

Medi-Temp III FW601 Blood/Fluid Warmer Operator's Manual/Service Manual



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Before you begin . . .



Important

Before using the Medi-Temp III FW601 Blood/Fluid Warmer, please read and understand this *Operator's Manual* and the *SAFETY PRECAUTIONS* prior to use.

If you have any questions, please contact your local dealer for assistance.

Warranty

The Medi-Temp III FW601 Blood/Fluid Warmer is warranted free of defects in material and workmanship for a period of one (1) year.

The Disposable Warming Sets are warranted free of defects in material and workmanship for a single application.

A copy of the warranty is available upon request. Gaymar disclaims all implied warranties including, but not limited to, the implied warranties of merchantability and of fitness for a particular purpose.

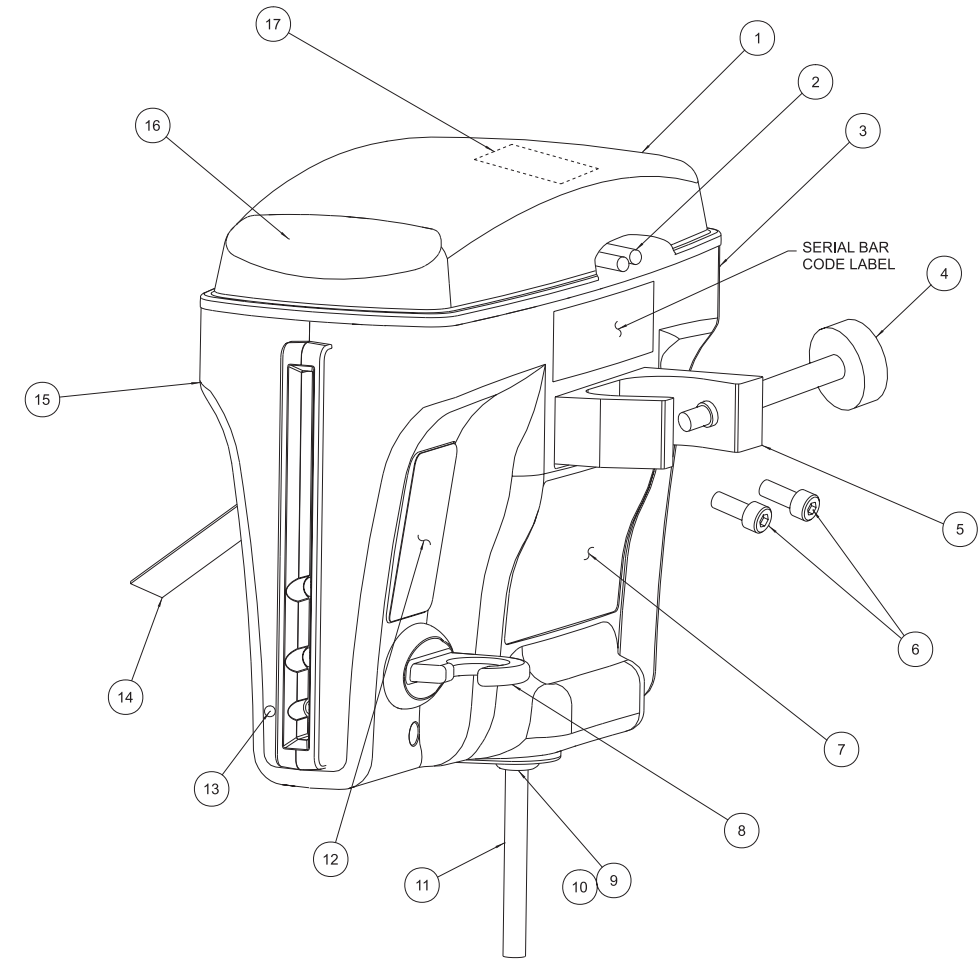


Figure 11—Replacement Parts

ITEM	P/N	Description	ITEM	P/N	Description
1	11138-000	Top cover	11	11266-000	Power cord
2	90695-032	Fuse	12	11289-000	Bubble trap label
3	11136-000	Right cover	13	11320-000	Blue dot label
4	91439-000	Swivel screw	14	03791-000	Hose strap
5	08614-000	IV pole clamp	15	11137-000	Left cover
6	91479-025	Socket cap screw	16	12288-000	Front label
7	12194-000	Ratings label	17	11293-000	Fuse label
8	11142-000	Bubble trap receiver	18	91519-017	Plastic Screw (For top cover qty 4 not shown)
9	90074-117	Insulation grommet	19	90228-004	Cable clip (not shown)
10	90076-027	Heyco strain relief bushing	20	12195-000	Operator's manual (not shown)

