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RPI FIELD SERVICE CALIBRATION KIT

RPI Part #MIK074

For servicing the Midmark • Ritter Ultra Clave®

For use with these models only:

M9 (S/N Series: CZ, DA, DB, DX, DY, FD & OM)

M9D (S/N Series: FF & FG)

M11 (S/N Series: ES, ET, FP, FR & GB)

M11D (S/N Series: GC & GC)

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This guide has been prepared to help troubleshoot, evaluate and repair the Midmark•Ritter M9 and M11 Ultra-Clave®.

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1.0 - LEAK DETECTION GUIDE

DOOR and/or DAM GASKET	Check for water or steam leaking around the door.
VENT SOLENOID VALVE	Check for water or steam leaking back into the reservoir through the condensing coil.
FILL SOLENOID VALVE	Check for water leaking back into the reservoir through the fill line by observing an increase in the reservoir water level and/or presence of bubbles.
BELLOWS VALVE	Check for excessive steam from the bellows line in the reservoir. Note: a slight "hiss" of steam is not uncommon.
PRESSURE RELIEF VALVE	Check for water leaking beneath the back of the sterilizer. <i>Caution: Release pressure in the sterilizer before replacing the pressure relief valve.</i>
PRESSURE SENSOR HOSE	Check for steam leaking onto or around the Main PC board.

2.0 - PLANNED MAINTENANCE (PM) CHECK LIST



Sterilizer PM Kit (RPI Part #MIK072)
for parts to fit the M9 UltraClave® sterilizer

Sterilizer PM Kit (RPI Part #MIK080)
for parts to fit the M11 UltraClave® sterilizer

DOOR GASKETS: MIG027 fits M9 and MIG028 fits M11

Remove the old door gasket. Clean the gasket groove in the door and chamber face. For easy installation of the new gasket, use the “South-East-West-North” method (i.e. begin installing the gasket at the bottom of the door, then install the left and right sides and finish at the top by squeezing in any of the excess, making sure that the gasket fits flush).

DAM GASKETS: MIG035 fits M9 and MIG036 fits M11

Use CAUTION when removing or installing the dam gasket – the door studs can be sharp. To install the door dam, align and place the dam gasket on and over the door studs. The dam must lie flat against the door (refer to the Installation Instructions included with the MIG035/MIG036 dam gasket).

DOOR SPRING: MIS076

Remove the old spring. Reuse the screw to install the two new door springs – one on top of the other. This will aid in the door opening.

FILTERS: MIF038 or MIF062

Depending on the age of the machine, you will need to replace either the sintered bronze style Chamber Filter (MIF038) or both the mesh style Chamber Filter and Vent Filter (MIF062). See below for instructions.

• **Chamber Filter (sintered bronze style filter) – MIF038:** If the machine has only a Chamber Filter – Remove all trays and the rack from the chamber. Clean the chamber, then remove the old chamber filter. Install new filter. Reinstall rack and trays.

• **Chamber & Vent Filters (mesh style filter) – MIF062:** If the machine has both a Chamber and a Vent Filter – Remove all trays and the rack from the chamber. Clean the chamber, then remove the chamber filter. Install the new filter. You must also replace the Vent Filter that serves as a filter for the steam trap/bellows and is located in the vent line to the tee fitting. Reinstall rack and trays.

After replacing the parts, check the reservoir and clean if dirt or debris are present. (Note: Debris is the #1 reason for Steam Trap/Bellows failure.) • Refill reservoir with **distilled water** only. • Conduct a temperature check using a Max Register Thermometer (RPI Part #RPT113). • Conduct a pressure check to identify any leaks that may need to be addressed.

3.0 - ERROR CODES AND OTHER DIAGNOSTICS

ERROR CODE 1

Power interruption to control PC board.

1. Overheat thermostat activates (opens).
 - Pressure leak during sterilization cycle.
 - Water sensor shorted (which will result in bypassing of filling phase).
 - Chamber water level too low.
 - High input voltage during drying cycle.
 - Faulty overheat thermostat.
2. Poor electrical connection or faulty wiring (bad power source to sterilizer).
3. Main PC board may be faulty.

