

# HydraTherm DT

## OPERATION MANUAL



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**This device complies with part 15 and part 18 of the FCC Rules.**

**NOTE:** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

## INTENDED USE

The HydraTherm DT is intended for use in treatment facilities and rehabilitation clinics to heat hot packs for the purpose of moist heat therapeutic treatment.

Congratulations on your purchase of your Richmar HydraTherm Desktop (DT). Richmar warrants that your HydraTherm is free of defects in material and workmanship. This warranty shall remain in effect for two (2) years from the date of the original purchase of the end user, only if used with Richmar HydraHeat packs. The warranty will remain in effect for one (1) year from the date of the original purchase of the end user if using any other type of hydrocollator approved packs for moist heat therapy.

If this product fails to function during the warranty period due to a defect in materials or workmanship, Richmar or the selling dealer will repair or replace the respective product without charge.

All product repairs must be performed by Richmar or a company authorized by Richmar to repair the product. Repairs or replacement do not extend the life of the warranty. Any modifications or repairs performed by unauthorized centers or groups will void the warranty of this product.

To register your warranty coverage with Richmar, fill out the online form at: [richmarweb.com/warranty-registration](http://richmarweb.com/warranty-registration)

## **RICHMAR SHALL RESERVE THE RIGHT TO REQUEST PROOF OF PURCHASE FROM THE END-USER TO VALIDATE THE WARRANTY PERIOD**

**This warranty does not cover:**

1. Replacement parts or labor furnished by anyone other than Richmar, the selling dealer or a certified service technician approved by Richmar.
2. Defects or damage caused by labor furnished by someone other than Richmar, the selling dealer, or a certified service technician

approved by Richmar.

3. Any malfunction in the product caused by product misuse, including, but not limited to, the failure to provide reasonable and required maintenance or any use that is inconsistent with the product's manual.

## **RICHMAR SHALL NOT BE LIABLE IN ANY EVENT FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES**

Some locations do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusion may not apply to you.

To obtain Service from Richmar or an authorized technician approved by Richmar, under this warranty:

1. A claim must be made within the warranty period to Richmar or the selling dealer.
2. All claims must be approved with a Return Authorization Number. Any product sent back without an authorized RA number will be returned to the sender.
3. Provide the following information when calling for an authorization number:
  - a. Item Number
  - b. Name of selling dealer
  - c. Date of Purchase from selling dealer
  - d. Product Serial Number
  - e. Reason for return
4. The return Authorization Number must be marked clearly on the returned carton and is valid for 10 business days from the date of issue. Returned merchandise must be in the same unit of measure as originally purchased.

## **Returns will not be accepted on items that are:**

- a. Missing serial number
- b. Special order items
- c. Returned more than 30 days after delivery
- d. Returned without notification

If device malfunction is deemed to be a result of any other type of hydrocollator approved packs (i.e. bentonite clay pack leakage, etc.), the warranty will be null and void.

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license to any of these intellectual property rights. The manufacturer shall not be liable for any errors and/or omissions for incidental or consequential damages in connection with the performance or use of this material. All rights reserved. Without limiting the rights under copyright law, no part of this document may be reproduced, stored in or introduced into a retrieval system, or transmitted in any way without the express written permission of the manufacturer.

## FOREWARD

This manual is written to ensure proper and safe operation of the HydraTherm DT Heating Unit. It contains general information regarding replacement parts, operation, safety precautions and maintenance. In order to maximize safety, efficiency and the life of your Heating Unit, please read this manual thoroughly and follow all instructions

prior to operating the unit.

Specifications and instructions put forth in this manual are in effect at the time of publication; however, due to Richmars policy of continued product improvement, changes may be made to these specifications and instructions at any time without obligation on the part of Richmar.

## SYMBOLS GLOSSARY

### CAUTIONS

Text under a "CAUTION" heading explains possible safety infractions that could have the potential to cause minor to moderate injury or damage to equipment.

### WARNINGS

Text under a "WARNING" heading explains possible safety infractions that could potentially cause serious injury and equipment damage.

### DANGER

Text under a "DANGER" heading explains possible safety infractions that are imminently hazardous situations that could result in death or serious injury.

### DANGEROUS VOLTAGE

Text under a "DANGEROUS VOLTAGE" heading indicator serves to inform the user of possible hazards resulting in an electrical charge.

**NOTE:** Throughout this manual, "NOTE" may be found. These notes are helpful information to add in the particular area or function being described.



