quantity Required
*00114D	O-ring (.117 x .040)	2
*00138D	O-ring (.176 x .070)	10
*00143D	O-ring (.239 x .070)	1
*00193D	O-ring (.364 x .070)	3
*00306D	O-ring (.114 x .070)	1
*00348D	O-ring (.310 x .070)	1
00770D	Ball, 3/16” Diameter	4
00822	Nut, 9/16” – 18 Hex	1
01866	Reed, Alarm Plate	1
*01943	O-ring (.437 x .070)	2
03310	Spring, .21 x .16 x .25LG	1
03312	Poppet Check Valve	1
*03314D	Ring, Retaining, Int., .39	1
*03319	Muffler Bleed	1
03805A	Blender, Balance Block MicroBlender	4
03806	PPT, Check Valve, MicroBlender	1
03914A	Block, Vlv MicroBlender, W plugs	1
*03808D	O-ring, (.4681D x .078)	4
03809	Conn. Aux. Outlet O2, ¼ BPT	1
03810	Spring, .210 x .156 x .437	1
03813	Bypass Adjuster	2
03816B	Poppet, Bypass .700	1
03817A	Spring, (.148 OD x .500)	2
03818	Front Valve Seat	1
03819D	Nut, Front Seat	1
03820	Stem, Valve Front, MicroBlender	1
03821	Valve Stem, Rear	1
03825D	Screw, 10-32 x .75” Socket Head Cap	8
03826D	Screw, 10-32 x 2.25 Socket Head Cap	4
03829	Cap, Balance Block	6
03833	Air Inlet Connector	1
03834L	Conn, 9/16-18 LH x 9/16-18 LH, 02	1
03835L	Conn, 7/17 – 27 x 9/19 -18 LH, 02	1
03837	Nipple, O2 Connector	1
03838	Housing, Check valve, Microblender	1
03840	Plate, Front Assembly Microblender	1
03854	Knob, assembly, Microblender Ctrl	1
*03858A	Diaphragm, Assembly	2
03859D	Spring (.118OD x .450 LG)	4
03864L	Inlet, 02 DISS	1
03869	Outlet, Auxiliary,	1
03870	Outlet, Primary	1
*03895D	Duckbill, Check Valve	2
*03897D	Washer, Step	2
*03903D	Plug, Foam Alarm	1
*04639D	O-ring, (.426 X .040)	1
04640	Spring, .210 x .020 x .55	2
04896	Cap, Bypass Seat	1
04897	Sleeve	1

Part Number	Description	Quantity Required
04898	Retainer, Check-ball	1
*04899	Ball, Check Rubber	1
*05163D	Spring (.093 x .053 x .300)	1
*05186D	O-ring (.414 x .070)	6
*05279D	O-ring (.614 x .070)	1
*05307D	O-ring (.239 x .070)	2
05436	Alarm Retainer Cap Assembly	1
*06804D	Nylon Cone Filter	2
*07849D	O-ring (.313 x .051)	1
31000	Spring	1