Temp.	Resis.	Temp.	Resis.	Temp.	Resis.	Temp.	Resis.	Temp.	Resis.	Temp.	Resis.	Temp.	Resis.	Temp.	Resis.	Temp.	Resis.
(°C)	(ohms)	(°C)	(ohms)	(°C)	(ohms)	(°C)	(ohms)	(°C)	(ohms)	(°C)	(ohms)	(°C)	(ohms)	(°C)	(ohms)	(°C)	(ohms)
35	1471	38	1300	41	1152	44	1023	47	910	50	811	53	725	56	648	59	581
35.1	1465	38.1	1295	41.1	1148	44.1	1019	47.1	907	50.1	808	53.1	722	56.1	646	59.1	579
35.2	1459	38.2	1290	41.2	1143	44.2	1015	47.2	903	50.2	805	53.2	718	56.2	644	59.2	577
35.3	1453	38.3	1285	41.3	1139	44.3	1011	47.3	900	50.3	802	53.3	716	56.3	641	59.3	575
35.4	1447	38.4	1279	41.4	1134	44.4	1007	47.4	896	50.4	799	53.4	714	56.4	639	59.4	573
35.5	1441	38.5	1274	41.5	1129	44.5	1003	47.5	893	50.5	796	53.5	711	56.5	637	59.5	571
35.6	1435	38.6	1269	41.6	1125	44.6	999	47.6	889	50.6	793	53.6	709	56.6	634	59.6	569
35.7	1429	38.7	1264	41.7	1120	44.7	995	47.7	886	50.7	790	53.7	706	56.7	632	59.7	567
35.8	1423	38.8	1259	41.8	1116	44.8	991	47.8	882	50.8	787	53.8	703	56.8	630	59.8	565
35.9	1417	38.9	1254	41.9	1112	44.9	988	47.9	879	50.9	784	53.9	701	56.9	627	59.9	563
36	1411	39	1249	42	1107	45	984	48	876	51	781	54	698	57	625	60	561
36.1	1405	39.1	1244	42.1	1103	45.1	980	48.1	872	51.1	778	54.1	695	57.1	623		
36.2	1400	39.2	1239	42.2	1098	45.2	976	48.2	869	51.2	775	54.2	693	57.2	620		
36.3	1394	39.3	1234	42.3	1094	45.3	972	48.3	866	51.3	772	54.3	690	57.3	618		
36.4	1388	39.4	1229	42.4	1090	45.4	968	48.4	862	51.4	769	54.4	688	57.4	616		
36.5	1383	39.5	1224	42.5	1085	45.5	965	48.5	859	51.5	767	54.5	685	57.5	614		
36.6	1377	39.6	1219	42.6	1081	45.6	961	48.6	856	51.6	764	54.6	683	57.6	611		
36.7	1371	39.7	1214	42.7	1077	45.7	957	48.7	853	51.7	761	54.7	680	57.7	609		
36.8	1366	39.8	1209	42.8	1073	45.8	954	48.8	849	51.8	758	54.8	678	57.8	607		
36.9	1360	39.9	1204	42.9	1068	45.9	950	48.9	846	51.9	755	54.9	675	57.9	605		
37	1355	40	1199	43	1064	46	946	49	843	52	752	55	673	58	603		
37.1	1349	40.1	1195	43.1	1060	46.1	942	49.1	840	52.1	748	55.1	670	58.1	600		
37.2	1344	40.2	1190	43.2	1056	46.2	939	49.2	836	52.2	747	55.2	668	58.2	598		
37.3	1338	40.3	1185	43.3	1052	46.3	935	49.3	833	52.3	744	55.3	665	58.3	596		
37.4	1333	40.4	1180	43.4	1047	46.4	932	49.4	830	52.4	741	55.4	663	58.4	594		
37.5	1327	40.5	1176	43.5	1043	46.5	928	49.5	827	52.5	738	55.5	660	58.5	592		
37.6	1322	40.6	1171	43.6	1039	46.6	924	49.6	824	52.6	735	55.6	658	58.6	590		
37.7	1316	40.7	1166	43.7	1035	46.7	921	49.7	821	52.7	733	55.7	655	58.7	587		
37.8	1311	40.8	1161	43.8	1031	46.8	917	49.8	817	52.8	730	55.8	653	58.8	585		
37.9	1306	40.9	1157	43.9	1027	46.9	914	49.9	814	52.9	727	55.9	651	58.9	583		

Figure 10—Resistance temperature chart
(Gaymar FWTI Temperature Sensor)

1.0 Indications for Use

This device is intended to aid in the prevention of inadvertent hypothermia during administration of blood, blood products, and other fluids.



1.1 Safety Precautions

⚠ DANGER



Risk of electric shock.
No user serviceable parts inside.

⚠ WARNING

- All air must be removed from the fluid lines prior to connection to the patient.
- Monitor the fluid lines to insure they are air free. Never administer fluids if there are air bubbles in the line between the bubble trap and the patient connector.
- Monitor the fluid level in the bubble trap frequently. Bubbles released during heating are captured in the trap. To refill the trap, insert a sterile syringe into the valve and draw air out until the trap is (2/3) full. Do not allow the bubble trap to go below one-quarter (1/4) full.
- The bubble trap must be kept mounted and in the vertical position at all times.

Failure to follow the above warnings could result in the introduction of air to the patient. Introduction of air to the patient could result in death or serious injury.

⚠ CAUTION

- US Federal law restricts this device to sale by or on the order of a physician.
- Do not immerse in cleaning and/or sterilization solution. Do not submerge or soak unit; it is fluid resistant, not fluid proof.
- For grounding reliability of the Blood/Fluid warmer, plug only into a properly grounded outlet.
- The RUN/STANDBY switch does not provide isolation from the mains. Isolation from the mains (IEC 601-1) can only be achieved by disconnecting the cord from the mains.