ERROR CODE 2

The Stop button was depressed during the sterilization cycle.

ERROR CODE 3

The On/Standby button was depressed during the sterilization cycle.

ERROR CODE 4

Door ajar during sterilization cycle.

- Verify the door latch properly engages the door switch and the switch activates.
- Check door switch continuity and the wiring connections.

ERROR CODE 5

Excessive pressure (Pressure exceeds 35 psi).

- Sterilizer is overloaded.
- Bellows is closing prematurely trapping air in the chamber.
- Temperature probe is dirty or malfunctioning.
- Sterilizer may need to be re-calibrated. Refer to 5.0 - Calibration Procedure.

ERROR CODE 6

Excessive temperature (Temperature exceeds 277°F).

- Check for pressure leaks. Refer to 1.0 - Leak Detection Guide.
- Temperature probe is dirty or malfunctioning.
- Sterilizer may need to be re-calibrated. Refer to 5.0 - Calibration Procedure.

3.0 - ERROR CODES AND OTHER DIAGNOSTICS *(continued)*

ERROR CODE 7

Pressure display reads less than 24.5 psi.

- Check for pressure leaks. Refer to 1.0 - Leak Detection Guide.
- Temperature probe is dirty or malfunctioning.
- Sterilizer may need to be re-calibrated. Refer to 5.0 - Calibration Procedure.

ERROR CODE 8 or 9

Door malfunction: Error Code 8 – Door switch did not return to normally open condition after door pulse solenoid actuated. Error Code 9 – Display Pressure exceeded 0.9 PSI during the Dry cycle.

- If pressure reading is not at zero (0), sterilizer needs to be re-calibrated. Refer to 5.0 - Calibration Procedure.
- If door opens at end of cycle, check door switch continuity (normally open).
- If door does not open at end of cycle, refer to 4.0 - Door Opening Test Procedure.
- Inspect door mechanism for smooth operation. Lubricate if necessary.
- Check door switch and wire connections.
- Check door pulse solenoid.

ERROR CODE 10

Hardware and/or software problem – Watchdog timer reset error.

1. Poor electrical connection or faulty wiring (bad power source to sterilizer).
2. Main PC board may be faulty.

ERROR CODE 11

Software interruption error.

- Run additional cycles. If problem continues, replace the Main PC board.

ERROR CODE 12

Ram Test Error.

- Run additional cycles. If problem continues, replace the Main PC board.

3.0 - ERROR CODES AND OTHER DIAGNOSTICS *(continued)*

FUSE CHART *(Fuses located on Main PC Board)*

Printer Fuse

Fast Acting; 1/4" dia. x 1-1/4" Lg.; 3 Amp, 250 Volt

Line Fuse(s)

Fast Acting; 1/4" dia. x 1-1/4" Lg.; 15 Amp, 250 Volt

DRYING CYCLE DIP SWITCH SETTING

If sterilizer is overheating in Dry mode, check the settings.

Caution: Disconnect the power cord before changing these settings.

Off = Position switch to the left. On = Position switch to the right.

Coollest: Setting #1 #1 OFF #2 OFF #3 ON #4 ON	Warm: Setting #3 #1 OFF #2 OFF #3 OFF #4 OFF	If sterilizer needs to dry even cooler - Setting #5 #1 OFF #2 ON #3 ON #4 ON
Cool: Setting #2 #1 OFF #2 OFF #3 OFF #4 ON	Warmest: Setting #4 #1 OFF #2 OFF #3 ON #4 OFF	

LOW WATER ERROR

Ground Circuit continuity failed the (5) minute time limit.

If water is continuously filling the chamber:

- Check for an open circuit or corrosion on the Water Lever Sensor.
- Check temperature probe by disconnecting it from Main PC board.
- The fill valve may be stuck in the Open position.

If water flow is restricted or not present:

- Check for debris (dirt) on the filter and in the fill lines.
- Check fill valve for proper operation or debris.
- Water level sensor malfunction.

DISPLAY LIGHTS INACTIVE

Sterilizer displays temperature and pressure, but the LED status lights do not light up.

- Disconnect the power cord and wait 30 seconds (this will reset the internal CPU). Run additional cycles.

