Plexus C1000D SERIES

Control Unit

Service Manual

PN 11812-000

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Important

Before using the Plexus C1000D please read and understand the *Plexus C1000D Operator's Manual* and the *SAFETY INSTRUCTIONS* prior to each application.

Only qualified medical service personnel should repair the Plexus C1000D.

In the event of any questions, contact our Technical Service Department for assistance:

USA Only:

Phone 1 800 828-7341

Fax 1 800 993-7890

Outside USA:

Phone (716) 662 8636

Fax (716) 662-0730

1.0 Contraindications

Refer to Operator's Manual.

1.1 Indications for Use/Theory of Operation

Refer to Operator's Manual.

1.2 Safety Precautions

Review the following *SAFETY PRECAUTIONS* prior to servicing the Plexus C1000D.

DANGER

- Explosion hazard. Do not use in the presence of flammable anesthetics.
- Risk of electric shock. Refer servicing to qualified service personnel.

WARNING

- Never drop or insert any object into any opening of the control unit. Doing so may cause fire or electrical shock by shorting internal components.
- Do not spill food or liquids into the Control Unit. If spillage does occur, turn off the unit, disconnect it from its power supply and allow at least 24 hours for drying.
- Keep unit away from radiators or other heat sources.

CAUTION

- Repairs should be performed only by qualified personnel familiar with repair practices for servicing medical devices. Do not attempt to repair the Plexus C1000D Control Unit unless you possess these skills. Otherwise, damage to or malfunction of the control unit may result.

2.0 Receiving Inspection

Upon receipt, unpack the Plexus C1000D Control Unit and inspect for concealed damage. Save all packing material. If any damage is found, notify the carrier at once and ask for a written inspection. Prepare a written description of any damage. Photograph any damage.

Failure to take the above action within 15 days of receipt may result in loss of claim.

Do not return the Plexus C1000D Control Unit to Plexus Medical. Contact Plexus Medical's Technical Service Department for instructions.

USA only	**1 800 828-7341**
Outside USA	**(716) 662-8636**

3.0 Repair Policy

The Plexus C1000D Control Unit is warranted free of defects in material and workmanship for a period of two (2) years.

The Control Unit is warranted under the terms and conditions of the Plexus Medical warranty in place at the time of purchase. A copy of the warranty is available upon request. Plexus Medical disclaims all implied warranties including, but not limited to, the implied warranties of merchantability and of fitness for a particular purpose.

Control units may be returned to the factory for servicing (see 4.3, Return Authorization).

For customers who choose to repair Plexus C1000D Control Units at their location, this manual contains information to allow a qualified technician to make necessary repairs. For technical support, contact Plexus Medical's Technical Service Department.

3.1 In-Warranty Repairs

All in-warranty repairs must be authorized by Plexus Medical's Technical Service Department before proceeding.

3.2 Out-of-Warranty Repairs

The following repair options are available when servicing Plexus C1000D Control Units:

1. Defective Components - replacement parts may be ordered by specifying the Plexus Medical part number as shown in the parts lists.
2. Plexus C1000D Control Unit Repairs - If the Plexus C1000D Control Unit becomes inoperative and the cause cannot be determined, the complete control unit may be returned to the factory for servicing at the purchaser's expense (see 4.3, Return Authorization).

3.3 Return Authorization

Please be sure to obtain a return goods (RG) authorization number from Plexus Medical's Customer Service Department before returning the Plexus C1000D Control Unit or any component parts to Plexus Medical.

USA only	1 800 828-7341
Outside USA	(716) 662-8636

4.0 Specifications

Physcial

Dimensions	12" x 10 1/4" x 5"
	(30.5 cm x 26 cm x 13 cm)
Weight	4.2 to 5 lbs. (1.9 to 2.3 kg)
Operating Ambient Temperature Range	60°F to 80°F 15.5°C to 26.5°C

Storage and Shipping Conditions

Ambient Temperature	40°F to 105°F Range 4.5°C to 40.5°C
Relative Humidity	10% to 100% Non-condensing

Electrical

	C/1000D	C1000DE/DFE/CE
Power	115 VAC	230 VAC
Frequency	60 Hz	50 Hz
Current	1A	.5A
Fuse	F 0.15A	F 0.15A

Type BF Equipment

Attention, Consult Accompanying Documents

IPXO Protection Against Harmful Ingress of Liquids Ordinary Protection (IPX0)

5.0 Control Panel Features (see figure 1)

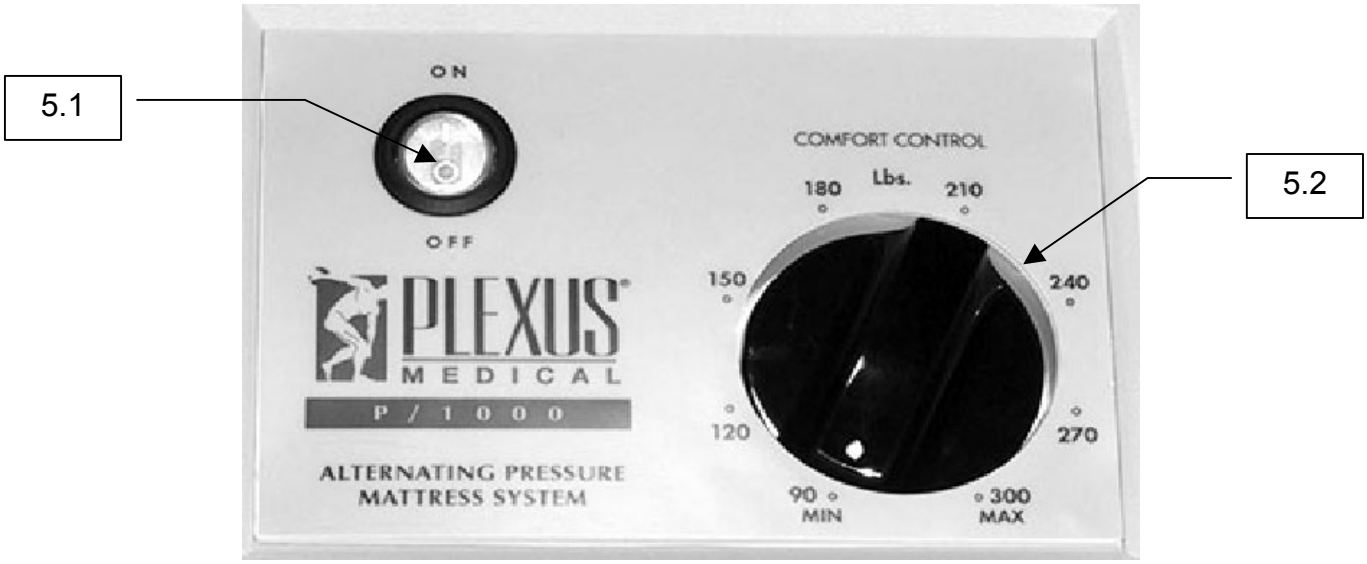


Figure 1 - Front Panel C1000D

5.1 ON/OFF Switch

When unit is on, rocker switch will light.

