

Homeothermic Monitoring System

USER'S MANUAL



Homeothermic Monitoring System 55-7020, 55-7030, 55-7031, 55-7034



Table of Contents

| SUBJECT | PAGE # |
|--|---------------|
| Warranty & Repair Information | 2 |
| Manual Description | 2 |
| Warranty | 2 |
| General Safety Summary | 3-4 |
| Technical Specifications | 5-6 |
| Introduction | 7 |
| Operation | 8-15 |
| Target Temperature | 8 |
| Settings | 9-15 |
| Setting the Target Temperature | 9 |
| Audible Alarms | 9 |
| Alarm Settings | 10-12 |
| System Information | 12 |
| Upgrade Software | 13 |
| Analog Control | 14 |
| Display Backlight | 14 |
| Pad Power Level | 15 |
| Troubleshooting Guide | 16 |
| Viewing the Heating Pad Status | 16 |
| System Part Numbers | 17 |
| Appendix A: Analog Output Ports | 18 |
| Appendix B: Driver Installation | 18-20 |

Warranty & Repair Information

Manual Description

This manual is designed to provide all operational and program information required to operate the Homeothermic Monitoring System. The functions and features are described in the Technical Specifications section.

Warranty

Harvard Apparatus warranties this instrument for a period of one year from date of purchase. At its option, Harvard Apparatus will repair or replace the unit if it is found to be defective as to workmanship or materials. This warranty does not extend to damage resulting from misuse, neglect or abuse, normal wear and tear, or accident. This warranty extends only to the original consumer purchaser.

IN NO EVENT SHALL HARVARD APPARATUS BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES. Some states do not allow the exclusion or limitation of incidental or consequential damages so the above limitation or exclusion may not apply to you. **THERE ARE NO IMPLIED WARRANTIES OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR USE, OR OF ANY OTHER NATURE.** Some states do not allow this limitation on an implied warranty, so the above limitation may not apply to you.

If a defect arises within the one-year warranty period, promptly contact **Harvard Apparatus, 84 October Hill Road, Holliston, Massachusetts 01746** using our toll free number 1-800-272-2775, or outside the U.S. call 508-893-8999. Our E-mail address is support@hbiosci.com. Goods will not be accepted for return unless an RMA (returned materials authorization) number has been issued by our customer service department. The customer is responsible for shipping charges. Please allow a reasonable period of time for completion of repairs or replacement. If the unit is replaced, the replacement unit is covered only for the remainder of the original warranty period dating from the purchase of the original device.

This warranty gives you specific rights, and you may also have other rights which vary from state to state.

General Safety Summary

Please read the following safety precautions to ensure proper use of your Homeothermic Monitoring System. If the equipment is used in a manner not specified, the protection provided by the equipment may be impaired.

To Prevent Hazard or Injury

Use Proper Line Cord

Use only the specified line cord for this product and make sure the line cord is certified for the country of use.

Use Proper Power Supply

The unit is supplied with an approved power supply. To maintain the safety integrity of the device, use only the following:

| Globtek Inc. | | ASTEK | |
|----------------|-----------------------------|----------------|-----------------------------|
| Model: | GT-43006-4015-T3 | Model: | DPS54-M |
| Output: | 15V DC, 2.7 A | Output: | 15V DC, 4 A |
| Input: | 100-240V ~, 50/60 Hz, 1.0 A | Input: | 100-240V ~, 50-60 Hz, 2.0 A |

Ground the Product

This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making any connections to the input or output terminals of the product, ensure that the product is properly grounded.

Make Proper Connections

Make sure all connections are made properly and securely. Any signal wire connections to the unit must be no longer than 3 meters.

Observe All Terminal Ratings

Review the operating manual to learn the ratings on all connections.

Orient the Equipment Properly

Do not orient the equipment so that it is difficult to operate the disconnection device.

Place Product in Proper Environment

Review the operating manual for guidelines for proper operating environments.

Avoid Exposed Circuitry

Do not touch any electronic circuitry inside of the product.

General Safety Summary

Do Not Operate with Suspected Failures

If damage is suspected on or to the product do not operate the product. Contact qualified service personnel to perform inspection.

Observe All Warning Labels on Product

Read all labels on product to ensure proper usage.