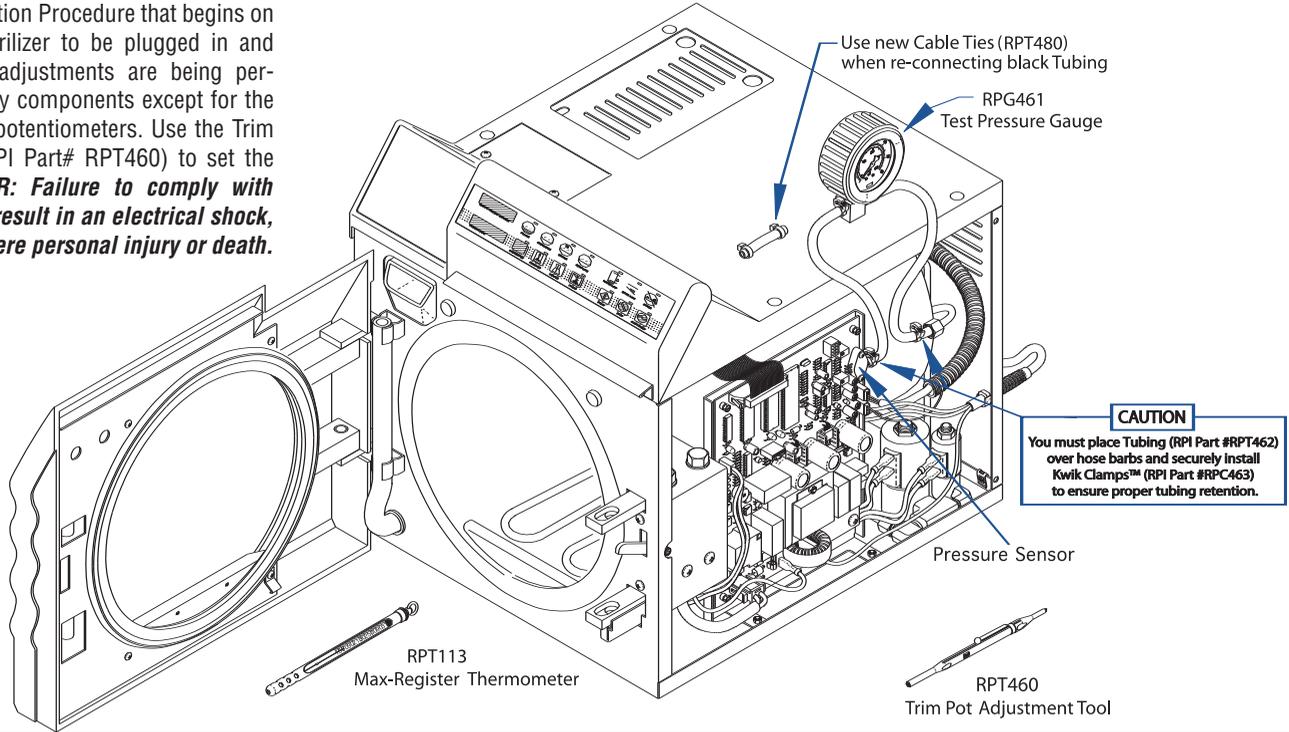
4.0 - DOOR OPENING TEST PROCEDURE

Note: This test will only verify that the door opening relay on the main PC board is functioning. A complete cycle is necessary to verify function of the sensors and the latching mechanism.

1. To execute test, start any sterilization cycle. After chamber has filled with water, the "sterilizing" LED will light up.
2. Disconnect the power cord.
3. Open the door.
4. Depress STOP and POUCHES button simultaneously while re-connecting the power cord.
5. Sequentially depress each button from left to right across the panel.
6. Close the door. In sequence, this will make active all relays on the Main PC board.
7. To repeat this procedure, simply repeat Steps #2 through #6.