5.2 Comfort Control Selector

Selector has built in stop, rotation is limited to approximately 320° (From “MIN” setting to “MAX”)

5.3 Float Switch PN 10322-BLAN

With Float Option ONLY - In the closed position the control unit will be in Alternating Pressure Mode. In the open position the control unit functions in float mode.

5.4 Power Fail Indicator and Alarm (Not shown)

With Float Option ONLY - Visible (flashing red LED) and audible alarms indicate loss of power to the control unit.

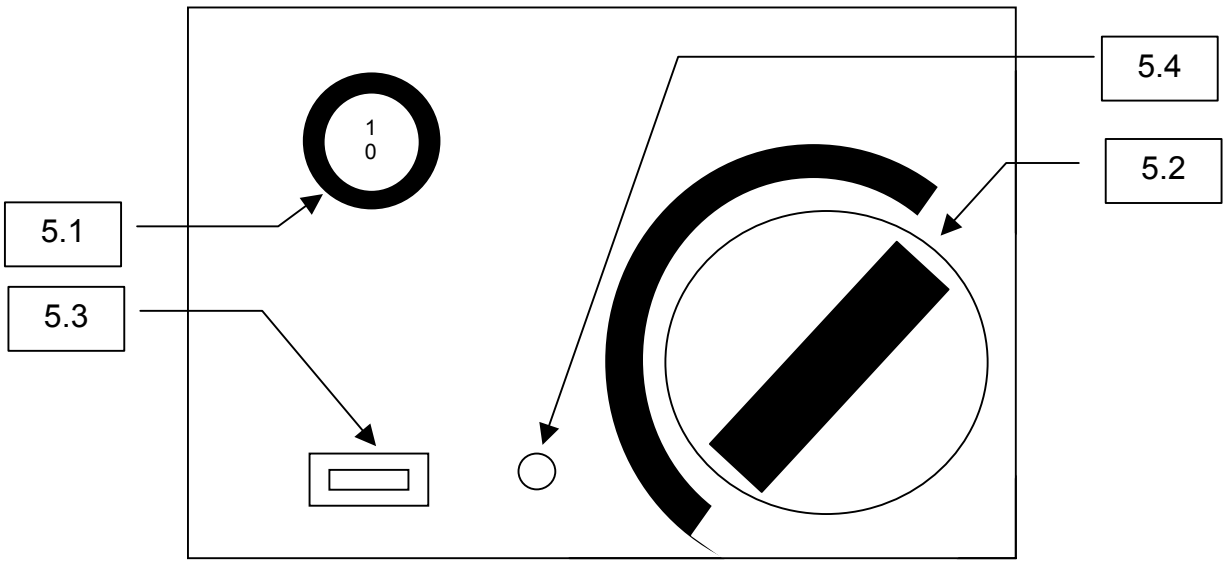


Figure 2 – Front Panel C100DF

6.0 Cleaning

6.1 Chassis exterior

To clean, use soap and water and a clean cloth to wipe down the pump, power cord and hoses. Wipe dry with a clean dry cloth. Do not autoclave.

NOTE: Blood and other fluids must be thoroughly cleaned from all surfaces before applying the disinfectant. Apply a hospital grade disinfectant according to the manufacturer's instructions and hospital protocol. Allow to completely dry. The contact time is what makes the solution effective.

6.2 Mattress

Outside surfaces of mattress may be cleaned with a damp cloth and mild detergent. Do not disinfect with alcohol, which may cause mattress material degradation.

Cushions are made of plastic. If it is necessary to sterilize cushions, use ETO sterilization and/or handle like any other plastic product. Sterilization temperatures must not exceed 57°C (135°F).

7.0 Rear Panel Features (see figure 2 (below)

7.1 Model/Serial Number/Identification Plate

This barcode label must not be removed from the unit. The model and serial number information is needed to arrange for returns to the factory.

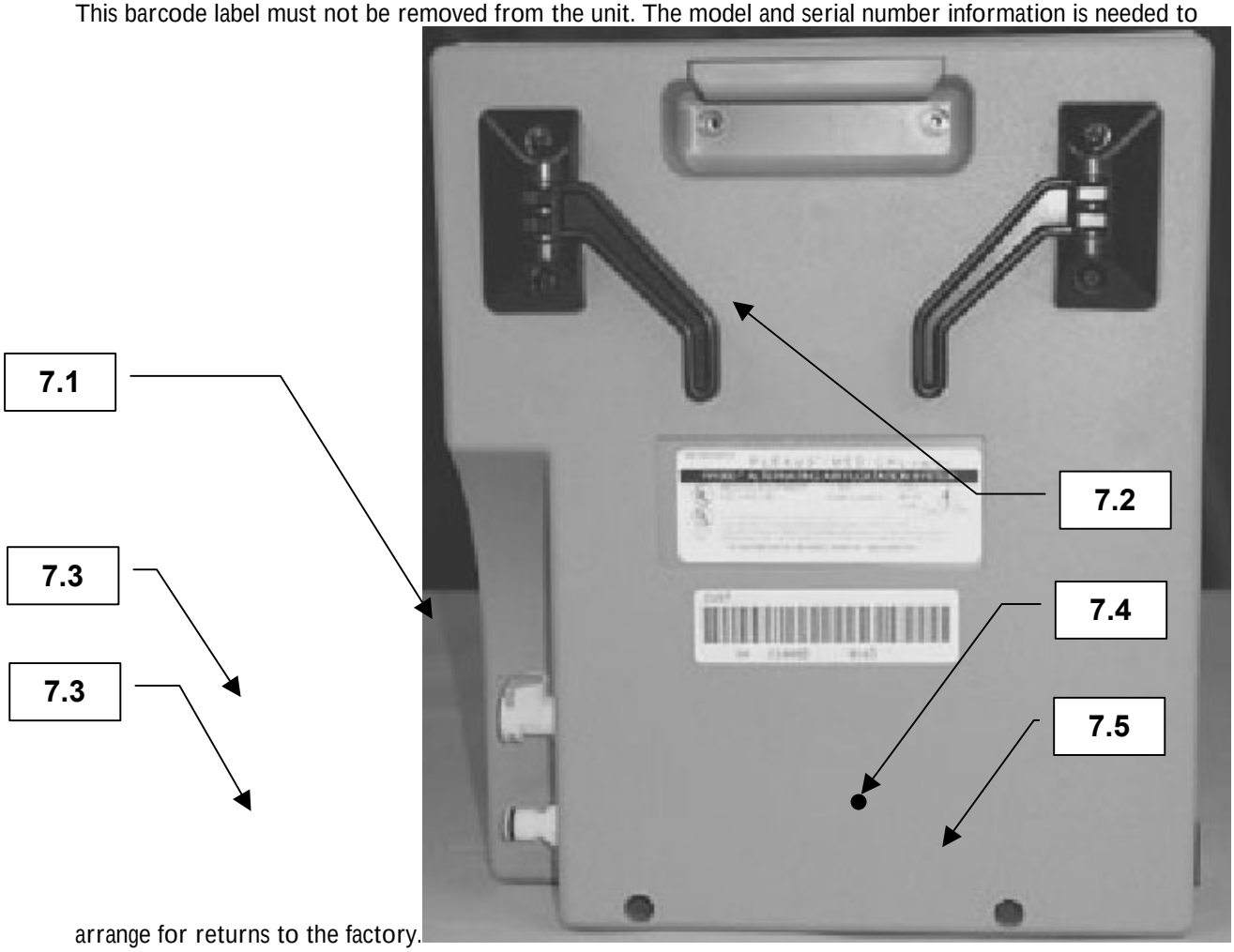


Figure 2 - Rear Panel Features

7.2 Hooks

Hooks are molded from a high strength plastic. These hooks should be used to attach the control unit to the foot of the bed.