Note: For safety purposes software will shut off currents to the pad when the pad temperature reaches 52°C. As a safety backup, there is a built-in hardware shutoff in the pad at 53°C.



CAUTION: ANIMAL SHOULD BE MONITORED BY USER AT ALL TIMES.



CAUTION: FOR RESEARCH USE ONLY. NOT FOR CLINICAL USE ON PATIENTS.



CAUTION: DO NOT CONNECT TO FIREWIRE DEVICES. DAMAGE MAY OCCUR TO THE HOMEOTHERMIC MONITORING SYSTEM OR COMPUTER.



**CAUTION
REFER TO
MANUAL**



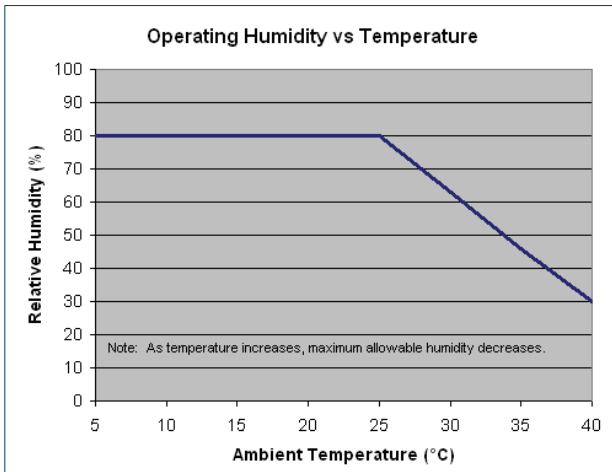
**PROTECTIVE
GROUND
TERMINAL**

Technical Specifications

| | |
|--------------------------------------|---|
| Pad Set Temperature Range | Ambient to 50°C (68-122°F) |
| Resolution | 0.1°C/F |
| Integrated Temperature Sensor | Yes |
| Temperature Stability | ±0.1°C |
| Temperature Display | User Selectable °C and °F |
| Pad Material | Silicone |
| Probe | Flexible Rectal Probe |
| Probe Shaft Length | 100 mm (3.94 in) |
| Probe Shaft Diameter | 1.6 mm (0.06 in) |
| Probe Tip Diameter | 1.6 mm OD (0.06 in) |
| Information Displayed | Current Body Temperature (Rectal Temperature) and Set Temperature |
| Serial Communication | RS-485 (IEEE 1394 6-pos); USB (Type B) |
| Analog Output | 0-5V, 0-50°C |
| Analog Input | 0-5V, 20-50°C |
| Dimensions (H x W x D) | 12.0 x 22.6 x 15.8 cm (4.72 x 8.91 x 6.21 in) |
| Weight | 0.68 kg (1.5 lbs) |
| Power Supply | 100-240 VAC, 50/60 Hz |
| Input Power | 15V DC, 25 W |
| Input Power Connector | 2.5 mm ID x 5.0 mm OD Plug |
| Regulatory | CE, ETL (UL, CSA), WEEE, EU RoHS |
| Warranty | 1 year |

Technical Specifications

| | |
|-----------------------------------|---|
| Atmospheric Specifications | |
| Operating Temperature | 4°C to 40°C (40°F to 104°F) |
| Storage Temperature | -10°C to 70°C (14°F to 158°F) |
| Operating Humidity | See Chart Below |
| Storage Humidity | 20% to 80% RH, non condensing |
| Method of Operation | Continuous |
| Classification | Class I |
| Pollution Degree | 1 |
| Installation Category | II |
| Supplier Name | Harvard Apparatus |
| Supplier Address | 84 October Hill Road, Holliston, MA 01746 |
| Regulator Certifications | CE, ETL (UL, CSA), WEEE, & EU RoHS |
| Safety Declarations | ANSI/UL 61010-1; CAN/CSA C22.2 No. 61010-1; IEC 61010-1; CENELEC EN 61010-1 |
| EMC Declaration | FCC 47CFR 15B, EN61326-1 |



Introduction

The Homeothermic Monitoring System is a closed loop temperature control system for small rodents. Utilizing a small, flexible rectal probe to monitor the animal's core temperature and a heating pad to provide heat input, the animal's core body temperature can be accurately controlled. The control unit receives temperature feedback from the rectal probe and adjusts the current to the pad accordingly.

Each system is supplied complete with control unit, flexible temperature probe, heating pad, insulation pad and USB cable.