5.0 - CALIBRATION PROCEDURE - PRESSURE/TEMPERATURE POTENTIOMETER ADJUSTMENTS

IMPORTANT The Calibration Procedure that begins on page 9 requires the sterilizer to be plugged in and powered up while the adjustments are being performed. Do not touch any components except for the adjusting screws of the potentiometers. Use the Trim Pot Adjustment Tool (RPI Part# RPT460) to set the potentiometers. **DANGER: Failure to comply with these instructions may result in an electrical shock, which may result in severe personal injury or death.**



5.0 - CALIBRATION PROCEDURE - PRESSURE/TEMPERATURE POTENTIOMETER ADJUSTMENTS *(continued)*

The pressure zero, pressure range, and temperature potentiometers must not be adjusted exclusively. If one potentiometer needs to be adjusted, then the entire potentiometer adjustment procedure must be performed, and it must be performed in the proper sequence as described in the steps below.

INSTRUCTIONS

- 1) Remove the power cord from the A.C. outlet. Remove right hand side panel.
- 2) Open the sterilizer door.
- 3) To begin diagnostics, go to page 10, see Figure 1.

AT-A-GLANCE CALIBRATION PROCEDURE

- 1) Open door.
- 2) Depress LIQUIDS and PACKS buttons at the same time as plugging in the power cord.
- 3.) Starting with UNWRAP button, depress and release all buttons from left to right across panel.
- 4) Turn **pressure zero pot #1** counter-clockwise to **0.0 PSI**. Then turn clockwise until the display pressure reads **0.1 PSI**.
- 5) Depending on if the board is old or new, connect multi-meter leads as shown in Figure 2 on page 13 (old), or Figure 3 on page 14 (new).
- 6) Adjust **temperature pot #3** to 2.56 VDC reading on multi-meter.
- 7) Connect the test pressure gauge, close the door and press the START button.
- 8) Check for pressure leaks at this time. Refer to 1.0 Leak Detection Guide.
- 9) After display reaches 272°F, adjust the **pressure range pot #2** until the display pressure matches test pressure gauge to within +/- 0.5 PSI
- 10) Depress the STOP button to end the test cycle.
- 11) After the sterilizer vents and the door opens, unplug the power cord (main PC board to reset itself).

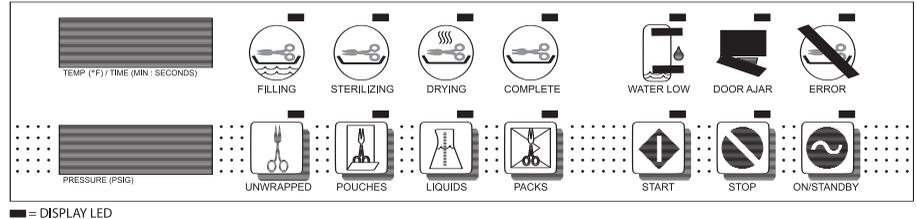
Figure 1 – Diagnostics Procedure (M9 & M11 and M9D & M11D Style Key Pad Displays)

Step #3 continued from page 9.

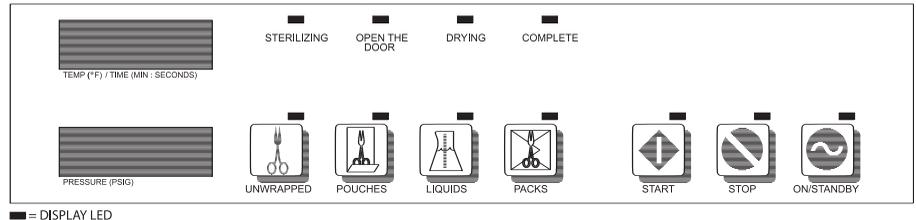
*Read the **IMPORTANT** note on page 8, before you begin the following steps.*

- Press and hold the LIQUIDS and PACKS buttons simultaneously while connecting the power cord into an A.C. outlet.
- Release the LIQUIDS and PACKS buttons simultaneously to cause the display PC Board LED's to individually illuminate, and then extinguish one at a time in a left to right sequence.
- Press and release the buttons in the following order and one at a time: UNWRAPPED, POUCHES, LIQUIDS, PACKS, START, STOP and ON/STANDBY. When each button is pressed, the corresponding LED will illuminate and stay illuminated. When the sequence is completed, the PRESSURE (PSI) display will display the pressure that the control PC board is reading and the TEMP (°F)/TIME (MIN: SECONDS) display will display the temperature that the control PC board is reading. When the displays register proper values, continue with calibration – proceed to Step #4, page 11.