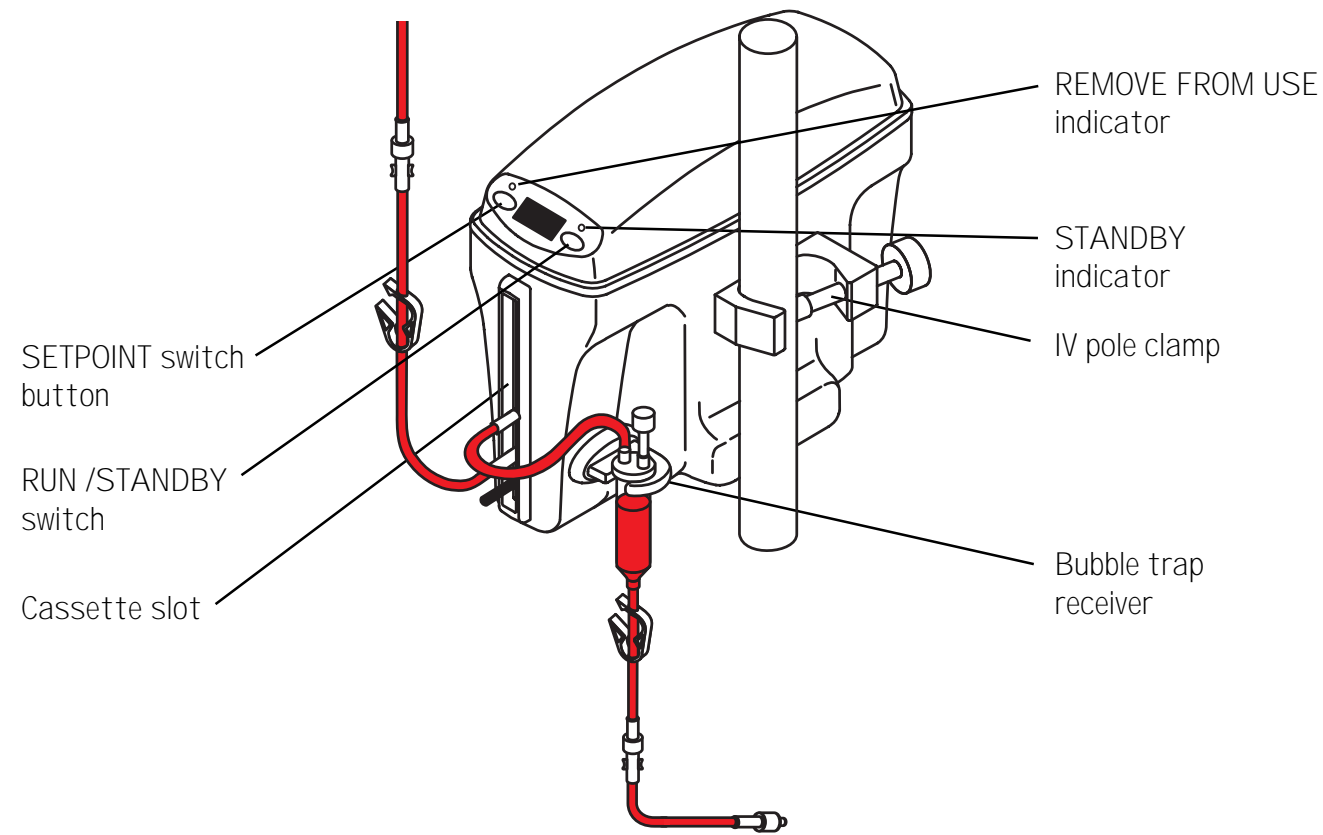


Figure 1—FW601 Blood/Fluid Warmer

2.0 Product Description

The Medi-Temp III FW601 Blood/Fluid Warmer is a dry-heat device designed for safe and rapid warming of blood, blood products and other fluids through the utilization of disposable blood/fluid warming sets. The warmer does not provide fluid flow rate control. Blood, blood products and other fluids normally refrigerated, can be rapidly warmed to user selectable temperatures of between 38.0°C–41.0°C at flow rates up to 300 ml/min. Room temperature fluids can be warmed at flow rates up to 500 ml/min. The disposable Blood/Fluid warming sets are available in Standard, Standard with Extensions, Pediatric, and High Flow models.

2.1 Warmer

The warming unit is designed to be IV pole mounted. The device has no on/off switch. Connection to the AC supply is indicated by a green *STANDBY* mode indicator, located on the front panel. In *STANDBY* mode, no power can be applied to the heater. To begin normal operation, the *RUN/STANDBY* button must be pressed.

When this occurs, an LED temperature display located on the front panel will display the actual fluid temperature or the setpoint temperature in °C. The setpoint is user selectable from 38.0°C–41.0°C in 1.0°C increments, by use of the *SETPOINT* switch on the front panel. Also located on the front of the unit is a slot for insertion of the disposable warming set. On the right side of the unit, just below the IV pole clamp, is a receiver for the disposable warming set's bubble trap.

2.2 Disposable sets

The Medi-Temp III FW601 Blood/Fluid warming unit is designed to be used only with Gaymar series disposable warming sets. The following warming sets (figure 2) are designed for use up to 300 mm Hg pressure. Contact your local dealer for more information.

8.0 Technical Specifications


Technical Specifications	
Item	FW601
Setpoint range / resolution	38.0°C to 41.0°C in 1.0°C increments
Fluid temperature resolution	0.1°C
Controller accuracy at 100 ml/min	±0.5 °C
Voltage	100 VAC
Input	11A, 1100VA
Fuse	(2) 15A time delay 250V
Frequency	50/60 Hz
Ambient temperature range	15°C to 29°C
Power cord	15 ft long, UL listed type SJT, 16 AWG 3-conductor cord with molded-on grounding-type hospital grade plug
Classification	Class I grounded, type BF, splashproof equipment not suitable for use in the presence of a flammable anaesthetic mixture with air or with oxygen or nitrous oxide. Suitable for continuous duty.
	 IPX4
Weight	2.7 kg
Size	22 cm x 28.5 cm x 12 cm

Figure 9—Specifications

7.0 Troubleshooting

Symptom	Probable causes	Required action
Display alternately flashes LO and the fluid temperature	Output fluid temperature has not yet reached 34°C.	Allow unit to run for 2 minutes. If temperature does not increase, remove from use and request service.
Display alternately flashes HI and the fluid temperature	A transient disturbance, such as a sudden change in flow rate, has caused the fluid temperature to rise above 43°C.	NONE—unit will resume normal operation when temperature drops below 43°C.
Audible alarm sounds and display flashes LO and the fluid temperature	Output fluid temperature has dropped below 34°C.	Allow unit to run for 2 minutes. If temperature does not increase, remove from use and request service.
Audible alarm sounds and display indicates FA_	The electronic diagnostics have detected an internal problem.	Remove from use and request service.
Audible alarm sounds continuously and yellow RFU light is lit	Internal fluid temperatures have exceeded 45°C and backup system has been activated.	Stop fluid flow, discard cassette, and request service.
Cassette is difficult to insert into warming unit	Cassette primed prior to insertion.	Drain cassette and reinsert.
	Inside slot of warming unit may have contamination on the heater plates.	Clean inside of unit by following cleaning procedure (section 5.0)
Cassette is difficult to remove from warming unit	Cassette is still pressurized.	Close input clamp and open output clamp. Allow fluid to drain.