The easy to use LCD touch screen allows users to set a target temperature and clearly view the animal's current core body temperature as well as the set temperature at all times. The thermometer icon on the display screen provides a graphical representation of the animal's temperature. Audible alarms advise the user should the animal's core body temperature deviate from the set temperature.

Heating pads are available in four sizes to fit all your surgical needs. The standard size is appropriate for mice and small rats and fits nicely into standard stereotaxic instruments, while the large size is for rats and other like-sized rodents. Two additional sizes are available to fit the common stereotaxic instrument adapters. The pads are flexible enough to fully wrap the animal, which allows the animal to be warmed from all sides rather than just from the animal's front or back.

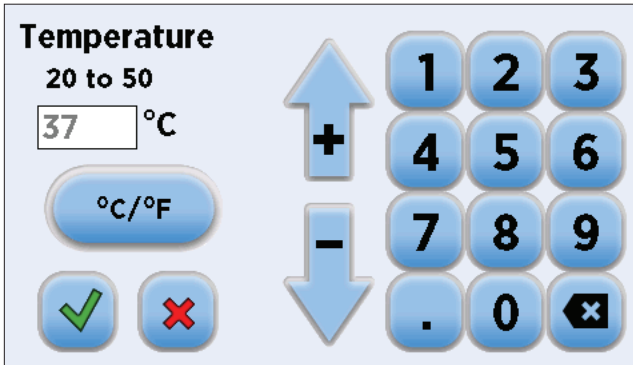




Front and Back of the Homeothermic Monitoring System

Operation

TARGET TEMPERATURE

Setting the Target Temperature



1. Set the target temperature by selecting the **Set Temp** button.
2. Use the °C/°F button to select desired temperature unit.
3. Use the keypad, or up and down arrows, to select the desired temperature.
4. Accept the changes made by pressing the  and return to the main screen
OR Cancel the changes made by pressing the  and go back to the main screen.
5. Ensure both the rectal probe and the heating pad are connected to the control unit.
6. Select **Start** to begin warming (**Homeothermic Mode**). When **Stopped** the unit is in **Monitor Mode**, meaning it will continue to read the temperature from the probe, but it will not heat the pad at all.

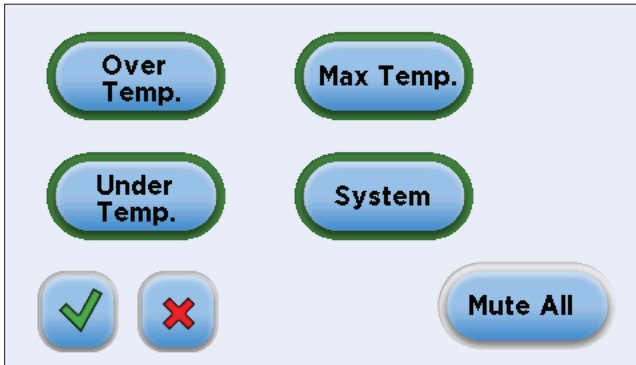
Note: You should allow the system to equilibrate to the set temperature before inserting the probe into an animal.

Note: Probe should not be inserted completely into the animal; only the sensor tip needs to be inserted into the animal.

Operation

SETTINGS

Audible Alarms



The Homeothermic Monitoring System has several Audible Alarms that the user can choose to mute, should they wish. There are alarms for:



Over Temperature: (+) X° (user defined 0.5-5 $^{\circ}$ C) of user set temperature

Under Temperature: (-) X° (user defined 0.5-5 $^{\circ}$ C) of user set temperature

Maximum Temperature: the maximum temperature the unit is capable of maintaining has been reached

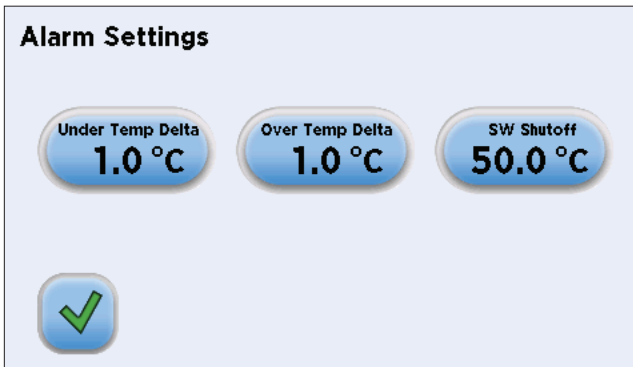
System Alarms:

- **Check Probe Cable:** the software is unable to detect the temperature probe
- **Check Pad Cable:** the software is unable to detect the pad
- **Maximum Temperature Shut-off Software:** the thermistor located in the heating pad has detected a temperature above X° and the pad is no longer being heated. This temperature defaults to 42 $^{\circ}$ C, but can be set by the user from 25 $^{\circ}$ C to 52 $^{\circ}$ C.