M9 & M11 Style Key Pad Display



M9D & M11D Style Key Pad Display



5.0 - CALIBRATION PROCEDURE - PRESSURE/TEMPERATURE POTENTIOMETER ADJUSTMENTS *(continued)*

- 4) **PRESSURE ZERO ADJUSTMENT (Potentiometer #1):** Turn the adjusting screw of the pressure zero potentiometer, #1 (see Figures 2 and 3, pages 13-14), in the counter-clockwise direction until the Pressure (psi) display reads 0.0 psi (0.0 kPa). **(See Notes 1 and 2 below.)** Then turn clockwise until pressure display reads 0.1 psi (kPa).
- 5) **TEMPERATURE ADJUSTMENT (Potentiometer #3):** Continue by determining the style of PCB and confirming meter lead attachment points (see Figures 2 and 3, pages 13-14). Set the multi-meter to read VDC, at least the 5 Volts range. Connect the red lead of the multi-meter to Test Point (A) and the black lead of the multi-meter to Test Point (B). (See Figures 2 and 3, pages 13-14.)

CAUTION Test Points for the multi-meter leads must be connected exactly as shown in the illustration - Figures 2 and 3, pages 13-14. Connecting a lead to the wrong side of the resistor or wrong pin of the chip will result in an incorrect adjustment.

- 6) The multi-meter should read 2.550 VDC +/- 0.001 VDC. If the multi-meter reading is not 2.550 VDC +/- 0.001 VDC, turn the adjusting screw on the temperature potentiometer #3 in a clockwise direction to lower the voltage setting or a counter-clockwise direction to raise the voltage setting until the multi-meter reading is 2.550 VDC, +/- 0.001 VDC. **(See Notes 1 and 2 below.)**

NOTE In this step, if the digital multi-meter being used has only three digits, turn the adjusting screw on the potentiometer #3 counter-clockwise (see Figures 2 and 3, pages 13-14) then adjust to a setting of 2.54 VDC and then adjust counter-clockwise to 2.55 VDC.

- 7) For temperature verification in a later step, place a Max-Register Thermometer on the tray and close the sterilizer door.

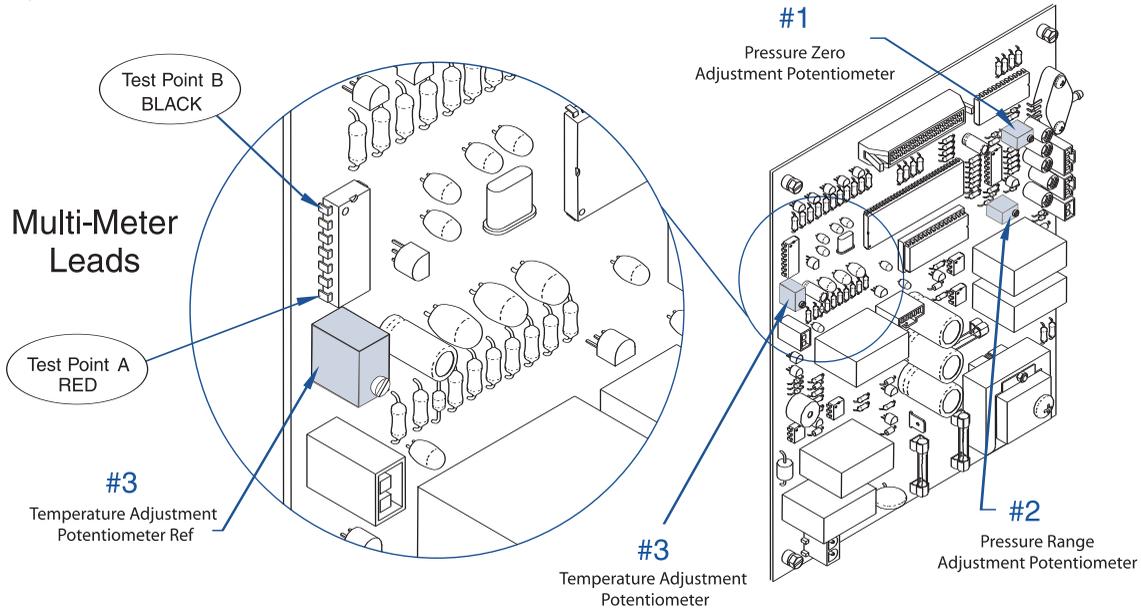
NOTES: 1) Turning the adjusting screw of the pressure range potentiometer in the clockwise direction raises the sterilizer pressure reading while turning the adjusting screw in the counter-clockwise direction lowers the sterilizer pressure reading. **2)** Turning adjusting screw 1/4 turn raises or lowers the temperature of the sterilizer approximately 30°F (1.67°C). On **old style** PC boards, turning the adjusting screw of the temperature potentiometer in the clockwise direction raises the sterilizer temperature while turning the adjusting screw in the counter clockwise direction lowers the sterilizer temperature. On **new style** PC boards, it is the opposite.