7.3 Connectors

Male and female connectors are compatible with the couplings from the M/200, and M/1000 series mattresses and overlays.

7.4 **Ground access point**

This point allows access for current leakage/ ground resistance measurements. If your unit does not have this access point, it can be added by following the directions in the following section

7.5 PEM – Power Entry Manual

8.0 Routine Maintenance and Function Testing

The following maintenance and test procedure should be performed by a qualified technician familiar with testing and maintaining medical products.

Allow unit to warm up for 1 hour prior to performing the following tests.

To insure proper testing results follow these procedures carefully paying close attention to setups and required test equipment. Failure to follow the procedures can lead to inaccurate or misleading results.

Document the testing results using the checklist at the end of this section. Keep a copy of the test results for your records.

Testing of the C1000M should be performed annually or as prescribed by your facilities maintenance program.

Equipment requirements:

2 each 0-100mmHg gauges	Plexus PN 10392
Test fixture hoses	Plexus PN 10140
Male Connector	Plexus PN 10329
Female Connector	Plexus PN 10330
Mattress Pressure test fixture	Plexus PN 11668-000
Inflator/Deflator	Plexus PN 30286
Electrical safety analyzer	
Flow meter with connector	Plexus PN 77484-000
¼ male coupling	Plexus PN 10001
¼ female coupling	Plexus PN 10002

8.1 Physical Inspection (Record results on the Function Test Check Sheet)

Check the unit for cracks or breaks in the housing. Rotate the comfort knob clock-wise and counter clockwise to verify that it stops at the appropriate positions and that it is on tight. Check the power cord connector for cracks/breaks. Check the on/off switch for proper operation. Verify that the bed hooks are in place and tight. Check the power cord for breaks and the blades on the plug for looseness. Replace or repair any irregularities found during physical inspection.

8.2 C/1000D / DE - Testing (Record results on the Function Test Check Sheet)

8.2.1 Connect the unit as shown in FIGURE 5 .

8.2.2 Turn power on.

8.2.3 Adjust comfort control knob to Max setting (fully clockwise).

8.2.4 Take initial pressure reading. One of the gauges should read 75 ± 15 mmHg and the other gauge should read 0-5 mmHg. If these readings cannot be obtained at the fully clockwise position the pump will need to be investigated and repaired before proceeding.

8.2.5 Allow unit to cycle at least three complete cycles before taking the next readings.

8.2.6 During the cycling of the unit the gauges should alternate between the following readings. High pressure = 60-90 mmHg. Low pressure = 0-5 mmHg.

8.2.7 Observe the following. During the venting cycle (gauge going from high to low) the high pressure gauge should drop to 0 mmHg while the low pressure is rising.

8.2.8 Verify that the unit continues to cycle for several minutes. The gauges should alternate back and forth between 60-90 mmHg and 0-5 mmHg.

8.3 C/1000DF / DFE - Testing (Record results on the Function Test Check Sheet)

8.3.1 Connect the unit as shown in FIGURE 5 .

8.3.2 Turn power on.

8.3.3 Adjust comfort control knob to Max setting (fully clockwise).

8.3.4 Take initial pressure reading. One of the gauges should read 35 ± 5 mmHg and the other gauge should read 0-5 mmHg. If these readings cannot be obtained at the fully clockwise position the pump will need to be investigated and repaired before proceeding.

8.3.5 Allow unit to cycle at least three complete cycles before taking the next readings.

8.3.6 During the cycling of the unit the gauges should alternate between high and low pressure. Observe the following. During the venting cycle (gauge going from high to low) the high pressure gauge should drop to 0 mmHg while the low pressure is rising.

8.3.7 Verify that the unit continues to cycle for several minutes.

8.3.8 Select the float mode, the timing motor should stop within 3 minutes. In the stopped position there must be pressure on both gauges, the pressure should read between 30 and 40 mmHg.

8.3.9 With the power switch on and the unit running, disconnect the power cord. The unit should produce a visible, and audible alarm.

8.4 C1000DC Series - *Testing (Record results on the Function Test Check Sheet)*

8.4.1 Connect the unit as shown in FIGURE 5 .

8.4.2 Turn power on.

8.4.3 Adjust comfort control knob to Max setting (fully clockwise).

8.4.4 Take initial pressure reading. One of the gauges should read 90 ± 10 mmHg and the other gauge should read 0-5 mmHg. If these readings cannot be obtained at the fully clockwise position the pump will need to be investigated and repaired before proceeding.

8.4.5 Allow unit to cycle at least three complete cycles before taking the next readings.

8.4.6 During the cycling of the unit the gauges should alternate between the following readings. High pressure = 80-100 mmHg. Low pressure = 0-5 mmHg.

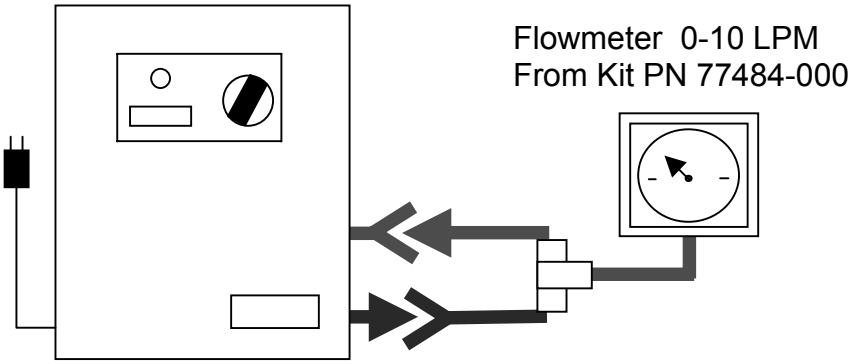
8.4.7 Observe the following. During the venting cycle (gauge going from high to low) the high pressure gauge should drop to 0 mmHg while the low pressure is rising.

8.4.8 Verify that the unit continues to cycle for several minutes. The gauges should alternate back and forth between 60-90 mmHg and 0-5 mmHg.

8.5 Flow Test – All Series

8.5.1 Connect control unit to a flow meter as shown below.

8.5.2 Turn on control unit and place at max pressure setting. The flow will fluctuate during alternation, Record the highest flow rate in a 5 minute period. Flow must exceed 2 ½ LPM.



8.6 Electrical safety inspection (Record results on Function Test Check Sheet)

Connect the unit to an electrical safety analyzer. Using the analyzer manufacturer's instructions verify that the unit does not exceed 100 μA at 110 V~ or 500 μA at 220 V~ of current leakage in any combination of settings. Verify the ground connection does not exceed .5 ohms of resistance.