ATTENTION: Refer to the Instruction Manual/ Booklet



Type B equipment – Equipment providing a particular degree of protection against electric shock, particularly regarding allowable leakage currents and reliability of the protective earth connection (if present).



Indicates a requirement not to dispose of WEEE as municipal waste.

The following labels are located on the electrical enclosure in the rear of the unit.



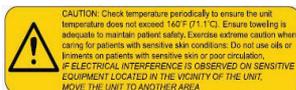
### Hazardous Voltage

High Voltage is present in the electrical enclosure located in the rear of the unit. Service should only be accomplished by trained personnel.



### Explosion Hazard

Due to the high temperatures in which the unit operates, **DO NOT** use this unit in the presence of flammable anesthetics.



### Water Temperature

Check water temperature periodically to ensure temperature does not exceed 150°F (65°C). For personal safety and patient safety, please observe the cautions as outlined in the label below.



### Hot Surface

Hot surface. **DO NOT** touch.

## PRECAUTIONARY INSTRUCTIONS

### CAUTIONS

- The HydraTherm DT Heating Unit is intended for clinical/professional use **ONLY**.
- Read, understand and practice the precautionary and operating instructions. Know the limitations associated with the HydraTherm DT Heating Unit. Observe the cautionary and operational decals installed on the Product.
- On the initial startup of the Heating Unit or when new packs are added check the water level every 2 hours for a period of 8 hours. This will prevent running the heater with low water levels as some new heat packs absorb water.

**NOTE:** Richmar **DOES NOT** recommend using other heat pack products, as we have not tested the safety of those heat packs and their use could result in injury to patients. Richmar recommends only using

HydraHeat Packs, which do not absorb water, used at safer temperatures than other like heat packs, can be sanitized between uses, and helps to reduce maintenance tasks.

- Each patient can tolerate different temperature levels and patients skin should be monitored to ensure skin is not becoming too hot. **DO NOT** leave patient unattended.
- Temperature readings from external thermometers may differ from the displayed temperature based on the location of temperature reading, and type of thermometer used. Dependent on these factors, the temperature reading may vary by +/- 1-2° F
- **ALWAYS** allow sufficient time for water temperature to stabilize prior to temperature readings.
- **ALWAYS** keep the water level at or over the top of the heat packs (see

# PRECAUTIONARY INSTRUCTIONS



Fill Line with Packs on inside back of HydraTherm tank).

- Check water level daily, due to evaporation from unit.
- Clean the tank periodically as described in the cleaning and maintenance sections of this manual and/or Quick Start Guide.
- **ALWAYS** replace heat packs as soon as they show signs of wear. Packs were developed to be replaced annually per manufacturer recommendations.
- If the unit is to be left unattended for longer than one week:
  - a. Turn off the heating unit
  - b. Disconnect the power cord from the power source/electrical outlet
  - c. Remove the packs and store them on a dry, flat surface
  - d. Drain tank
- **ALWAYS** use factory authorized replacement parts.
- **ALWAYS** use a towel, pillowcase, or washable terry cover against the patients skin when using Hydra Heat packs to prevent injury to patient and contamination. If using any other type of hydrocollator approved heat packs, please use manufacturers covering recommendations.

**NOTE:** For further information on avoiding electrical interference, refer to that section of this manual, refer to the EMC table at the back of this manual.

- If electrical interference is observed on sensitive equipment in the locale of the Heating Unit, first turn the unit off to determine the source of interference. If necessary, unplug the Heating Unit and move it to another area. It is recommended to allow water to cool and/or drain the unit prior to moving. Please see Draining Instructions section of this manual.
- **DO NOT** store the unit in a confined space.
- When heated, the surface of the unit and lid may become hot. Use the handle to lift the lid. **DO NOT** touch the lid top. The lid will need approximately 18.5" of clearance to open completely

Lid should stay upright, not fall back as this could wear the hinges.

- **DO NOT** sit on the HydraTherm DT.
- **DO NOT** add chlorine additive to the water.

## **WARNING**

- **DO NOT** apply HydraHeat Packs directly to the patients skin.
- Check the temperature periodically to ensure the unit temperature does not exceed 150°F (65°C).
- **DO NOT** move the HydraTherm DT Heating unit when filled with heated water. Contact with hot water could result in scalding and/or burns to users or others.
- **ALWAYS** unplug the unit from its electrical service when cleaning the unit.
- Exercise extreme caution when caring for patients with insensitive skin or in areas of poor circulation.
- Consult healthcare professionals before using heat packs on individuals who cannot communicate.