5.0 - CALIBRATION PROCEDURE - PRESSURE/TEMPERATURE POTENTIOMETER ADJUSTMENTS *(continued)*

- 8) **CONNECTING THE TEST PRESSURE GAUGE TO THE STERILIZER:** Disconnect the black tubing from Pressure Sensor and from the barb fitting. Keep black tubing in a safe place for re-installation upon completion of calibration procedure. Then connect the RPI Test Pressure Gauge to pressure sensor and the barb fitting – secure using clamps. ***(Important: See Notes 1 and 2 below. See illustration on page 8.)***
- 9) Press the START button to initiate a test calibration cycle and then wait until the temperature on the TEMP (°F) / TIME (MIN: SECONDS) display reaches 272 - 273°F (133 -134°C). *From a cold start, the wait should be about 9-10 minutes.*
- 10) **PRESSURE RANGE ADJUSTMENT (Potentiometer #2):** Turn the adjusting screw of the pressure range potentiometer, #2 (see Figures 2 and 3, pages 13-14) in the clockwise or counter-clockwise direction until the reading on the PRESSURE (psi) display matches the reading of the Test Pressure Gauge within a tolerance of +/- 0.5 psi (3.5 kPa).
- 11) Check the multi-meter reading, it must still read 2.550 VDC, +/- 0.001 VDC.
- 12) Press the STOP button to end the test calibration cycle and let the sterilizer vent.
- 13) Disconnect the power cord from the A.C. outlet, then remove the multi-meter leads from test points A and B (see Figures 2 and 3, page 13-14).
- 14) Open the sterilizer door and remove the Max-Register Thermometer (RPI Part #RPT113) from the sterilizer tray. Verify that the chamber temperature has reached 272-273°F (133-134°C).
- 15) Repeat Steps #3 and #4 of this procedure (see page 10-11). The display must read 0.1 psi (1 kPa) with the sterilizer door open. If it does not, repeat Calibration Procedure starting with Step #4, page 11.
- 16) Disconnect the power cord from the A.C. outlet. Remove the Test Pressure Gauge from the sterilizer. Using new cable ties, re-install the original black tubing removed in Step #8. Re-install right hand side panel.
- 17) Run a final test cycle and use Max-Register Thermometer (RPI Part #RPT113) to confirm chamber temperature.