Figure 8—Troubleshooting chart

Description	Standard Catalog Number	Needless Catalog Number	Application	Priming Volume
Standard	D25340CE	—	KVO—150 ml/min	39 ml
Standard with 48" extension	D25310CE	D25310NL	KVO—150 ml/min	48 ml
Standard with 60" extension	D25315CE	—	KVO—150 ml/min	50 ml
Pediatric with 30" extension	—	D25320NL	KVO—100 ml/min	30 ml
High Flow with 48" extension	D25330CE	D25330NL	100—500 ml/min	79 ml
Irrigation	IRR3570	—	500 ml/min max	NA

KVO = minimum flow required to keep veins open

Figure 2—Gaymar series warming sets

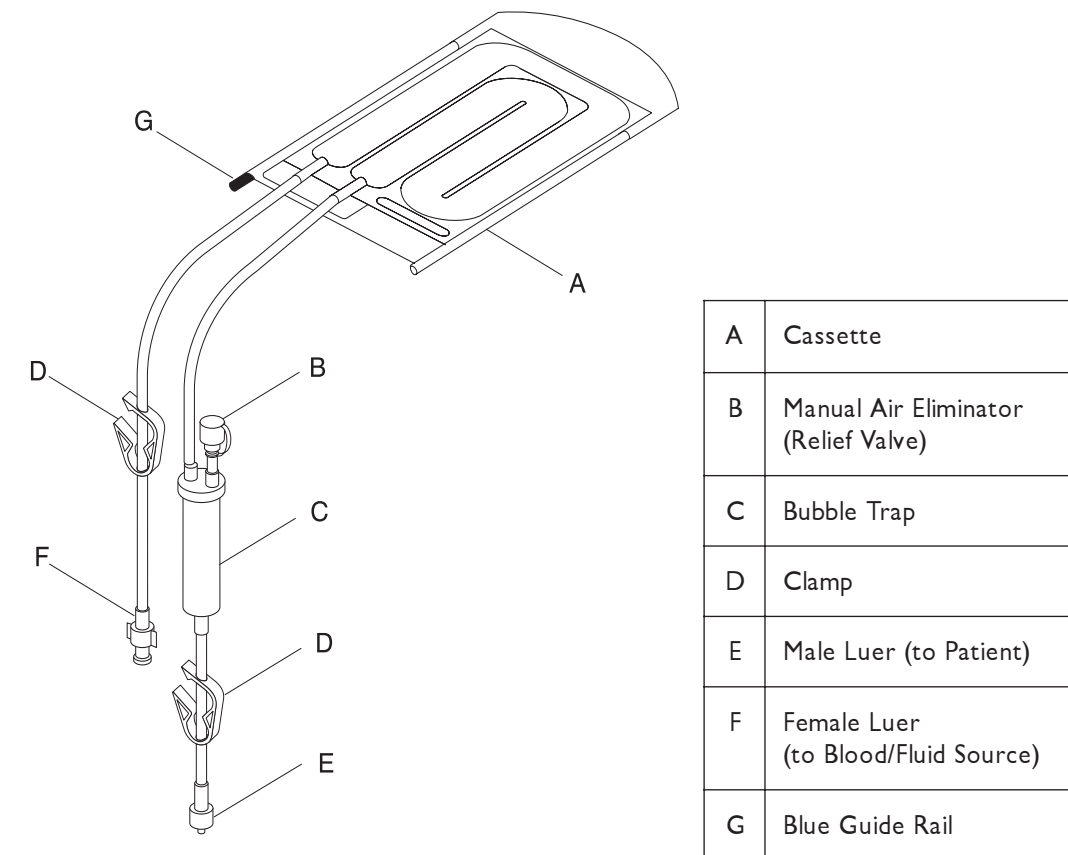


Figure 3—Warming set and bubble trap

3.0 Instructions for Use (see figures 3—5)

- Attach warming unit to IV pole and secure with clamp on side of unit.
- Plug the power cord into a properly grounded outlet.
- Remove the warming set from its sterile packaging

NOTE: The warming set is designed so it can be inserted into the warmer in only one orientation. Orient the cassette so that the blue guide rail is inserted into the bottom of the warming unit.

- 1 Grasp each rail (see figure 4). Insert the front end of the cassette into the front of the warming unit, with the blue guide rail facing down. Align the rails to each of the slotted openings.

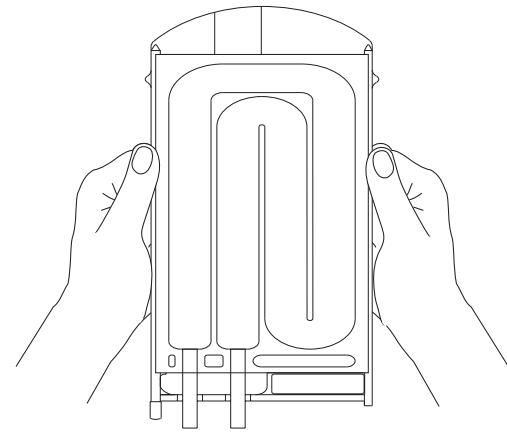


Figure 4—Inserting the cassette

Move hands to the rail protrusions and continue to insert the cassette until the clear guide rail is **almost** flush with the front of the unit. (The blue guide rail will protrude slightly for easy removal.)