If the water reaches or exceeds 150°F (65°C) turn the unit OFF, remove the Power Cord and quarantine the unit. Contact Richmar Technical Service for further instructions.

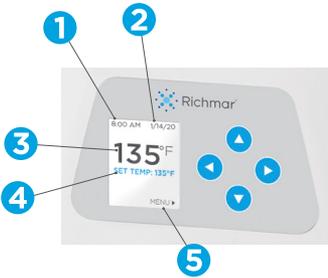
- The water temperature in the HydraTherm DT Heating Unit is adjustable from 120°F (49°C) to 150°F (65°C).

**NOTE:** According to the CPSC, scalding temperature of water (exposed to more than six seconds) is 140°F (60°C) and up.\* While removing packs from the HydraTherm DT, **NEVER** place hands into the heating unit.

- It is recommended to check water temperature daily before use.
- Individuals with circulatory problems should consult with a physician before receiving moist heat therapy.

## **WARNING**

- Be aware of pinch point between lid and unit, when the lid is open.

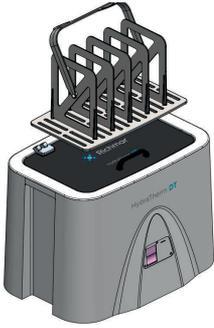

**Front View**
**Rear View**


1. Time Clock
2. Date
3. Current Device Temperature
4. Desired Set Temp (Default is set to 135°F)
5. Settings Menu


**Main Screen Display**
**Side View**


1. Power Switch
2. Main Fuse 6 Amp
3. Power Supply Receptacle
4. Drain Hose Attachment

**Enclosure Panel**



Item #	Description	QTY
HT-R6-DT	HydraTherm DT Heating Unit	1
HT-DT-WP	HydraTherm DT with 6 Standard Heat Packs	1
DT-RACK	HydraTherm Finned Rack System	1
HT-R6-X	HydraTherm DT Power Cord	1
DT-HOSE	HydraTherm DT Drain Hose	1
DT-FILTER	HydraTherm DT Drain Filter	1

## RACK ASSEMBLY AND RECOMMENDED PACK SET UP

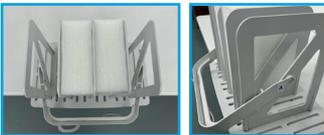
The HydraTherm DT unit comes standard with finned rack system. The finned rack system functions as a method to not only keep the packs separate for even heat distribution but also as a raising mechanism to lift the packs out for easier removal.

### Assembly Instructions

- Align the A side of the rack to the A side of the handle and the B side of the rack to the B side of the rank handle.



- Place the rack base at the edge of a table so that the rack handle may be positioned off the edge of the table at a level lower than the plane of the rack base.



- Ensure that the keyed feature on each side of the handle aligns correctly with the key-hole feature on each end face of the rack.



- Insert the keyed features of the handle into the key-hole features in the rack end faces.



- Rotate the handle to the vertical position and lift the rack to the middle of the table.



- The handle should now be securely fitted to the rack and should not become dislodged unless it is fully rotated back to the same angle at which it was attached to the rack.



# RACK ASSEMBLY AND RECOMMENDED PACK SET UP

## Pack Set Up

When purchasing your HydraTherm DT Heating Unit, Richmar recommends two different pack configurations that will fit into your device. It is not recommended to use any more than 4 packs of any other size configuration, than the two recommended below, as the heat may not evenly distribute throughout the heat packs while in the tank.

The recommended pack configurations for both options are shown below.

**Figure 1:** For the 6 - 12" x 10" pack

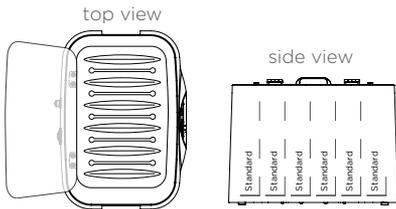


Figure 1

configuration, packs fit best with the long side placed vertically into the tank.

**Figure 2:** For the variety size configuration, fold the cervical and oversize pack and the standard pack placed vertically.

**NOTE:** If using tongs to remove packs from the heating unit, it is NOT recommended to use metal tongs or any type of removal method that includes sticking hand in the water or anything that includes metal, which can pierce or puncture the packs, and will not be covered under the warranty.

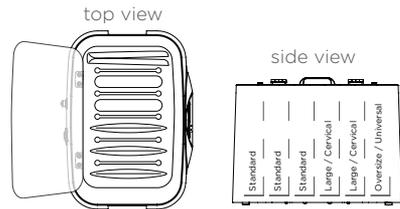


Figure 2

The HydraTherm DT Heating Unit is designed to be simple and easy to use.