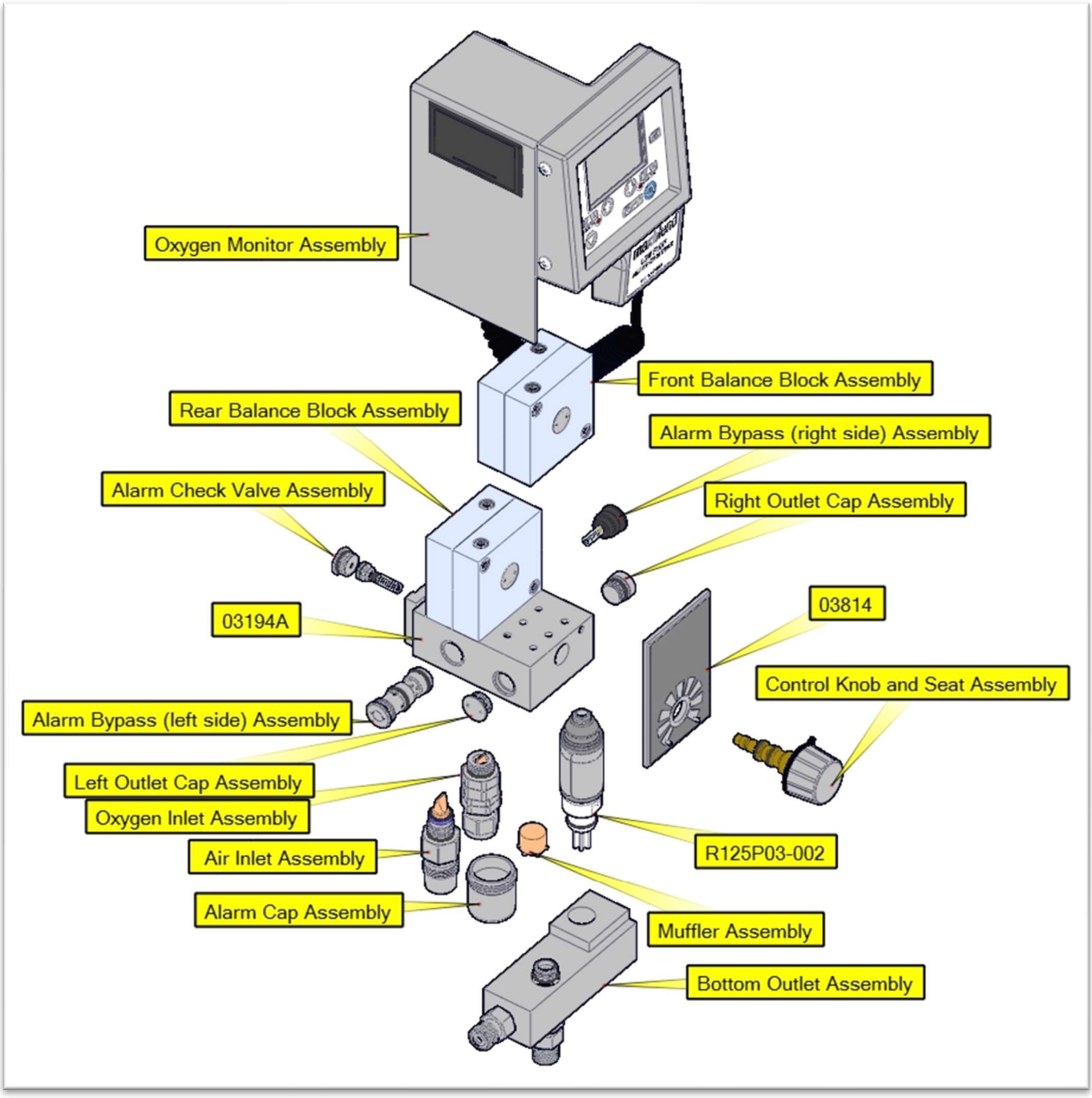
*Indicates parts are contained in Maintenance Kit, P/N 10003 (R200P02).
The “D” Suffix is used when ordering certain parts. These parts come in packages of 10. However, the “Quantity Required” column indicates the number of parts actually required for one High Flow MicroBlender.
Refer to the following pages for component illustration.

Note: Part numbers that are 5 digits long can be purchased from Viasys. Part numbers beginning with the letter “R” can be purchased from Maxtec.

13.1 High Flow MaxBlend (Air/Oxygen Blender) Components Illustration

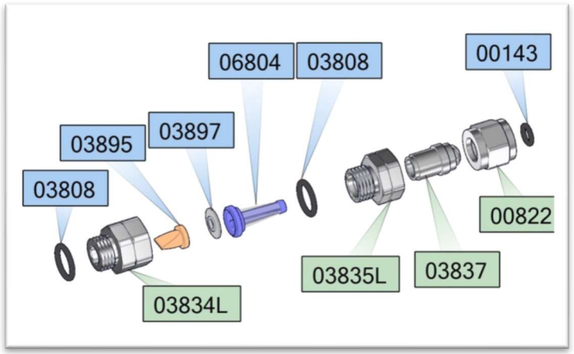
WARNING: THE MAXBLEND SHOULD BE SERVICED AND/OR CALIBRATED BY A MAXTEC TRAINED HOSPITAL/DEALER SERVICE TECHNICIAN OR BY MAXTEC SERVICE PERSONNEL.