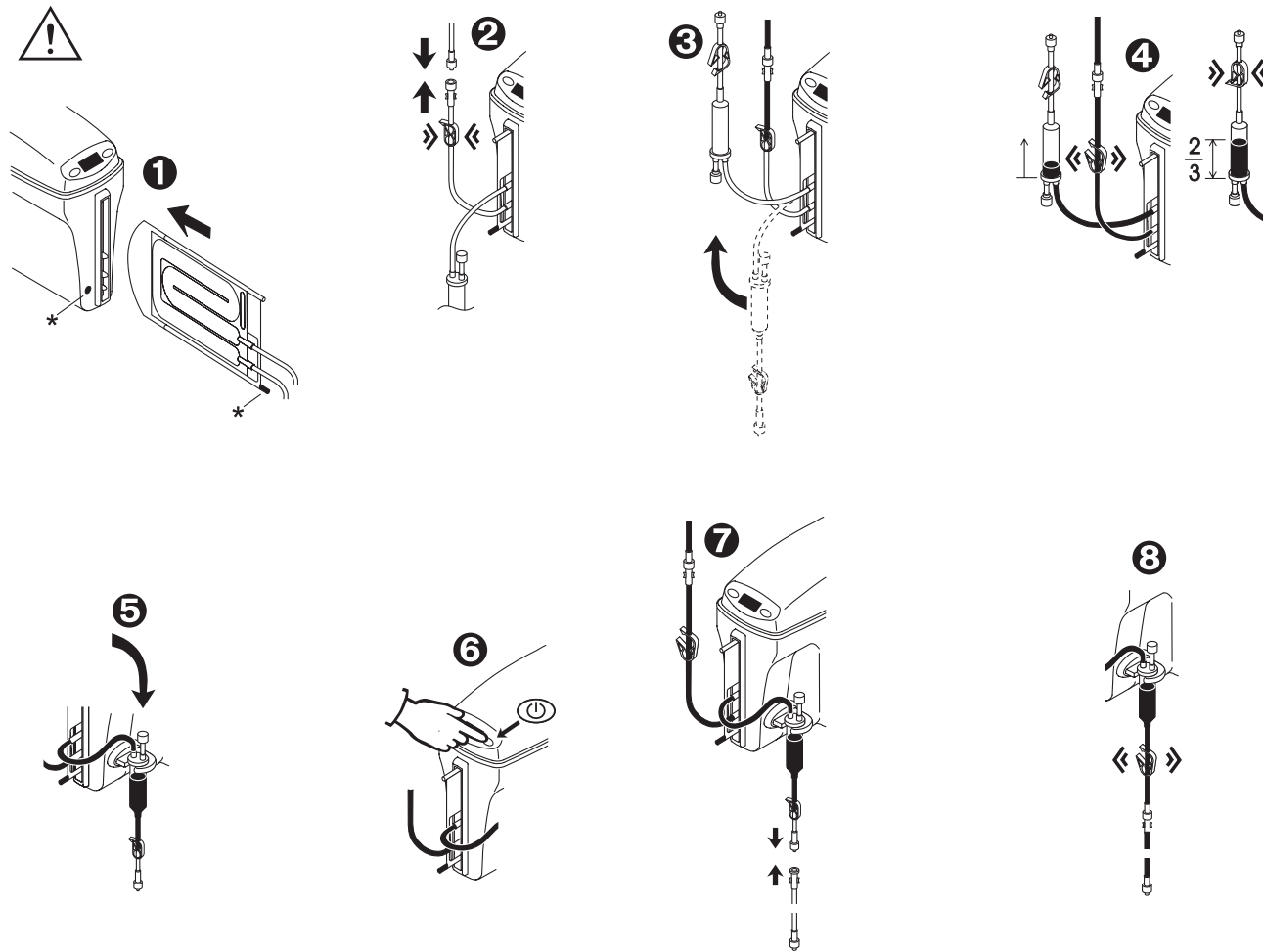


Figure 5—Setup instructions

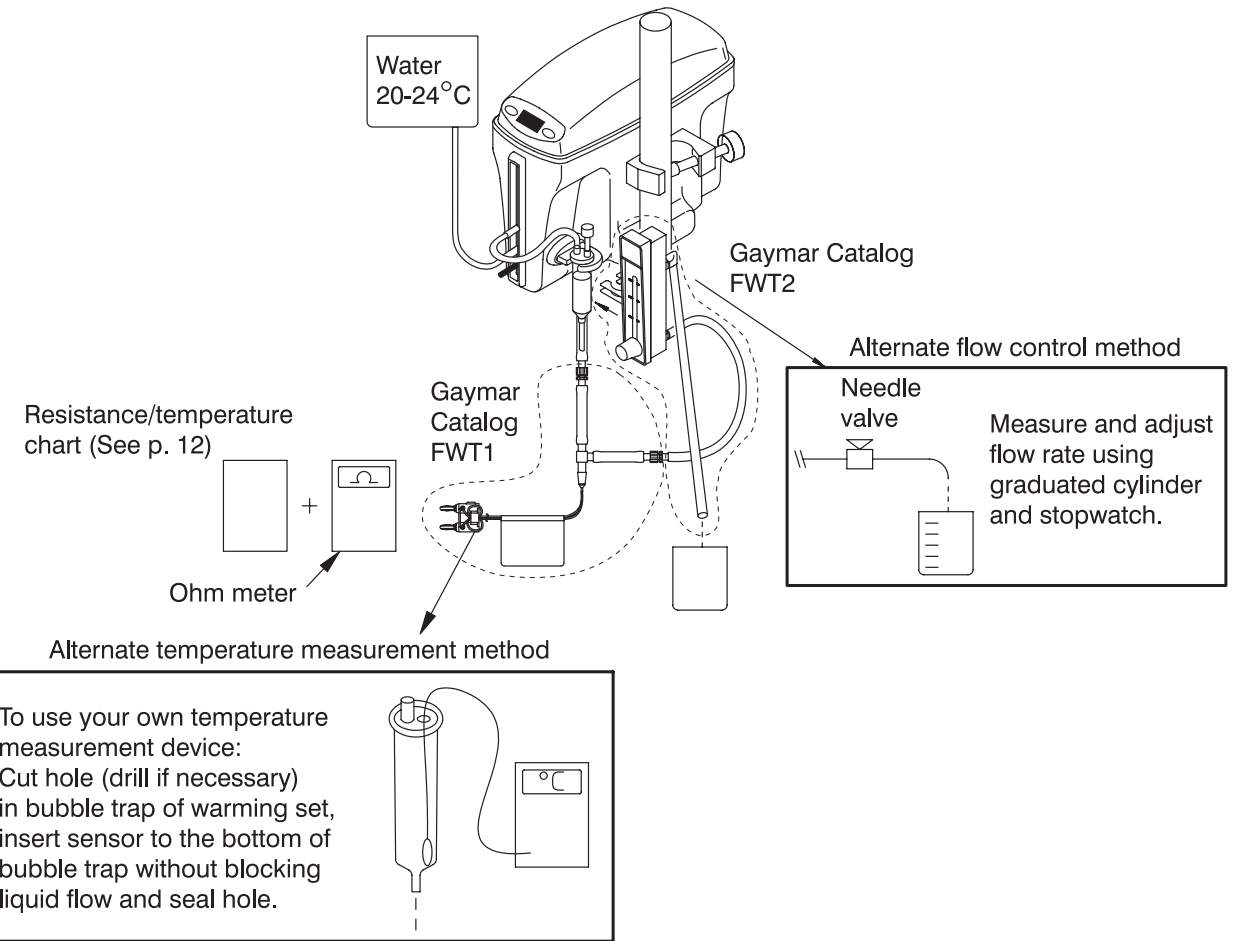


Figure 7—Test setup

1. Insert any D25000 series Warming cassette into the warming unit. Using hot tap water (46°C–50°C), flow hot water through the cassette for approximately 1-3 minutes.
2. Connect AC power to the warming unit. The device should immediately sound the audible alarm and light the RFU light.

6.4 Ground Resistance Check

Use a current leakage/ground resistance tester to measure the resistance between the ground pin on the power plug and the mounting screw on the IV pole clamp.

The resistance value should not exceed 0.50 ohms.

6.5 Current Leakage Test

Measure the maximum earth leakage current (ground open). Measure all combinations of line polarity with neutral open and closed. Values should not exceed the following:

Neutral closed 150µA

Neutral open 200µA

6.0 Functional Check and Safety Inspection

To assure optimum performance, dependability, and safety, the following should be performed every twelve months or as specified in the facility's preventive maintenance program.

Equipment or tools required

- Any Gaymar D25340 series Blood/Fluid Warming Set
- Temperature measurement device:
 - Gaymar D25340 Blood/Fluid Warming Set; and
 - Temperature sensor (Gaymar catalog FWT1) and an ohmmeter (accuracy, 1.5% of reading; maximum excitation current of 100uA) and the resistance temperature chart. See figure 10 (p. 12).
- or**
- Any Gaymar D25000 series Blood/Fluid Warming Set; and
- Waterproof temperature sensor/meter with an accuracy of $\pm 0.3\%$ across the range of 30°C to 60°C and a thermal time constant of 2 seconds or faster.
- Flow measurement device (Gaymar catalog FWT2 flowmeter):
 - Fluid source with calibrated flow meter and a minimum accuracy of ± 12 ml/minute
- or**
- Fluid source with adjustable flow control, Use a stop watch and graduated cylinder to adjust flow rate.
- Current Leakage/Ground resistance tester
- AC multimeter

6.1 Physical Inspection

Check that the following items are in good condition and secure.

- Labels, if peeling or missing
- Screws in cover
- Bubble trap receiver
- Power cord
- IV pole clamp

6.2 Output Fluid Temperature Verification

The FW601 Blood/Fluid Warmer is factory calibrated at a flow rate of 100 ml/min.

To verify the output fluid temperature is correct:

1. The ambient room temperature must be between 20°C to 24°C .