1. Remove all of the contents inside the HydraTherm DT Heating Unit and ensure filter is securely in place at bottom of tank. Then place the finned rack system into the unit after attaching the dividers to the bottom of the rack system by snapping them in place.
2. Move tank to the location where it will be used, prior to filling the tank. **DO NOT** move the tank with hot water in it.
  - Allow a minimum of 18.5" of clearance above the lid so that the packs can be removed without external interference and 6" or more in the back to be able to access the electrical enclosure power switch.

### **WARNING**

As with all electrical equipment and components, the unit should be kept clear of any hazardous or explosive gases.

3. Insert the heat pack(s).
4. Verify the drain hose has been detached.

5. Plug power cord into back of device and into a properly grounded wall outlet. **DO NOT** plug device into any adapter or power strip as it will void the warranty.

**NOTE:** The HydraTherm DT can be filled completely (to the fill line) with tap water. No distilled water necessary.

### **CAUTION**

Adding additional packs after the unit is filled will cause the water to displace and may cause an overflow condition.

### **WARNING**

**DO NOT** attempt to use the unit if it is not properly grounded.

A Ground Fault Interruption circuit or receptacle (GFI outlet) is recommended for additional protection.

The Digital Thermostat, located on the front of the unit, controls and maintains the temperature of the water, as well as low water levels and error codes.

## INSTALLATION

1. To turn the unit on, simply plug the supplied power cord into the back of the unit and then into the appropriate 115-120VAC, 50/60Hz outlet and push the Power Switch to the "I" position. To turn the unit off, simply press the switch to the "O" position and unplug from the power outlet.
2. The unit will go through a self-test check and will display a start up screen showing the Richmar logo and then automatically switch to the Home Screen.



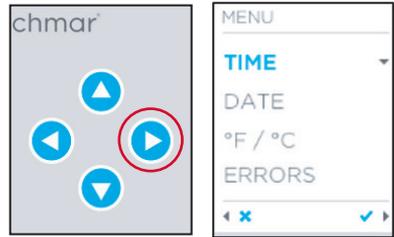
**NOTE:** If the Home Screen displays an Error Code at start up, please go to the Troubleshooting section of this manual to determine next steps

3. The Home Screen will display the current temp of the unit (black) and the set temp underneath (blue). The unit defaults to a Set Temp of 135°F (57°C). To increase or decrease the SET TEMP, press the up or down arrow until the SET TEMP (in blue on home screen) displays desired temperature. It should take approximately 8 hours for the tank to heat to 135°F (57°C) and 14 hours for the tank to heat to 150°F (65°C) if water starts at room temperature.

**NOTE:** The HydraTherm DT should not increase above 150°F (65°C).



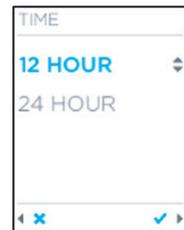
4. To program the device time, date and temperature measurement preference, press the right arrow on the keypad to enter the Settings Menu.



5. To change the desired settings, press the up or down arrow on the keypad to highlight the selection in blue.

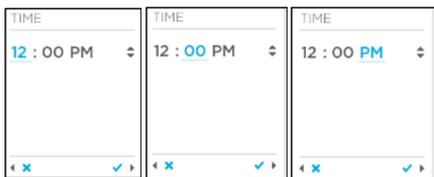


6. To change the time, press the right arrow on the keypad to display the time options. Highlight the preferred time option in blue and then press the right arrow on the keypad to accept the selection. To go back to the previous menu, press the left arrow on the keypad.

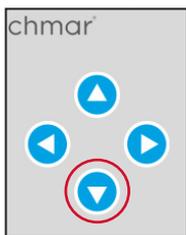


7. Press the up or down arrow until you reach the correct hour. Then press the right arrow on the key

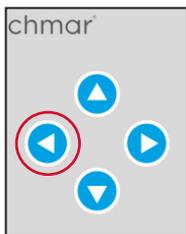
pad to change the minutes and the right arrow again to change to either morning or afternoon.



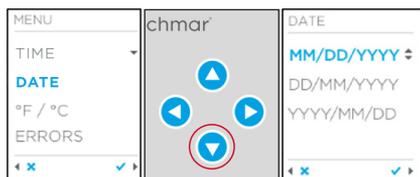
Press the right arrow to accept all changes and return to the Settings Menu.