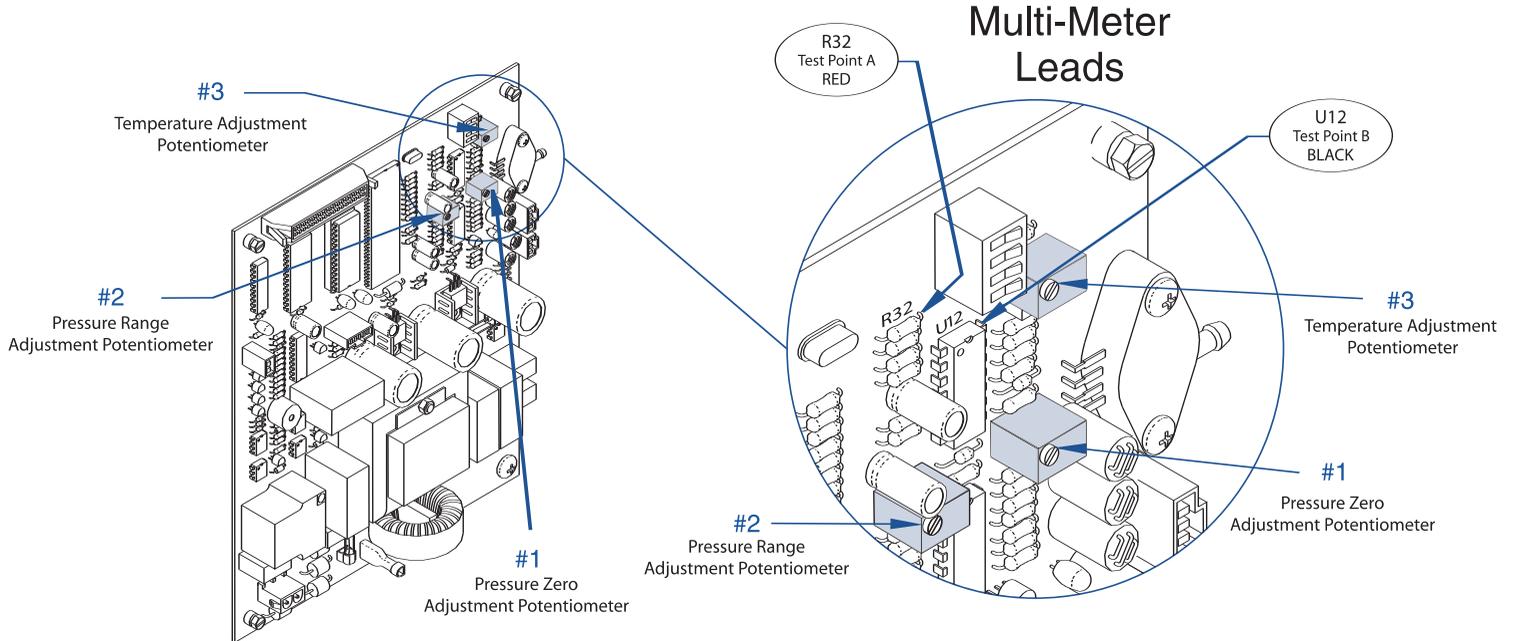
NOTES: 1) CAUTION Place and tighten the hose Kwik Clamps™ on the fittings in order to secure the hose (see illustration, page 8). **2)** After disconnecting Test Pressure Gauge from the sterilizer, reconnect the black tubing to Pressure Sensor and tube fitting using new hi-temp cable ties (see illustration, page 8).

Figure 2 – Old Style PC Board



NOTE: The pressure zero, pressure range, and temperature potentiometers must not be adjusted exclusively. If one potentiometer needs to be adjusted, then the entire potentiometer adjustment procedure must be performed, and it must be performed in the proper sequence.

Figure 3 – New Style PC Board



NOTE: The pressure zero, pressure range, and temperature potentiometers must not be adjusted exclusively. If one potentiometer needs to be adjusted, then the entire potentiometer adjustment procedure must be performed, and it must be performed in the proper sequence.