9.0 Function Test Check Sheet

Model _____

Serial _____

Test Procedure Results
(see routine maintenance and function test section of manual for details)

Physical Inspection OK
Yes or No

Testing

All C/1000D

1. High pressure reading observed in step F. _____ mmHg
2. Low pressure reading observed in step F. _____ mmHg
3. Flow test Pass or Fail

Float / Power Fail options only.

4. Pressure on both gauges? Pass or Fail
5. Power fail alarms function? Pass or Fail

Electrical safety inspection results.

1. Max current leakage reading ____ μ amps

2. Ground resistance less than .5 ohms
   Pass Fail

Tested by _____ Date _____

If the unit passes all the steps described in the physical inspection, testing and electrical safety inspection sections above it should be considered ready for use. Any unit that does not pass all the requirements above should be serviced to correct the problem before being returned for use.

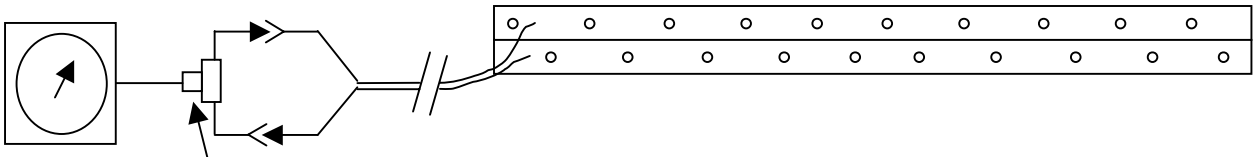


FIGURE 3 – Manifold Test

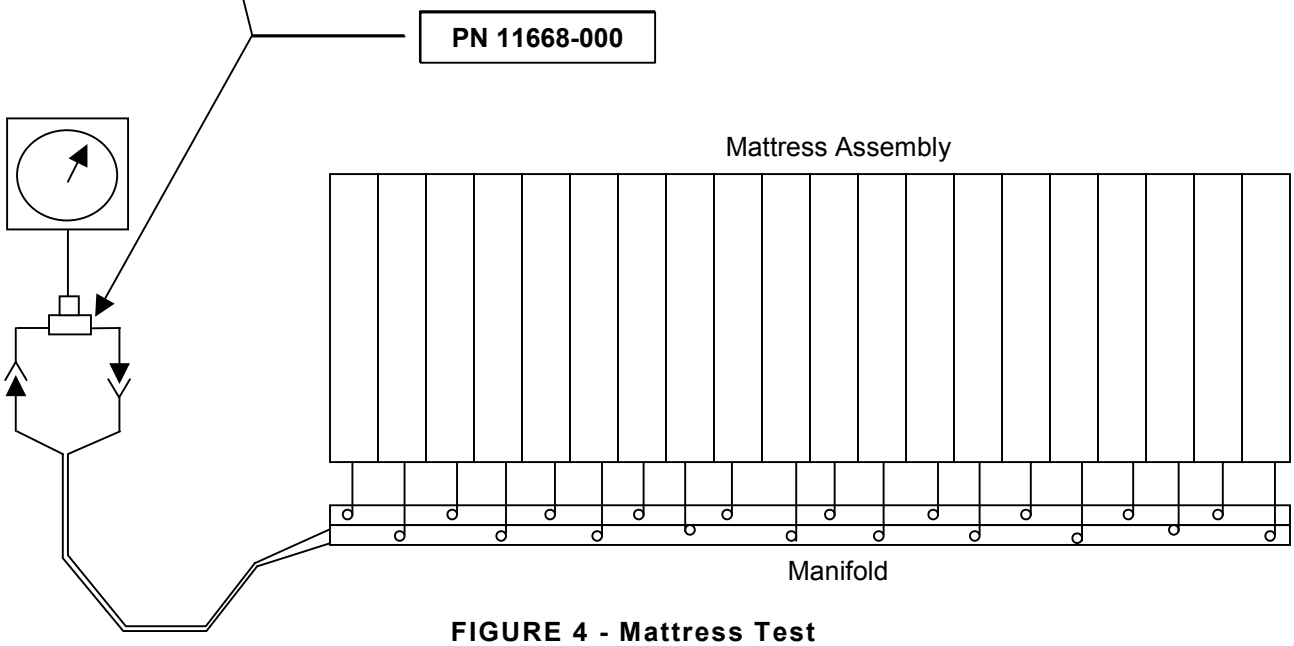


FIGURE 4 - Mattress Test

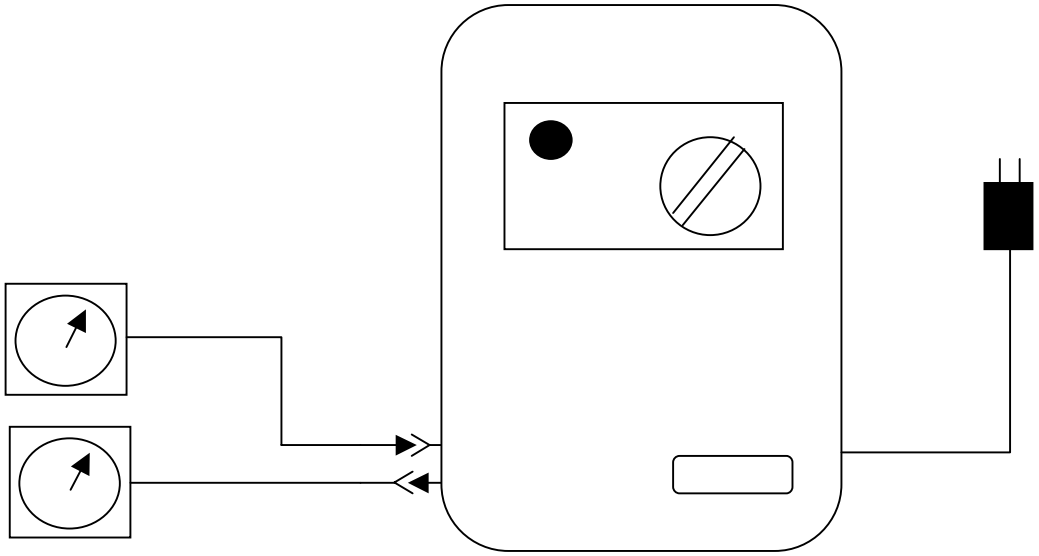
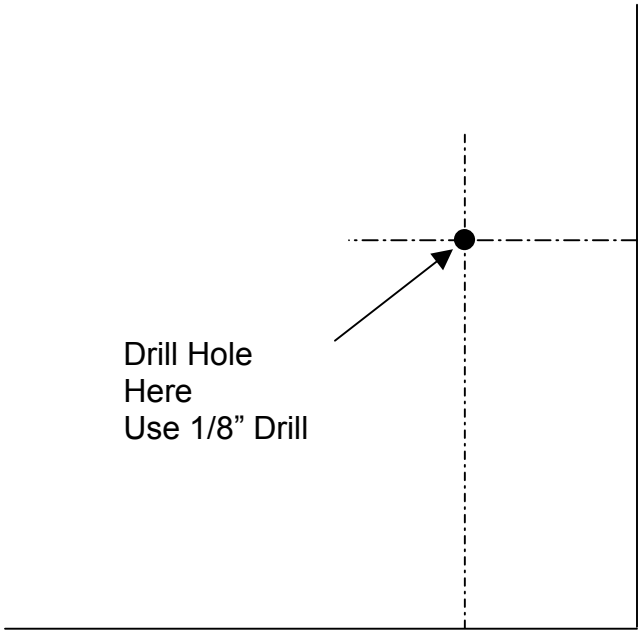