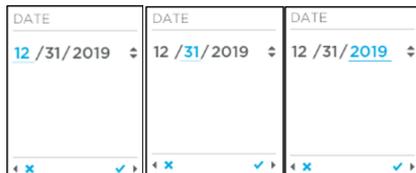
If no more setting changes are needed, press the left arrow on the keypad to return to the Home Screen.



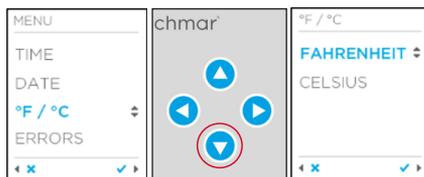
8. From the Settings Menu, to change the date, press the down arrow highlight "DATE" in blue. Then press the right arrow on the keypad to choose the preferred date format. Press the up or down arrow to change to the desired format.



9. Press the up or down arrow until you reach the correct number for the chosen format then the right arrow on the keypad to accept and advance to the next number until correct date is entered. Then press right arrow once more to return to the Home Screen or left arrow to go back to the Settings Menu.



10. To change the desired Temperature Measurement, enter the Settings menu and press the down arrow to highlight F°/C° in blue. Press the right arrow to accept. Then press up or down arrow to choose between Fahrenheit or Celsius. The heating unit defaults to F°.



**NOTE:** If there is a need to do a Factory Reset, enter the settings menu and press the down arrow until RESET is highlighted in blue. Press right arrow to accept. A screen will verify that Factory Reset is, in fact the chosen function. Press right arrow to accept.



## WARNING

**ALWAYS** unplug the unit from the electrical outlet when cleaning the unit.

**ALWAYS** allow the heating unit to cool down before moving. It is **NOT** recommended to move the tank when filled with water, as it can cause water to overflow out of the tank and possibly cause damage to the electrical outlet and your facility. **ALWAYS** use drain hose to drain unit, **DO NOT** dump water from top of unit. **NOTE:** If the only way to drain the tank is to move it while full, it is strongly suggested to have 2 people grip the tank, each using the side handle, and carefully move the tank where it can be drained.

The HydraTherm DT unit should take approximately **10 minutes** to drain:

1. Connect hose to the male connection on the back of the tank with dark grey portion of hose connection facing up and push until you hear the button click into place, as shown in Figure 3.
2. Let hose drain down into a sink until tank is empty.
3. Remove hose by pressing down on dark grey portion of hose until you feel a click and then pull hose away from back of tank as shown in Figure 4.
4. Remove packs and finned rack.
5. Remove drain filter at bottom of tank to rinse out any debris caught in the filter or bottom of tank. Wipe tank clean of any debris.



Figure 3.



Figure 4.

PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
Device fails to power ON. The LED screen does not illuminate.	Fuse open?	Check MAIN fuse with OHM Meter for continuity. Replace if open.
	Facility Outlet not correct power?	Check Device Specs with facility outlet power
	Faulty Power Cord	Replace Power Cord
	Faulty Power Switch	Replace Power Switch
Digital Thermostat is not reading correctly or fluctuating up and down.	Defective Digital Thermostat Control	Replace Digital Thermostat Control
Device does not heat. Device and LED are illuminated.	Is water level at Max Fill Line?	If YES, see #2
	Was unit filled with distilled water?	If YES, add a few cups of tap water
	Possible dirty and/or contaminated temperature sensor housing	Clean the temperature sensor element
	Faulty Heating Element	Replace Heating Element
Device begins heating but never reaches desired temperature and/or SET TEMP.	Water temperature sensor out of calibration	Calibrate water temperature sensor
	Faulty element temperature sensor	Replace sense-heating-element sensor
	Faulty water temperature sensor	Replace water sensor
	Faulty element	Replace heating element
Device heating above or below SET TEMP.	Faulty water temperature sensor	Replace water sensor
	Faulty control board	Replace control board

**\*NOTE:** Temperature reading from external thermometers may differ from displayed temperature based on location of temperature reading, and type of thermometer used. If in any case the suggested Troubleshooting Solutions **DO NOT** remedy the problem(s) you are experiencing, contact Richmar Tech Support for additional information.