2. Connect the test setup (see figure 7). Attach the Gaymar FWT1 temperature sensor to the output of the bubble trap.

Alternate method: Put a hole in the top of the bubble trap and insert a temperature measurement device through this hole. Make certain sensor is completely submerged in fluid then seal the hole in the bubble trap.
3. Connect the FWT2 flowmeter or flow measurement/control device to the output of the FWT1 temperature sensor.

Alternate method: If using the sensor in the bubble trap method, connect the FWT2 flowmeter or flow measurement/control device directly to the output of the bubble trap.
4. Flow room temperature water through the warmer at 100 ml/min (cc/min). Verify that the bubble trap is maintained 1/2 to 2/3 full.
5. Turn the warmer on. Adjust the *SETPOINT* to 41.0°C . Allow it to run for 10 minutes.
6. Verify that the output water temperature is $41.0^{\circ}\text{C} \pm 1.1^{\circ}\text{C}$. If using the FWT1 temperature sensor and an ohmmeter, verify that the resistance is within 1103—1204 ohms.

If temperature or resistance values are not met, check setup and repeat test. If still not within range, contact your dealer for service.

This device is factory calibrated and cannot be field adjusted.

6.3 Overtemp Protection Verification

Proper operation of the overtemp protection system is verified each time the unit is switched from *STANDBY* to *RUN* mode. Therefore, periodic testing of this system is not necessary. However, the following procedure may be used to force an *OVERTEMP* condition in order to observe that the overtemp protection system works:


⚠ CAUTION

When fully inserted, the clear guide rail should protrude no more than 0.5 cm from the front of the warming unit. **Failure to fully insert the cassette may result in damage to the cassette.**

- 2 Close warming set input clamp. Remove the protector from the female luer of the warming set and connect it to the male luer on the IV administration set. Remove the protector from the male luer of the warming set. To minimize temperature drop and priming volume, remove unnecessary lead extensions at this time.
- 3 Invert the bubble trap.
- 4 Open warming set input clamp. Allow fluid to prime the set. When the bubble trap fills to approximately (2/3) full, close the output clamp.
- 5 Re-invert the bubble trap and place it into the bubble trap receiver on the side of the warming unit.