1. In the **Settings** screen, select **Audible Alarms**.
2. A green ring around the alarm button indicates that the audible alarm is activated.
3. Mute an individual alarm by pressing the button and the green ring will disappear; this indicates that the alarm is muted.
4. Mute all alarms by pressing the **Mute All** button.
5. Accept the changes made by pressing the  and return to the main screen
OR Cancel the changes made by pressing the  and go back to the main screen.

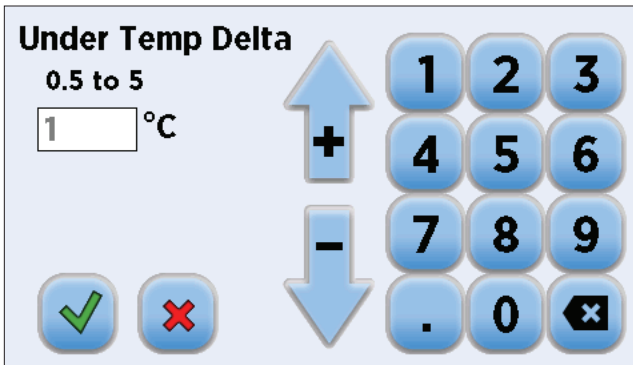
Operation



Alarm Settings



The Homeothermic Monitoring System allows you to set the desired threshold for several of alarms. The users can decide at what deviation from the set temperature the over and under temperature alarms will be triggered. Both of these alarms default to 1°C, but can be set from 0.5°C to 5°C. The user can also set the software shut off temperature for the pad. This is the maximum temperature the system will allow the pad to reach before shutting off heat to it. The software shut off defaults to 42°C, but can be set from 25°C to 52°C.

Under Temp Delta

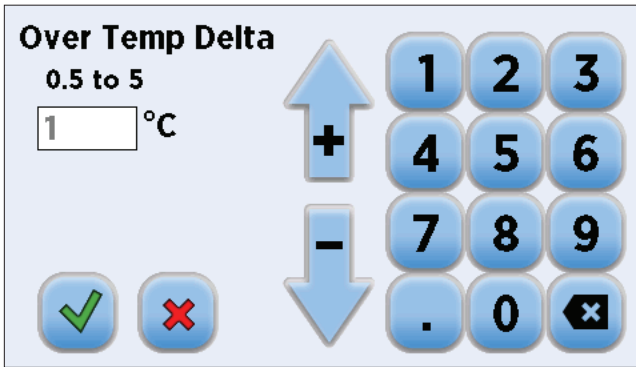




1. In the **Settings** screen, select **Alarm Settings**.
2. Select **Under Temp Delta**.
3. Use the keypad, or up and down arrows, to select the desired deviation from the set temperature you would like the **Under Temperature Alarm** to represent.
4. Accept the changes made by pressing the  and return to the main screen
OR Cancel the changes made by pressing the  and go back to the main screen.

Note: Under Temperature factory set value is (-) 1°C

Operation

Over Temp Delta

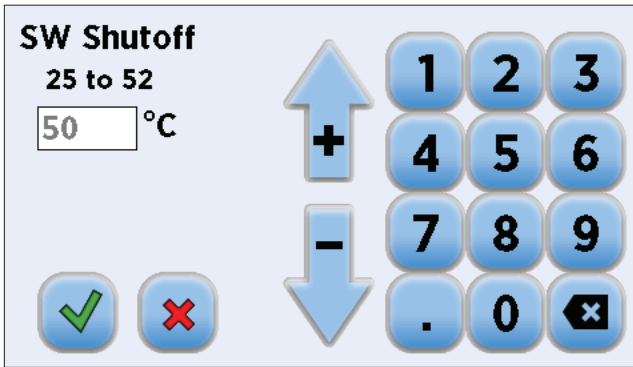




1. In the **Settings** screen, select **Alarm Settings**.
2. Select **Over Temp Delta**.
3. Use the keypad, or up and down arrows, to select the desired deviation from the set temperature you would like the **Under Temperature Alarm** to represent.
4. Accept the changes made by pressing the  and return to the main screen
OR Cancel the changes made by pressing the  and go back to the main screen.