# ERROR CODES



In the event an Error Code is displayed on the screen, reference the error code chart below. From the home screen, press the right arrow to enter the Settings Menu. Press the down arrow to ERRORS is highlighted blue. Press right arrow to accept. Depending on the displayed error code, chose from the Error #'s to determine problem and solution. Below is a possible list of error codes:

ERROR CODE	REASON	SOLUTION
1	Water level low	Tank will not operate. Must fill the tank and power cycle to clear error and/or request tank service to repair level sense subassembly
2	Water temperature over set temperature -for longer than 2 hours with no reduction in temperature	Request tank service to repair element and/or thermistor and/or main board
3	Water over max temperature - currently 150°F (65°C)	Request tank service to repair element and/or thermistor and/or main board
4	Element over max temperature - currently 302°F (150°C)	Request tank service to repair element and/or thermistor and/or main board
5	Thermistor open circuit / short circuit	Request tank service to repair thermistor
6	Water thermistors discrepancy - difference of 50°F (10°C) between the mid and top water thermistors	Request tank service to repair element and/or thermistor and/or main board
7	Element thermistors discrepancy - difference of 86°F (30°C) between the 2 element thermistors	Request tank service to repair element and/or thermistor and/or main board
8	Undercurrent - current below 0.5A through elements	Request tank service to repair element and/or main board

In the event an Error Code is displayed on the screen, reference the error code chart below. From the home screen, press the right arrow to enter the Settings Menu. Press the down arrow to ERRORS is highlighted blue. Press right arrow to accept. Depending on the displayed error code, chose from the Error #'s to determine problem and solution. Below is a possible list of error codes:

ERROR CODE	REASON	SOLUTION
9	Overcurrent - current over 5A through elements when on. 300mA when off	Request tank service to repair element and/or main board
10	Communications fail - No communications to level sense	Request tank service to repair level sense cable and/or level sense subassembly and/or main board
11	Overvoltage - voltage over 180V through elements. 10V when off	Check the tank is only being supplied by 110V
12	Undervoltage - voltage under 70V through elements.	Check the tank is only being supplied by 110V and/or request tank service to repair main board
13	Element thermistor trip	Request tank service to repair element and/or thermistor and/or main board
14	Water thermistor trip	Request tank service to repair element and/or thermistor and/or main board
15	Relay trip	Request tank service to repair element and/or thermistor and/or main board

# RECOMMENDED CLEANING & STORAGE

## **WARNING**

**ALWAYS** unplug the unit from the electrical outlet when cleaning the unit. **DO NOT** attempt to clean the debris or drain the tank with hot water

It is recommended to clean the HydraTherm DT a minimum of 2 times per year, or more frequently if needed.

## **CAUTION**

**NOTE: DO NOT USE** additives such as herbal teas, essential oils, etc., as they may damage the components of the heating unit. It is the manufacturers recommendation to use the HydraTherm DT with clean water and using the manufacturer supplied HydraHeat packs.

The interior of the unit should be cleaned using a non-abrasive cleaner. Check to make sure your cleaner has low amount or no chlorine content and make sure that any residue is thoroughly rinsed away with water.

**NOTE:** Failure to maintain your equipment will be considered user abuse and may result in voiding the warranty. If a device is suspected of user abuse or lack of required maintenance, the manufacturer may ask for documented proof of maintenance records before honoring the warranty.

1. Turn unit off to let the water and packs cool to room temperature.  
**NOTE: DO NOT** attempt to clean the debris or drain the tank with hot water.
2. Remove packs and finned rack from unit and drain according to Drain Instructions previously in the manual.
3. Use a sponge to clean with non-abrasive cleaning solution and remove the filter to clean any debris caught by the filter.
4. Refer back to Installation Instructions on how to properly refill the HydraTherm DT.

# TECHNICAL SPECIFICATIONS



## DEVICE TECHNICAL SPECIFICATIONS

Supply Voltage	110-120VAC
Line Frequency	50-60Hz
Power Consumption	750W
Adjustable Temperature Range	120°F (49°C) to 150°F (65°C) +/- 5°F (3°C)
Safety Thermal Control Accuracy	+/- 5°F (3°C)
Product Weight (without packs)	27 lbs
Filled Weight	36 lbs
Shipping Weight	45 lbs
Product Dimensions	546 x 420 x 423.5 (mm) (from bottom of feet to top of handle with lid closed)
Shipping Dimensions	590 x 450 x 450 (mm)
Lid Clearance Needed	18.5"
Display Screen	4.5" x 2.5"
Drain Hose Length	3'6"
DT Finned Rack Measurements:	15.5" x 3" x 9" (LWH)
Safety Class	 B - Equipment providing a particular degree of protection against electric shock, particularly regarding allowable leakage currents and reliability of the protective earth connection (if present).
Tank Capacity	28.7 Liters
Safety Tests Performed	IEC 60601-1-2
Heat Up Time to Default (approx.)	3-8 hours depending on initial and final water temperature

## Guidance and Manufacturer's Declaration - Electromagnetic immunity

The Hydratherm tank is intended for use in the electromagnetic environment specified below. The customer or the user of the Hydratherm tank should assure that it is used in such an environment.