FIGURE 5 – Function Test / Calibration

10.0 Curent Leakage Retrofit

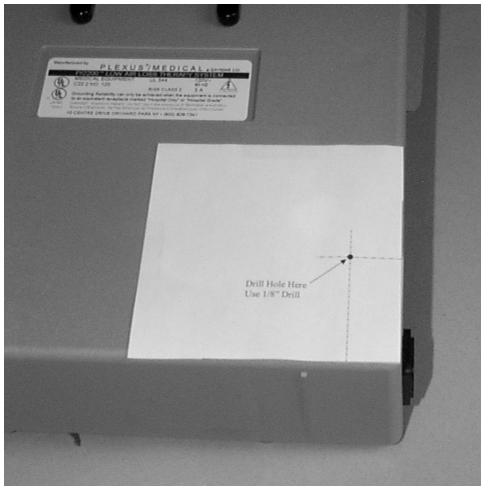


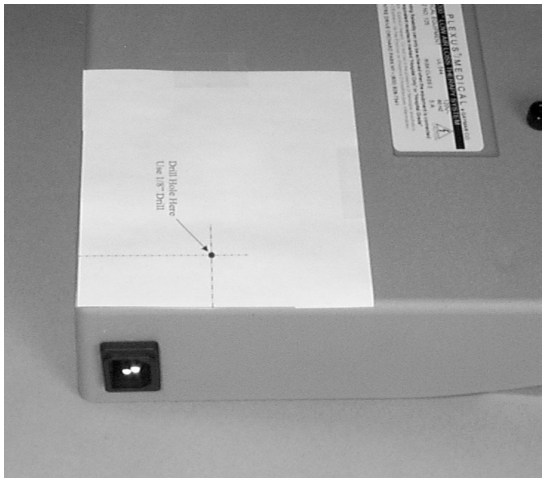
TEMPLATE

1) Cut along solid lines, to remove template from instructions.
2) Align template with bottom and side surface of enclosure in corner nearest the PEM (power entry module). If neccesary hold template in place with tape. (See pictures below)

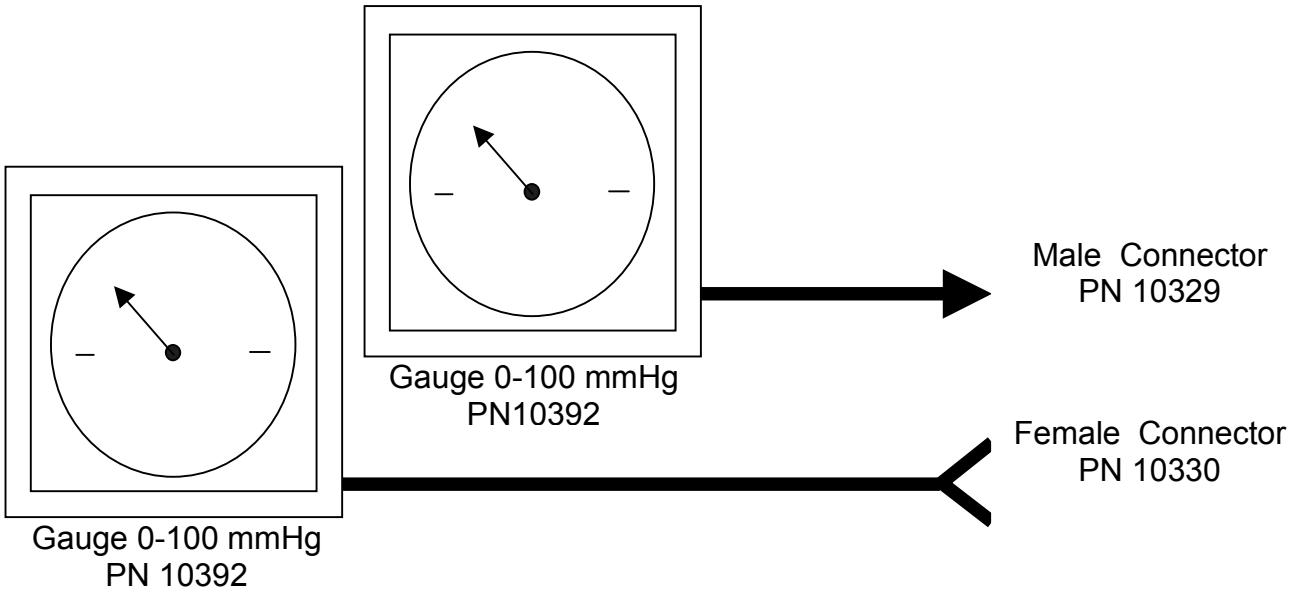
NOTE: Template is actuall size. Do not reduce or enlarge this image.

3) Drill hole in area indicated. Housing is approximately 1/8” thick. Do not drill deeper than 3/8”. Hole will need to be cleared of debris before use for testing.





11.0 Calibration Procedure C/1000D (A)



Procedure:

NOTE: Control unit must be turned on for 1 hour prior to calibration.

1. Turn control knob to “MIN”.
2. Grasp the control knob, remove by pulling away from the front panel of the control unit. *In some of the older units the knob may be glued, if this is the case the unit can not be field calibrated. Call Cusomer Sevice* for assistance
3. Connect gauges to contol unit.

NOTE: Due to the alternating cycles of the control unit, pressure will be measurable on one port for approximately 3 minutes.

4. Once a pressure is detected, adjust the pressure control valve (located in the center of the knob recess) to 21 ± 2 mmHg. Rotate the brass stem clockwise to increase, and counterclockwise to reduce pressure.

If the control valve is difficult to adjust, use pliers to turn the valve. Caution should be taken to avoid damaging the splines on the pressure controller.

5. Once pressure is set, reinstall nylon washer (PN 90151-022) over stem of pressure control valve, align knob so indicator is at “MIN” push knob onto pressure control valve. *The knob may need to be turned slightly to align the splines on the controler and the knob.* Knob must be fully seated on the controller.
6. Verify pressure at “MIN” (21 ± 2 mmHg) and “MAX” (75 ± 15 mmHg)

12.0 Troubleshooting

Mattress Test

12.1 Manifold:

12.1.1 Remove manifold from the mattress and block ports (20) with Red Plug PN 30258 as shown in FIGURE 3.

12.1.2 Connect Inflator/Deflator PN 30286 (120 VAC 60 Hz, or PN 30286-220V for 220 VAC 50 Hz) to the fill connectors on the manifold.