Note: *Over Temperature factory set value is (+) 1°C*

Operation

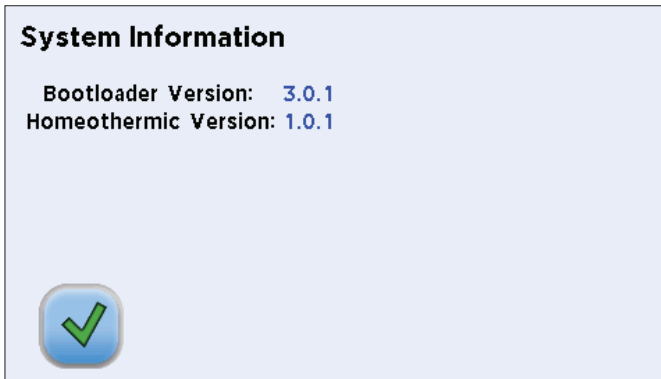
SW Shutoff




1. In the **Settings** screen, select **Alarm Settings**.
2. Select **SW Shutoff**.
3. Use the keypad, or up and down arrows, to select the desired maximum pad temperature you would like the heating pad to reach before the software turns off heat to the pad.
4. Accept the changes made by pressing the  and return to the main screen **OR** Cancel the changes made by pressing the  and go back to the main screen.

Note: *SW Shut off factory set value is 42°C.*

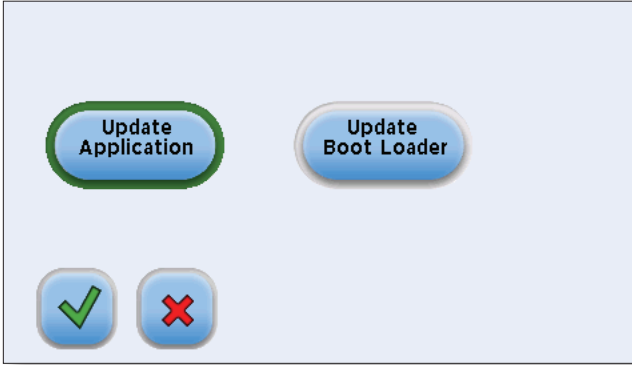
System Information




This setting allows you to view the version of the software that is currently on the Homeothermic Monitoring System. The  button allows you to exit and return to the main screen.

Operation

Upgrade Software

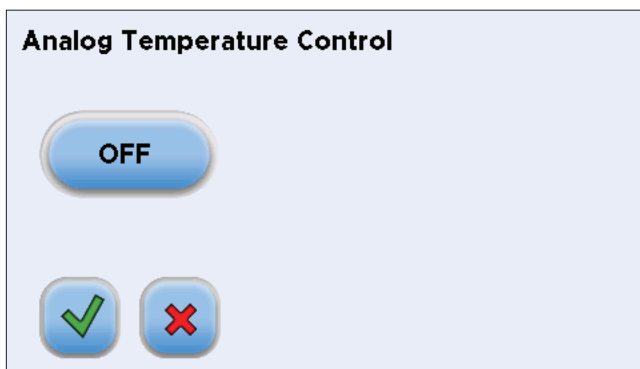


This setting is used to upgrade the software version on the Homeothermic Monitoring System to any newer versions that may become available.

1. Install the Homeothermic Monitoring System serial and bootloader drives on your computer. Both drivers are located on the CD that was provided with your unit.
2. Upload the latest software version to your desktop (the format is filename.srec).
3. Disconnect all I/O devices and then connect the unit to the PC using a USB cable.
4. On the **Settings** screen of the Homeothermic Monitoring System, press the **Upgrade Software** button.
5. On the **Update** screen, select the **Update Application** button and press the  button.
6. From the CD provided with the system, open the **Homeothermic Monitoring System Updater Application**.
7. Click **Open Update File** and browse to the file previously saved on your desktop and click Open.
8. Click **Start Update**.
9. After the update is complete, press **Reboot** to power cycle the Homeothermic Monitoring System.