CAUTION: Before attempting to service or repair the Maxblend the service person should first be familiar with its design and operation as explained in this manual. A numbering system is utilized, so that one can easily identify the steps involved with each operation.

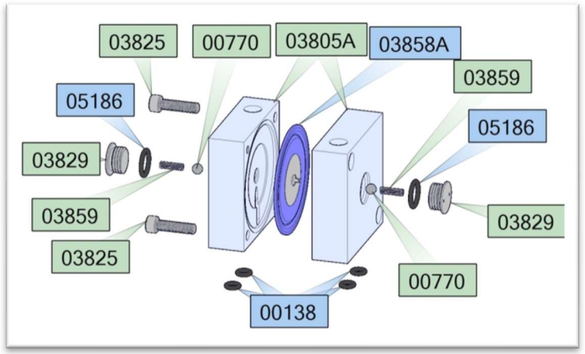


ASSEMBLY DIAGRAMS

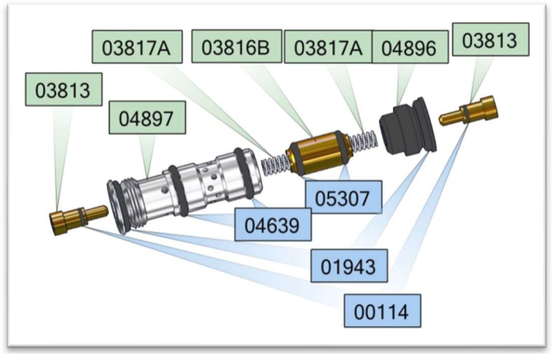
Oxygen Inlet Assembly Diagram



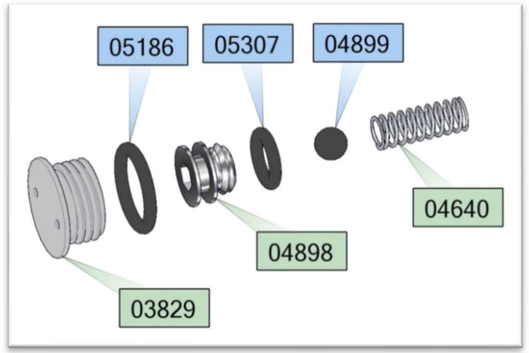
Rear Balance Block Assembly



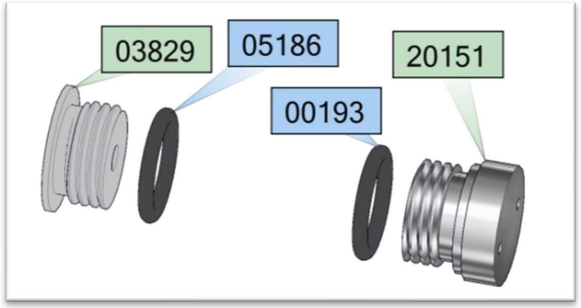
Alarm Bypass Assembly



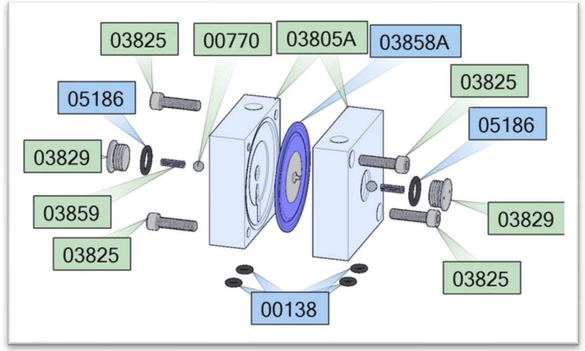
Alarm Check Valve Assembly