12.1.3 Inflate manifold to 40 ±10 mmHg. Kink hoses, and disconnect Inflator/Deflator. Connect Male and Female couplings to the gauge to seal the manifold. (See FIGURE 3)

12.1.4 Check each port for signs of air leaking. Water and mild soap may be used to aid in detecting leaks.

12.1.5 Inflate manifold to approximately 40 mmHg. Kink hose to prevent leaking as discussed in 14.1.4. Connect the two hose connectors to the test gauge and wait for system to stabilize. Once system has stabilized (Approximately 1 min.) monitor gauge pressure. If pressure drop is greater than 2 mmHg in 2 min, return manifold for repair or replacement.

12.1.6 Reattach manifold to the mattress.

If no problem is detected continue with test procedure

12.2 Air Cells or M/200 Overlay:

12.2.1 Inflate mattress/overlay with an Inflator/Deflator to approximately 40 mmHg.. Kink the mattress hose to prevent mattress from leaking, then disconnect the hose from the Inflator/Deflator. Attach gauge as shown in FIGURE 4.

12.2.2 Allow mattress to stabilize for 2 minutes.

12.2.3 Monitor pressure. If pressure drop is greater than 2 mmHg in 2 min., then a leak exists in one or several air cells. Inflate each air cell and plug the connector with Female Red Plug (PN 30287), then submerge in water and watch for air bubbles. Replace defective air cells if needed and reassemble mattress.

If no problem is detected continue with test procedure.

12.3 Control Unit Test

Hoses:

13.3.1 Open control unit and check to ensure that no hose inside the unit is kinked or cracked and leaking (see FIGURE 5).

13.3.2 If hose is kinked, pinch and move hose around to remove kink.

13.3.3 Attach unit to Test Fixture and verify that mattress pressure has returned to normal.

Once problem has been corrected continue to step 14.5.

If no problem is detected continue with test procedure.

12.4 Main Pump: (A warm up period of 30 minutes is required before the following tests are performed.)

12.4.1 16.4.1 If rattling or vibrating noise is apparent, replace pump.

If no problem is detected continue with test procedure.

12.4.2 Locate the hose coming out of the pump and attach it to a flow meter, the flow should read > 3¾ LPM. If flow is below minimum requirement replace pump.

If no problem is detected continue with test procedure.

12.4.3 Attach unit to test gauge (See FIGURE 5), set comfort control to “MIN”. The unit should provide a pressure of 21 ± 3 mmHg to one port. Pressure should alternate between gauges approximately every 2.5 minutes. If unit does not achieve pressure attempt calibration (See 17.0), replace pump if pressures can not meet calibration specs.

If no problem is detected continue with test procedure.

12.5 Timing Motor:

12.5.1 Units with float function: Verify that power in being supplied to both the pump and timing motor, using a voltmeter. Place meter to read VAC, and touch both terminals marked as motor on the PCB. Voltage should read 120 or 230 VAC, depending on the line voltage. If no voltage is detected replace PCB.

If no problem is detected continue with test procedure.

12.5.2 **For standard units:** Check voltage by touching the two outside terminals on the switch with voltmeter probes. Readings should match line voltage being supplied (110 or 220). If reading is less than supplied voltage check switch and fuse.

12.5.3 Visually check the motor and verify that it is turning. If motor is not rotating, replace motor.

If no problem is detected continue with test procedure.

12.6 Control Valve:

12.6.1 Attach unit to test gauge (See FIGURE 5), set comfort control to “MAX”, pressure should reach 75 ± 15 mmHg. If unit is out of spec. Refer to calibration procedure.

12.6.2 If unit fails pressure test, replace valve (See FIGURE 6, and 7):

12.6.2.1 Pull knob from front of enclosure.

12.6.2.2 Take off retainer attached to valve at base of valve seat.

12.6.2.3 Push the valve through to the front of the unit, and pull the knob and valve out.

12.6.2.4 Install new valve (PN 10137). Insure that retainer is fully seated, and that valve body does not rotate when stem is turned.

12.6.2.5 Set pressure minimum to 21 ± 2 mmHg by turning valve stem.

12.6.2.6 Install knob onto into recess on front of enclosure with the indicator at the “MIN’ position.

12.6.2.7 Turn knob to “MAX”, verify the indicator stops at “MAX” position, and pressure reads 75 ± 15 mmHg

12.6.3 If comfort knob continually spins, return unit for repair.

If no problem is detected continue with test procedure.

12.7 Fuse:

12.7.1 Open the unit and check the fuses.

12.7.2 Check fuse by setting the voltmeter for continuity check. Touch one end of the fuse with one probe and the other end with the other probe. If the fuse is bad, the meter will not detect and resistance and will not produce a continuous beeping sound. The fuse is good if a resistance across it is detected and a continuous beeping sound is heard.

If no problem is detected continue with test procedure.

12.8 On/Off Switch:

12.8.1 Make sure that the unit is not plugged in.

12.8.2 Remove all three leads attached to the switch.

12.8.3 Push switch out of the panel while pushing in the snaps on the side of the switch.

12.8.4 Snap the new switch in place and reattach the three leads.

12.8.5 Attach the neutral lead to the brass color terminal.

12.8.6 Attach the lead from the pump and motor to the center terminal.

12.8.7 Attach the line lead to the remaining terminal.

12.8.8 Plug unit in. Verify if switch is good by turning on the unit. Power and the green indicator light should go on.

12.9 Float Mode (C/1000DFE Only):

If float mode does not function.

12.9.1 Connect unit as shown in Fig. 5. Place unit in float mode, and wait for 3 minutes.

12.9.2 Check that the timing motor stops when metal tab comes in line with sensor. If motor does not stop, check continuity of Float Switch. Verify that the switch is working properly with an ohmmeter. With switch closed unit should stop in the float position.

If motor does not stop, replace PCB assembly.

12.9.3 After three minutes, both ports must be pressurized (This is float position #1) Place unit in alternating mode, wait for 1 minute. Place unit back in float mode. After three minutes, both ports must be pressurized (This is float position #2).

12.9.4 If pressure is not available at both ports in both positions, check the location of the reflective tape. (See Fig. 6) or for kinked tubing.

12.9.5 Place the unit in alternating mode, monitor the pressure gauges until both gauges read pressure. Turn unit off with On/Off power switch. Move photosensor until it is slightly over the leading edge of the reflective tape. Restore power, and check both float positions. Repeat adjustment until both float positions function. NOTE: The photosensor operates best when a distance of 1/8 inch is maintained between it and the surface to be sensed. Caution should be used in moving the sensor to avoid breaking the leads.

12.9.6 If LED or Buzzer does not work:

12.9.6.1 Check LED or Buzzer connectors, make sure that they are secured properly.

12.9.6.2 If problem continues replace LED or Buzzer.

12.9.6.3 If problem continues replace board.

If unit is still not functioning Contact technical services for further assistance at 800-828-7341 or 716-662-8739.