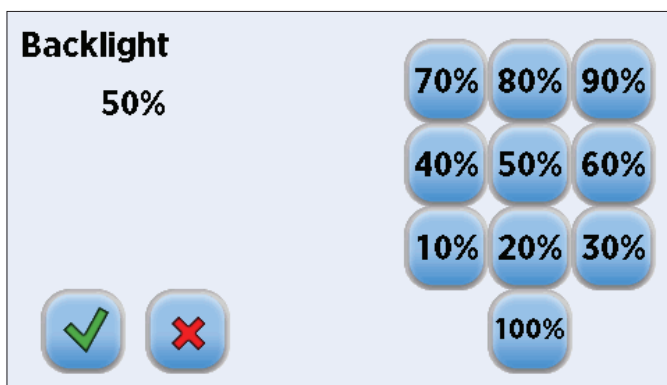
Operation



Analog Control



This setting is used to control the unit externally via the **Analog Input Port**. The Analog Input is a 0-5V for 20-50°C.

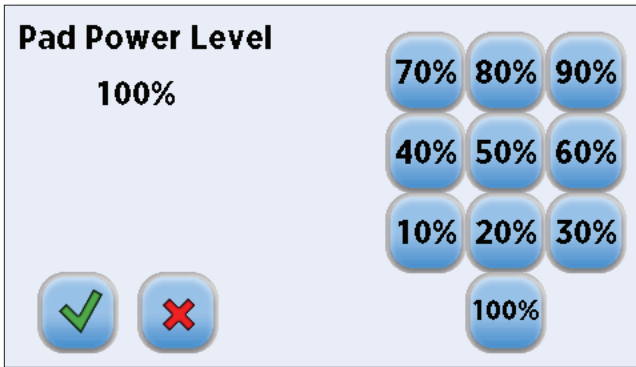
Display Backlight





1. In the **Settings** screen, select **Backlight**.
2. Select the desired % Backlight. For example, if you select 80%, the brightness of the display will be 80% of the maximum.
3. Accept the changes made by pressing the  and return to the main screen
OR Cancel the changes made by pressing the  and go back to the main screen.

Operation

Pad Power Level



1. In the Settings screen, select **Pad Power Level**.
2. Select the desired % Pad Power Level. For example, if you select 100% then the control unit will deliver 100% of the total current it is capable of delivering to the pad while it is heating; selecting 50% will result is 50% of the total available current being sent to the pad while it is heating.
3. Accept the changes made by pressing the  and return to the main screen
OR Cancel the changes made by pressing the  and go back to the main screen.

Note: *Pad Power Level factory set value is 50%.*

Troubleshooting Guide

| | |
|---|--|
| Unit will not power On | Check that power supply and cord are securely plugged into unit and outlet. Ensure that outlet is live. |
| Unit is not displaying the correct temperature | Check that the temperature probe is connected to the control unit. Place tip of probe in an environment of known temperature, such as a water bath. If probe is indeed not reading correctly a new probe may be needed. |
| Unit is not warming | Check to make sure that both the heating pad and the temperature probe are connected to the control unit. Check to make sure that the temperature probe is working (see above). If the temperature probe is working, a new blanket may be needed. |
| Unit is not reaching set temperature | Check to make sure that both the heating pad and the temperature probe are working. Make sure that the insulation pad included with the heating pad is placed under the pad. If you are still having issues remove the temperature probe from the animal and secure it to the pad until the desired temperature is reached. Once the desired temperature has been reached, reinsert the probe in the animal. |
| Pad does not start to cool down after rising to the defined over temperature value | Unit should be returned for evaluation. |
| Unit is not maintaining temperature | Check to make sure both the temperature probe and heating pad are properly functioning, and that the insulation pad is placed under the heating pad. Make sure that the probe is properly inserted into the animal. |

Viewing the Heating Pad Status

The screenshot displays the 'Homeothermic Mode' interface. On the left, it shows the following information: Probe Temp: 34.4°C, Pad Temp: 47.7°C, Pad Type: Standard, and Status: Adjusting.. In the center is a vertical thermometer graphic with a red liquid level. On the right side, there are three blue buttons: 'Settings' at the top, 'Set Temp 37.0°C' in the middle, and 'Stop' at the bottom.