EMISSIONS TEST	COMPLIANCE	ELECTROMAGNETIC ENVIRONMENT GUIDANCE
RF Emissions EN 55011 (CISPR 11)	Group 1	The Hydratherm tank uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF Emissions EN 55011 (CISPR 11)	Class	
Harmonic emissions IEC / EN 61000-3-2	Complies	
Voltage fluctuations / flicker emissions IEC / EN 61000-3-3	Complies	

**Table 1 - Guidance and manufacturer's declaration - electromagnetic emissions - for all equipment and systems**

### GUIDANCE AND MANUFACTURER'S DECLARATION - ELECTROMAGNETIC IMMUNITY

The Hydratherm tank is intended for use in the electromagnetic environment specified below. The customer or the user of the Hydratherm tank should assure that it is used in such an environment

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
Electrostatic discharge (ESD) IEC / EN 61000-4-2	±15 kV contact	±15 kV contact	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30 %.
	±8 kV air	±8 kV air	
Electrical fast transient/burst IEC / EN 61000-4-4	±2 kV for power supply lines	±2 kV for power supply lines	Mains power quality should be that of a typical commercial or hospital environment.
	±1 kV for input/output lines	±1 kV for input/output lines	
Surge IEC / EN 61000-4-5	±1 kV differential mode	±1 kV differential mode	Mains power quality should be that of a typical commercial or hospital environment.
	±2 kV common mode	±2 kV common mode	
Voltage dips, short interruptions and voltage variations on power supply input lines IEC / EN 61000-4-11	<5 % $U_T$ (>95 % dip in $U_T$ ) for 0.5 cycle	<5 % $U_T$ (>95 % dip in $U_T$ ) for 0.5 cycle	Mains power quality should be that of a typical commercial or hospital environment. If the user of the HydraTherm tank requires continued operation during power mains operation, it is recommended that the HydraTherm tank be powered from an uninterruptible power supply or battery.
	40 % $U_T$ (60 % dip in $U_T$ ) for 5 cycles	40 % $U_T$ (60 % dip in $U_T$ ) for 5 cycles	
	70 % $U_T$ (30 % dip in $U_T$ ) for 25 cycles	70 % $U_T$ (30 % dip in $U_T$ ) for 25 cycles	
Power frequency (50/60 Hz) magnetic field IEC / EN 61000-4-8	<5 % $U_T$ (>95 % dip in $U_T$ ) for 5 sec	<5 % $U_T$ (>95 % dip in $U_T$ ) for 5 sec	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
	30 A / m	30 A / m	

**NOTE:**  $U_T$  is the AC mains voltage prior to application of the test level.

**Table 2 - Guidance and manufacturer's declaration - electromagnetic immunity - for all equipment and systems**

## GUIDANCE AND MANUFACTURER'S DECLARATION - ELECTROMAGNETIC MM T

The Hydratherm tank is intended for use in the electromagnetic environment specified below. The customer or the user of the Hydratherm tank should assure that it is used in such an environment

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment – guidance
Conducted RF IEC/EN 61000-4-6	3 Vrms 150 kHz to 80 MHz outside ISM bands <sup>a</sup>	3 Vrms	Portable and mobile RF communications equipment should be used no closer to any part of the E360T-SY-IN Ventilator, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance $d = 3,5\sqrt{P}$ $d = 1,2\sqrt{P}$
	6 Vrms 150 kHz to 80 MHz in ISM bands <sup>a</sup>	10 Vrms	
Radiated RF IEC/EN 61000-4-3	10 V/m 80 MHz to 2,5 GHz	10 V/m 80MHz to 2,5 GHz	$d = 1,2\sqrt{P}$ ...80 MHz to 800 MHz $d = 2,3\sqrt{P}$ ...800 MHz to 2,5 GHz Where P is the maximum output power rating of the transmitter in Watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m) <sup>b</sup> . Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, <sup>c</sup> should be less than the compliance level in each frequency range. Interference may occur in the vicinity of equipment marked with the following symbol: 
			Testing additionally done at frequencies to simulate proximity to wireless transmitters <sup>d</sup>

**NOTE 1** At 80 MHz and 800 MHz, the higher frequency range applies.

**NOTE 2** These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

- a The ISM (industrial, scientific and medical) bands between 150 kHz and 80 MHz are 6,765 MHz to 6,795 MHz; 13,553 MHz to 13,567 MHz; 26,957 MHz to 27,283 MHz; and 40,66 MHz to 40,70 MHz.