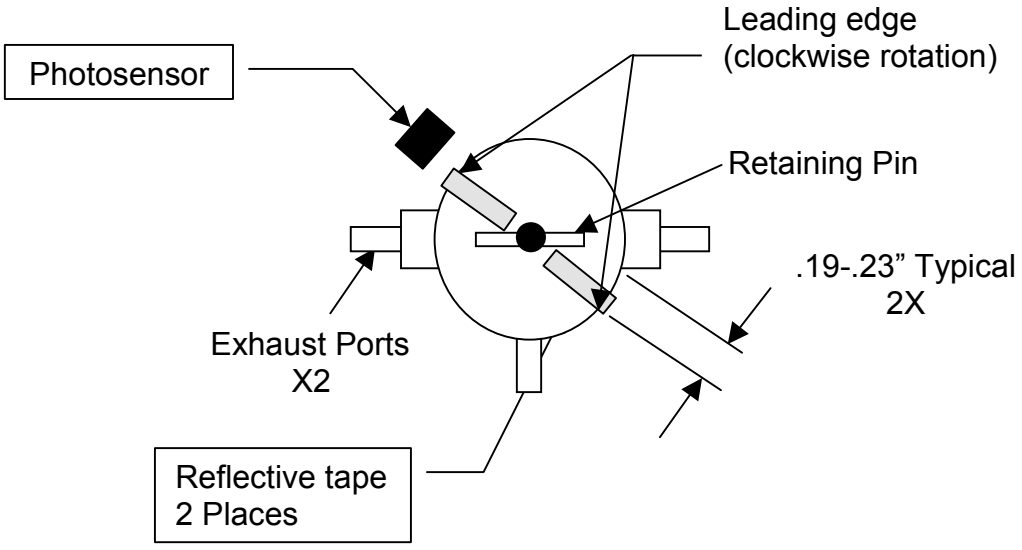


Figure 6

17.0 Parts List

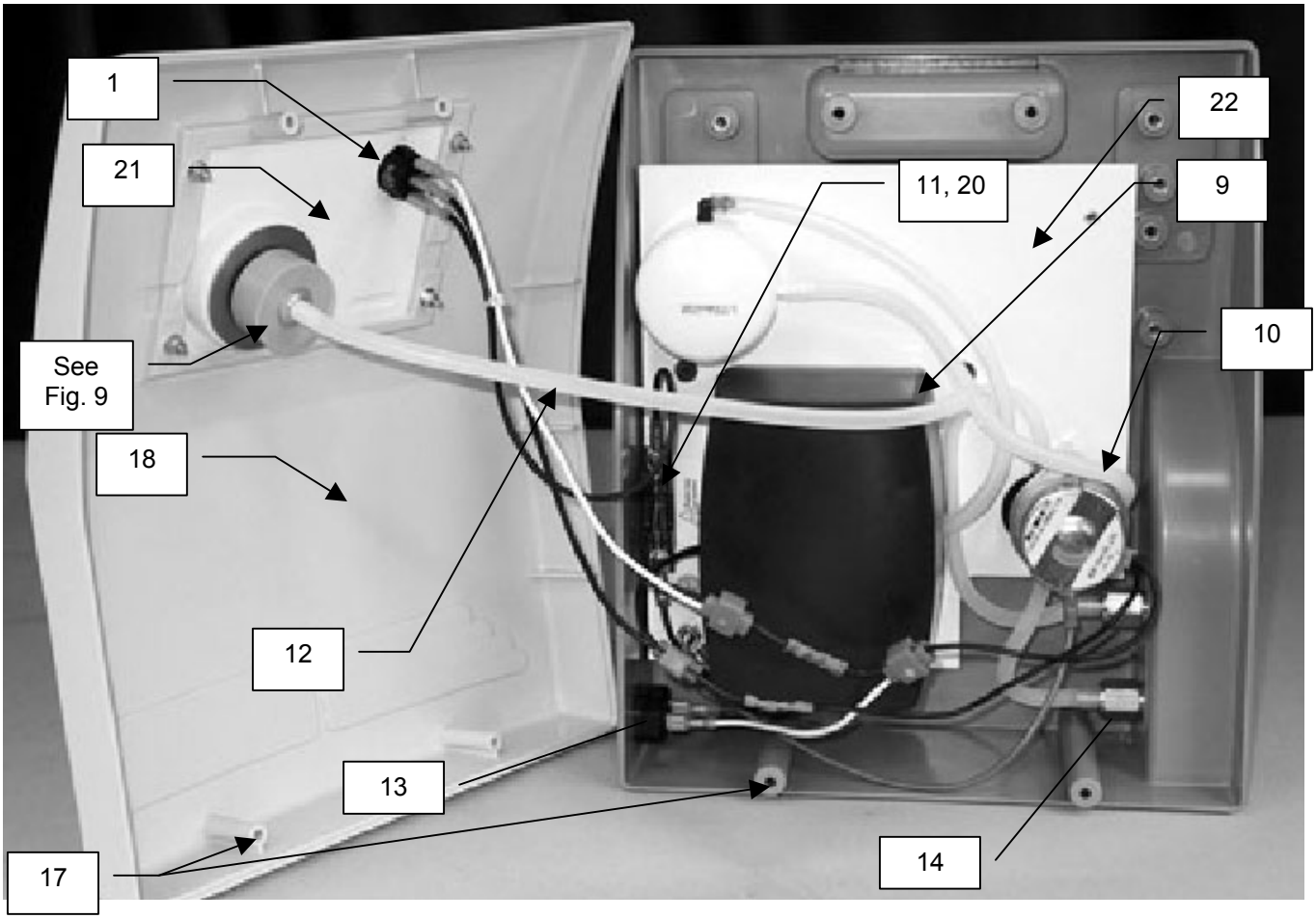


Figure 7 - Parts

ITEM #	DISCRIPTION	Plexus PN 120V Models	Plexus PN 240V Models	C/1000DFE Models (See Fig. 8)
1	SWITCH*	20161	20161	20161
9	PUMP	10139	10135	10135
10	TIMING MOTOR ASSEMBLY	11523-000 ‡	11523-001 ‡	Call technical service
11	FUSE	10146	10146	10146
12	TUBING	10140	10140	10140
	Pressure control knob (Not Shown)	20068	20068	20068
	Power Cord	10053	Call technical service	10053-EURO
13	Power entry module (Snap –in type)	10049-SNAP	10259-SNAP	10049-SNAP
13	Power entry module (Screw–in type)	10049	10259	10049
14	Brass Connector	20156	20156	20156
	Coupling Male (to mattress Not Shown)	10044	10044	10044
	Coupling Female (to mattress Not Shown)	10045	10045	10045
21	Control Panel	20111	Call technical service	Call technical service
15	PCB Assembly Power Fail / Float	N/A	N/A	30232
16	Pressure switch	N/A	N/A	10358
17	Screw	10363	10363	N/A
18	Front Housing	20213	20213	N/A
19	Rear Housing	20214-SFTT	20214-SFTT	N/A
20	Fuse Holder	10056	10056	10056
22	Chassis	20235	20235	N/A

*Switch retrofit kit is available for older push-button switches – PN 30292 **‡ Not for use on units with float**