On the main screen, press and hold the Start button for 5 seconds. Upon release of the button the Pad Temp and Pad Type will appear on the display screen between the Probe Temp and the Status.

System Part Numbers

| Order # | Systems |
|---------|--|
| 55-7021 | Homeothermic Monitoring System includes: Homeothermic Control Unit, Flexible Rectal Probe, Standard Size Heating Pad (12.0 x 20.5 cm), Insulation Pad, and USB cable. |
| 55-7034 | Homeothermic Monitoring System includes: Homeothermic Control Unit, Flexible Rectal Probe, Large Heating Pad (20.3 x 25.4 cm), Insulation Pad, and USB Cable |
| 55-7030 | Homeothermic Monitoring System includes: Homeothermic Control Unit, Flexible Rectal Probe, Heating Pad for Mouse Stereotaxic Adapter (7.0 x 14.5 cm), Insulation Pad and USB Cable |
| 55-7031 | Homeothermic Monitoring System includes: Homeothermic Control Unit, Flexible Rectal Probe, Heating Pad for Stereotaxic Anesthesia Platform (3.7 x 14.5 cm), Insulation Pad and USB Cable |


| Replacement Parts | |
|-------------------|--|
| 55-7021 | Flexible Rectal Probe, 1.6 mm OD |
| 55-7022 | *Heating Pad, standard, 12.0 x 20.5 cm |
| 55-7032 | *Heating Pad, large, 20.3 x 25.4 cm |
| 55-7023 | *Heating Pad, for mouse stereotaxic adapter, 7.0 x 14.5 cm |
| 55-7024 | *Heating Pad, for stereotaxic gas anesthesia platform, 3.7 x 14.5 cm |
| 55-7033 | Insulation Pad, for large heating pad, 20.3 x 25.4 cm |
| 55-7025 | Insulation Pad, for standard heating pad, 12.0 x 20.5 cm |
| 55-7026 | Insulation Pad, for mouse stereotaxic adapter heating pad, 7.0 x 14.5 cm |
| 55-7027 | Insulation Pad, for stereotaxic gas anesthesia platform, 3.7 x 14.5 cm |
| 70-4000 | RS-485 cable, 0.5 m |
| 70-4001 | RS-485 cable, 2 m |
| 70-4002 | USB cable, 2 m |

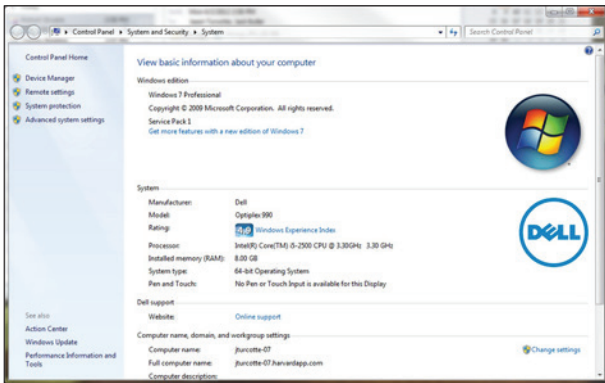
* Heating pad includes an insulation pad.

Appendix A: Analog Output Ports

| | |
|------------------------|----------------------------|
| Analog Output 1 | Power Input to Heating Pad |
| Analog Output 2 | Probe Temperature |
| Analog Output 3 | Heating Pad Temperature |

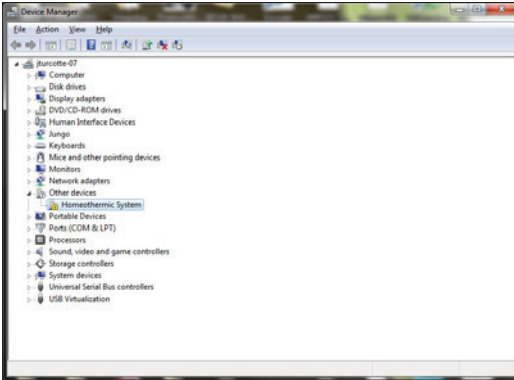
Appendix B: Driver Installation

Before connecting the Homeothermic Monitoring System to a computer via USB, the unit should be put into software update screen mode. Make sure the Update Application button is selected and press  to continue. To do this, enter the settings screen by selecting the Settings button on the display. Then select the Upgrade Software button twice to enter the software update mode. Once the unit is connected to the PC, Windows will seek to install drivers for communication. The following section details the installation of the Virtual CommPort Driver and the firmware updater driver supplied with the Homeothermic Monitoring System.