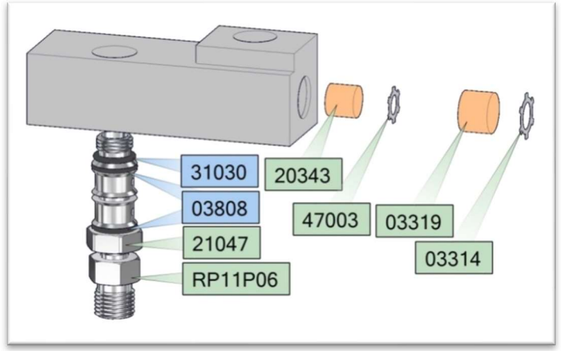
Left and Right Outlet Cap Assemblies



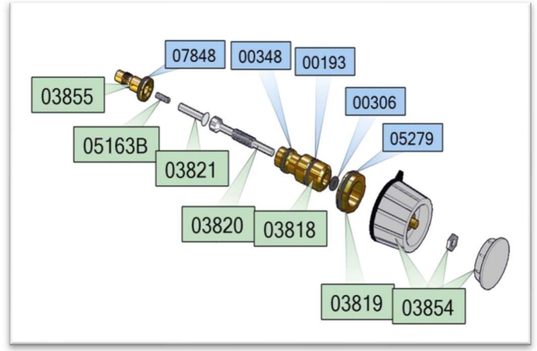
Front Balance Block Assembly



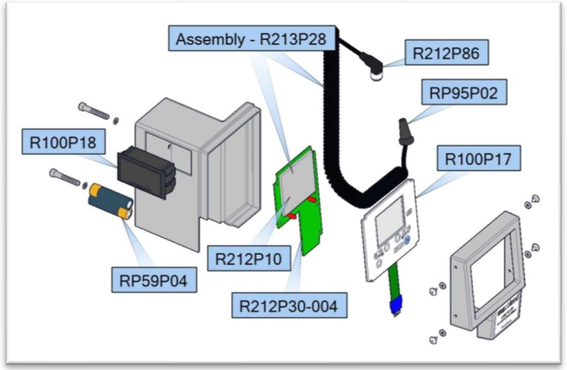
Bottom Outlet Assembly



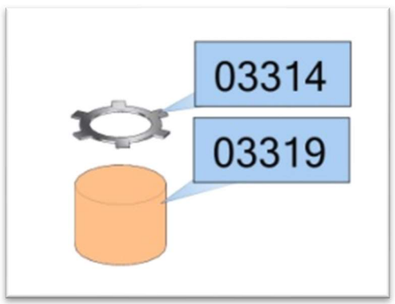
Control Knob and Seat Assembly



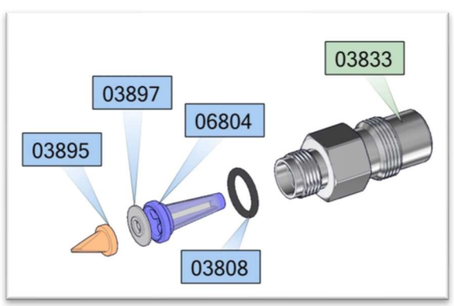
Oxygen Monitor Assembly



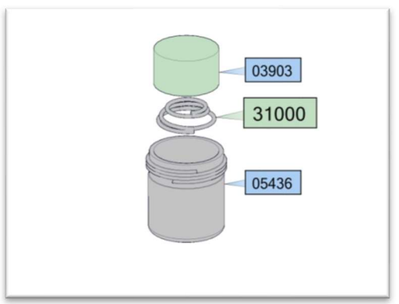
Muffler Assembly



Air Inlet Assembly



Alarm Cap Assembly



Note: Part numbers that are 5 digits long can be purchased from Viasys. Part numbers beginning with the letter “R” can be purchased from Maxtec.