## GUIDANCE AND MANUFACTURER'S DECLARATION - ELECTROMAGNETIC IMMUNITY

The Hydratherm tank is intended for use in the electromagnetic environment specified below. The customer or the user of the Hydratherm tank should assure that it is used in such an environment

**Immunity test    IEC 60601 test level    Compliance level    Electromagnetic environment – guidance**

- b The compliance levels in the ISM frequency bands between 150 kHz and 80 MHz and in the frequency range 80 MHz to 2,5 GHz are intended to decrease the likelihood that mobile/portable communications equipment could cause interference if it is inadvertently brought into patient areas. For this reason, an additional factor of 10/3 has been incorporated into the formulae used in calculating the recommended separation distance for transmitters in these frequency ranges.
- c Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the Hydratherm tank is used exceeds the applicable RF compliance level above, the Hydratherm tank should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the E360T-SY-IN Ventilator.
- d Testing at these frequencies also

Frequency MHz	Modulation Frequency	Polarisation (V/H)	Level (V/m)
385	18 Hz Pulse Modulation 50%	V and H	27
450	18 Hz Pulse Modulation	V and H	28
710	217 Hz Pulse Modulation	V and H	9
745	217 Hz Pulse Modulation	V and H	9
780	217 Hz Pulse Modulation	V and H	9
810	18 Hz Pulse Modulation	V and H	28
870	18 Hz Pulse Modulation	V and H	28
930	18 Hz Pulse Modulation	V and H	28
1720	217 Hz Pulse Modulation	V and H	28
1845	217 Hz Pulse Modulation	V and H	28
1970	217 Hz Pulse Modulation	V and H	28
2450	217 Hz Pulse Modulation	V and H	28
5240	217 Hz Pulse Modulation	V and H	9
5500	217 Hz Pulse Modulation	V and H	9
5785	217 Hz Pulse Modulation	V and H	9

**Table 3 - Guidance and manufacturer's declaration - electromagnetic immunity - for equipment and systems that are life-supporting**

# APPENDIX A - EMC TABLES

## RECOMMENDED SEPARATION DISTANCES BETWEEN PORTABLE AND MOBILE RF COMMUNICATIONS EQUIPMENT AND THE 360T- - Ventilator

The Hydratherm tank is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the Hydratherm tank can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the Hydratherm tank as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter  W	Separation distance according to frequency of transmitter			
	m			
	150kHz to 80MHz outside ISM bands	150kHz to 80MHz in ISM bands	80 MHz to 800 MHz	800 MHz to 2,5 GHz
	$d = 3,5\sqrt{P}$	$d = 12\sqrt{P}$	$d = 1.2\sqrt{P}$	$d = 2.3\sqrt{P}$
0.01	0,35	1,2	0.12	0.23
0.1	1,1	3,8	0.38	0.73
1	3,5	12	1.20	2.30
10	11	38	3.80	7.30
100	35	120	12.00	23.00

For transmitters rated at a maximum output power not listed above, the recommended separation distance  $d$  in metres (m) can be determined using the equation applicable to the frequency of the transmitter, where  $P$  is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

**NOTE 1** At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

**NOTE 2** The ISM (industrial, scientific and medical) bands between 150 kHz and 80 MHz are 6,765 MHz to 6,795 MHz; 13,553 MHz to 13,567 MHz; 26,957 MHz to 27,283 MHz; and 40,66 MHz to 40,70 MHz.

**NOTE 3** An additional factor of 10/3 has been incorporated into the formulae used in calculating the recommended separation distance for transmitters in the ISM frequency bands between 150 kHz and 80 MHz and in the frequency range 80 MHz to 2,5 GHz to decrease the likelihood that mobile/portable communications equipment could cause interference if it is inadvertently brought into patient areas.

**NOTE 4** These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

**Table 4 - Recommended separation distances between portable and mobile RF communications equipment and the equipment and system - for equipment and systems that are life supporting**



Manufactured for



Compass Health Brands Corp.  
Toll Free 1.888.549.4945  
6753 Engle Road  
Middleburg Heights, OH 44130  
[richmarweb.com](http://richmarweb.com)

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