⚠ WARNING

The bubble trap must be mounted and kept in a vertical position at all times. **Failure to do so could result in the introduction of air to the patient, resulting in death or serious injury.**

- 6 Press the *RUN/STANDBY* switch  on the front of the unit.

Upon successful completion of self-diagnostics, the display will flash the setpoint for approximately 3 seconds, then begin warming the fluid to the selected temperature.

The setpoint most recently used is retained in memory, even after power is removed. To select an alternate setpoint, first press the

SETPOINT switch   momentarily.

This will cause the setpoint to be displayed and flash for approximately 3 seconds. While the display is flashing the setpoint, the user may select any setpoint between 38.0°C and 41.0°C in 1.0°C increments by repeatedly pressing the *SETPOINT* switch.

NOTE: holding down the *SETPOINT* switch indefinitely will not increment the setpoint.

After the selection has been made, the display will continue to flash this setpoint for approximately 3 seconds, then revert to displaying the actual fluid temperature. The setpoint can be checked at any time during the procedure by momentarily pressing the *SETPOINT* switch.

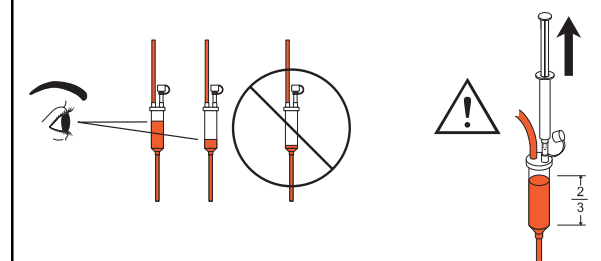
- 7 If required, connect an extension for patient connection.
- 8 Purge air from remaining length of tubing by opening output clamp and allowing fluid to flow.

⚠ WARNING

- All air must be removed from the fluid lines prior to connecting to the patient.
- Monitor the fluid lines to ensure they are air free. Never administer fluids if there are air bubbles in the line between the bubble trap and the patient connector.

Failure to do so could result in the introduction of air to the patient, resulting in death or serious injury.

⚠ WARNING



Monitor the fluid level in the bubble trap frequently. Bubbles released during heating are captured in the trap. To refill the trap, insert a sterile syringe into the valve and draw air out until the trap is two-thirds (2/3) full. Do not allow the bubble trap to go below one-quarter (1/4) full.

Failure to monitor the fluid level in the bubble trap could result in the introduction of air to the patient, resulting in death or serious injury.

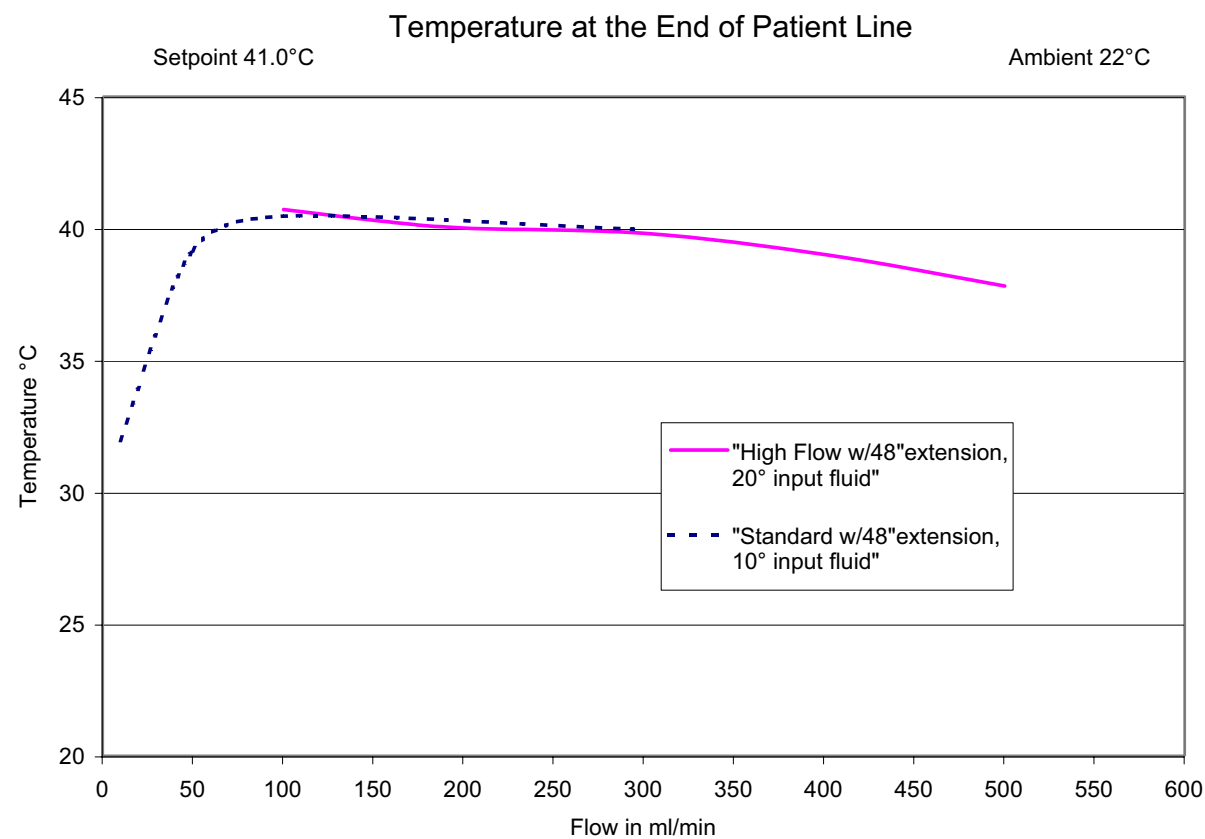


Figure 6—Typical fluid temperature vs. flow rate

3.1 Effect of Flow Rate on Fluid Temperature

Fluid temperatures exiting the patient line are affected by flow rate. The following flow vs. output fluid temperature curve is typical for the FW601 warming unit. See figure 6 above.