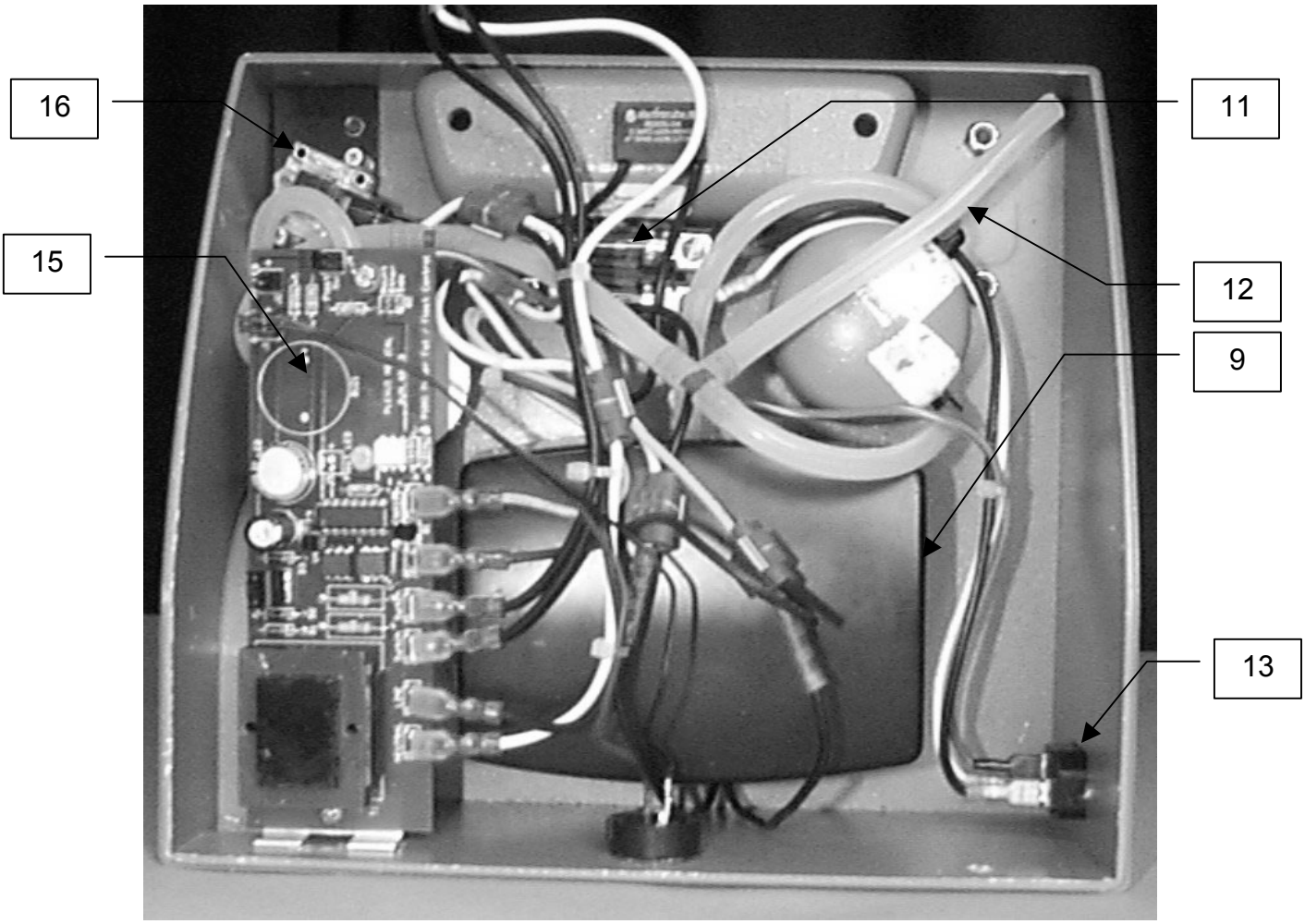


Figure 8

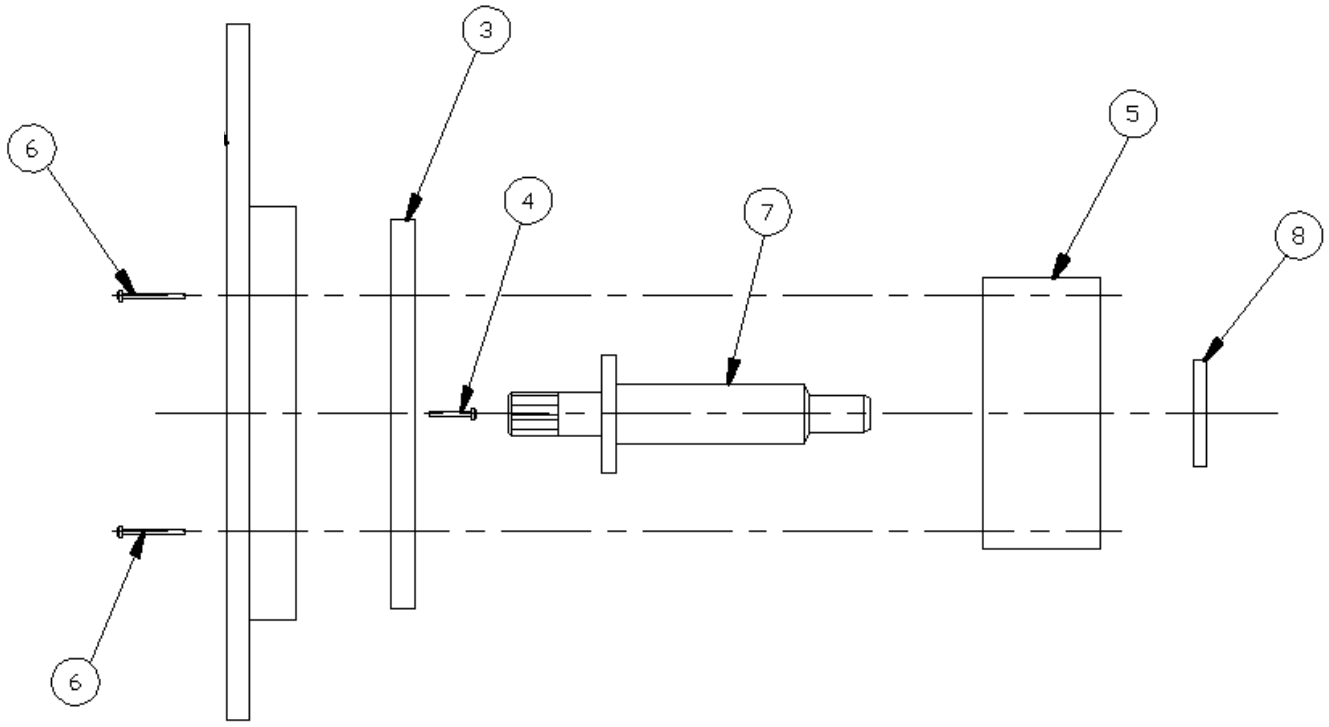


Figure 9 - Control Valve Detail

ITEM #	DISCRIPTION	Plexus PN 120V Models	Plexus PN 240V Models
3	KNOB RECESS PLATE	20181	20181
4	4-40 SCREW	10336	10336
5	VALVE SEAT	10250	10250
6	T-10 SELF TAPPING SCREW	10352	10352
7	VALVE	10137	10137
8	RETAINER	10317	10317

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