6.0 - RPI Parts to fit Midmark-Ritter M9 & M11 UltraClave™

RPI PART #	QEM PART #	DESCRIPTION	M9	M11
MIP050	002-0357-00	TEMPERATURE PROBE ASSEMBLY	•	•
MIS075	002-0358-00	WATER LEVEL SENSOR ASSY	•	•
PCV052	002-0359-00	PRESSURE RELIEF VALVE	•	•
MIF038	002-0360-00	FILL FILTER	•	•
MIS039	002-0362-00	DOOR SWITCH ASSEMBLY	•	•
MIK072	002-0361-00	STERILIZER PM KIT - FITS M9	•	•
MIS044	002-0363-00	PULSE SOLENOID	•	•
MIS079	002-0363-03	PULSE SOLENOID	•	•
MIS042	002-0365-00	SOLENOID VALVE (FILL)	•	•
MIS043	002-0366-00	SOLENOID VALVE (VENT)	•	•
MIH048	002-0367-00	HEATER ELEMENT ASSEMBLY	•	•
MIT047	002-0370-00	OVERTEMP THERMOSTAT	•	•
RPG461	002-0372-00	TEST PRESSURE GAUGE	•	•
MIK080	002-0504-00	STERILIZER PM KIT - FITS M11	•	•
MIH049	002-0505-00	HEATER ELEMENT ASSEMBLY	•	•
MIV073	002-0519-00	SOLENOID VALVE (VENT)	•	•
MIK078	002-0654-00	STEAM TRAP KIT (New Style)	•	•
MIV081	002-0654-00	STEAM TRAP (New Style)	•	•
MIF062	002-0360-00	FILL/VENT MESH CHAMBER - 2/pkg	•	•
RCB089	014-0193-00	AIR VENT DIAPHRAGM ASSEMBLY	•	•
RCB100	014-0193-00	AIR VENT BELLOW ASSEMBLY	•	•
MIS045	014-0199-00	SOLENOID VALVE (VENT)	•	•
MIS046	014-0200-00	SOLENOID VALVE (FILL)	•	•
RPT480	015-0013-05	CABLE TIE (HIGH TEMP) - 25/pkg	•	•
RPF049	015-0346-08	FUSE-PRINTER (3A, 250V)	•	•
RPF281	015-0346-07	FUSE (15A, 250V)	•	•
RPR290	015-0639-00	AC RECEPTACLE, SNAP-IN	•	•
RPC291	015-0640-00	POWER CORD W/RIGHT ANGLE PLUG	•	•
RPB289	015-1137-00	STRAIN RELIEF BUSHING	•	•
RPC288	015-1139-00	POWER CORD W/CONNECTORS	•	•
MIP041	016-0395-02	DOOR INSULATOR PAD	•	•
MIF051	016-0523-00	LEVELER FEET	•	•
MIS076	050-2347-00	DOOR SPRING	•	•
MIA086	050-2362-00	SPRING ARM	•	•
MIA077	050-3970-00	SPRING ARM	•	•
MIC037	052-0173-00	CONDENSATION COIL	•	•
MIG027	053-0366-00	DOOR GASKET	•	•
RPI268	053-0385-00	CHAMBER INSULATION	•	•
MIG035	053-0508-00	DAM GASKET	•	•
MIG028	053-0527-00	DOOR GASKET	•	•
RPI269	053-0585-00	CHAMBER INSULATION	•	•
MIG036	053-0784-00	DAM GASKET	•	•
MIP040	16-0395-01	DOOR INSULATOR PAD	•	•
MIC057	N/A	COIL (FILL VALVE)	•	•
MIC058	N/A	COIL (VENT VALVE)	•	•
MIC059	N/A	COIL (VENT VALVE)	•	•
MIC060	N/A	COIL (FILL VALVE)	•	•
MIC083	N/A	COIL (VENT VALVE)	•	•
MIH052	N/A	ATTACHING HARDWARE	•	•
MIK053	N/A	REPAIR KIT (FILL VALVE)	•	•
MIK054	N/A	REPAIR KIT (VENT VALVE)	•	•
MIK055	N/A	REPAIR KIT (VENT VALVE)	•	•
MIK056	N/A	REPAIR KIT (FILL VALVE)	•	•
MIK061	N/A	DRAIN HOSE KIT	•	•
MIK074	N/A	FIELD SERVICE CALIBRATION KIT®*	•	•
MIK082	N/A	REPAIR KIT (VENT VALVE)	•	•
PCNT36	N/A	SPEEDNUT	•	•
RPC463	N/A	KWIK™ CLAMPS	•	•
RPC476	N/A	CARRYING CASE W/FOAM INSERTS	•	•
RPK282	N/A	PRESSURE TUBE KIT	•	•
RPT113	N/A	MAX REG. THERMOMETER	•	•
RPT460	N/A	TRIM POT ADJUSTMENT TOOL	•	•
RPT462	N/A	TUBING (SILBRAD®) - SOLD BY THE FOOT	•	•

* For use with these models only: M9 (S/N Series: CZ, DA, DB, DX, DY, FD & OM); M9D (S/N Series: FF & FG); M11 (S/N Series: ES, ET, FP, FH & GB); and, M11D (S/N Series: GC & GG)

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