NOTE: Output fluid temperature for this curve is measured at the end of the patient line.

3.2 Warming Set Removal

The cassette cannot be removed from the warming unit while under pressure. To remove the cassette:

1. Close the warming set input clamp first, while leaving the output clamp open.
2. Close the warming set output clamp.
3. Following steps 1 and 2 will allow fluid to drain from the cassette. Gently pull on blue guide rail to remove cassette from warming unit.
4. Dispose of warming set per facility protocol.

⚠ CAUTION

Failure to drain cassette will make it difficult to remove. **Forcing the cassette out may cause it to rupture.**



4.0 Safety Systems

4.1 Over Temperature Protection

A backup system within the warmer is independent of the main controller and monitors fluid temperature continuously. If the output fluid temperature exceeds 45.0°C, the backup system will immediately interrupt power to the heaters. If the over-temperature condition is a temporary occurrence as a result of a sudden change in flow rate, the display will alternately flash *HI* and the fluid temperature. When the fluid temperature returns to acceptable temperature levels, normal operation will resume. If, however, the backup system detects that the over-temperature condition is a result of a failure of the main controller, an audible alarm will sound, the RFU (*REMOVE FROM USE*) indicator will light, and the device will shut down. If this occurs, immediately stop the fluid flow, discard the warming set, and contact your dealer for service.

4.2 Self-diagnostics

Each time the warming unit is switched from *STANDBY* mode to *RUN* mode, a self-test is initiated. If the backup system is not functioning properly, an error message will be displayed and the unit will shut down. In addition, self-tests are routinely performed during *RUN* mode to ensure continued safe operation of the warming unit.

4.3 Control Alarm LO

If the warming unit senses a fluid temperature less than 34.0°C, the audible alarm will chime and the display will alternately indicate the symbol *LO*, and the actual fluid temperature.

Exception: The unit will not alarm until the fluid temperature has initially surpassed the 34.0°C threshold.

5.0 Cleaning

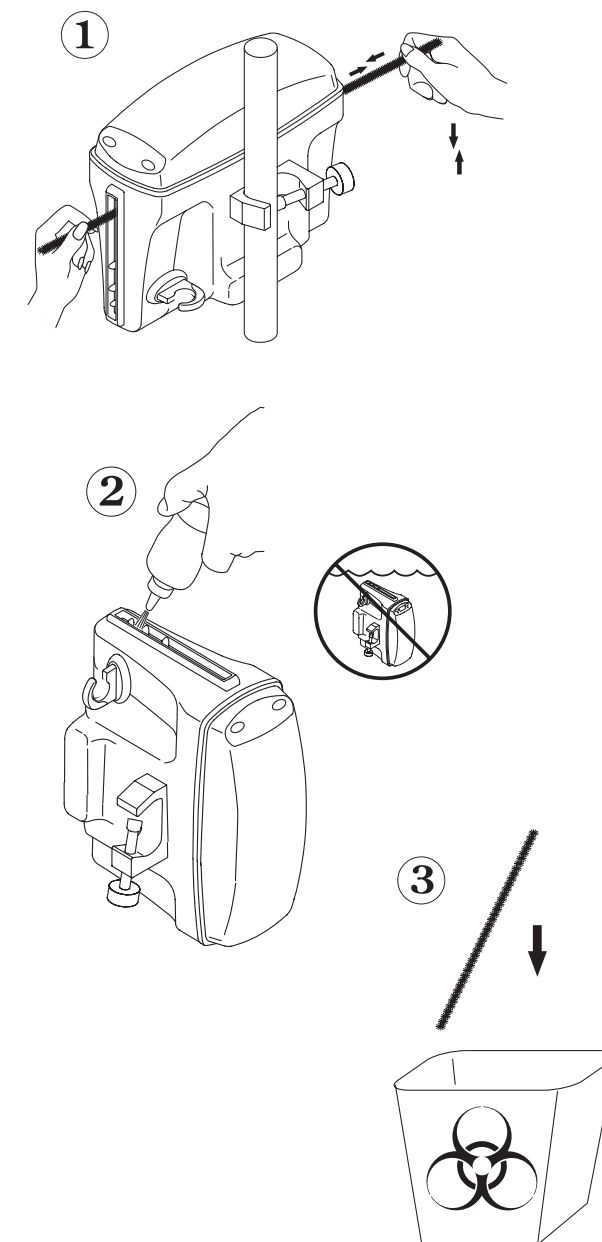
⚠ CAUTION

Do not immerse the warmer in cleaning or disinfectant solutions. Do not submerge it in liquids; it is fluid-resistant, not fluid-proof.

Immersion could result in malfunction or equipment damage.

Perform the following care and cleaning between patient use or per facility protocol.

- Unplug unit prior to cleaning
- To clean the external surfaces of the warmer, use a non-abrasive cleaning solution (such as warm soap water) and a clean cloth.



- Clean inside of cassette slot with disposable brush. Carefully flush using squeeze bottle with water. Replacement cleaning kit P/N 78350-000.
- Apply a disinfectant such as 10% chlorinated bleach solution (chlorinated bleach with 5.25% sodium hypochlorite) to both the outside of the unit and the cassette slot and allow to dry.

⚠ CAUTION

The warming unit should be cleaned if any fluid or foreign substance has entered the cassette slot. **Failure to keep the cassette slot clean could impede cassette insertion.**