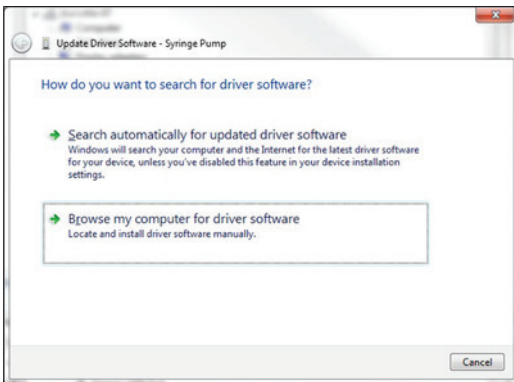


1. Connect the Homeothermic Monitoring System to the computer via USB. Open the **Control Panel** and select **System and Security** and then **System**. Click **Device Manager** on the left hand menu.

Appendix B: Driver Installation

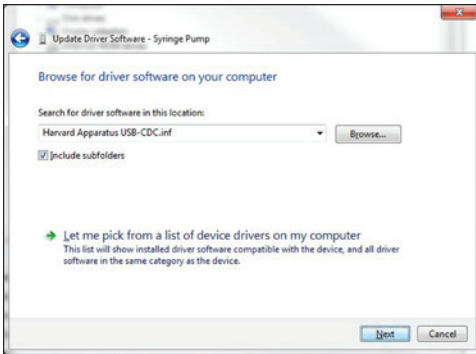


2. Two Flash Update Applications will be displayed in the **Device Manager** under **Other Devices**. Right click on either of the **Flash Update Applications** and select **Update Driver Software**.

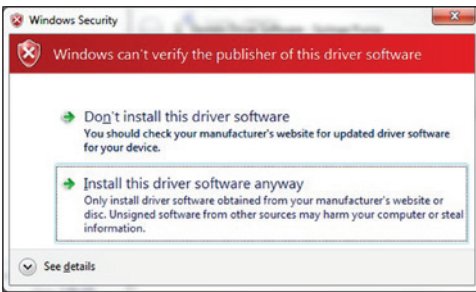


3. Select **Browse my computer for driver software**.

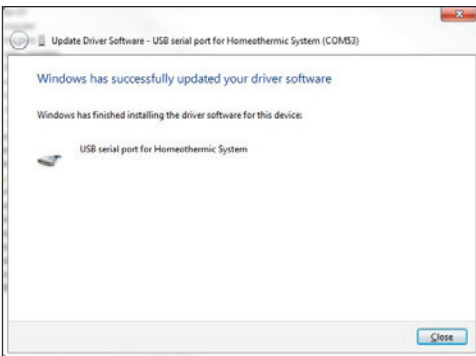
Appendix B: Driver Installation



4. Click **Browse** and navigate to the Homeothermic Monitoring System drivers folder located on the CD supplied with the pump. Make sure the “Include Subfolders” box is checked and then click next.



5. If a warning message regarding the driver publisher is displayed, choose **Install this driver software anyway**.



5. Click **Close** after the software has been successfully installed.
6. Repeat steps 2-6 for the second Flash Update Application listed.

U.S.A.

Harvard Apparatus

84 October Hill Road
Holliston, Massachusetts 01746

| | |
|-----------|--------------------------|
| Phone | 508.893.8999 |
| Toll Free | 800.272.2775 |
| Fax | 508.429.5732 |
| E-mail | support@hbiosci.com |
| Web | www.harvardapparatus.com |

Canada

Harvard Apparatus, Canada

6010 Vanden Abeele Street
Saint Laurent, Quebec, H4S 1R9

| | |
|-----------|---------------------------|
| Phone | 514.335.0792 |
| Toll Free | 800.361.1905 |
| Fax | 514.335.3482 |
| E-mail | sales@harvardapparatus.ca |
| Web | www.harvardapparatus.ca |

France

Harvard Apparatus, S.A.R.L.

6 Avenue des Andes
Miniparc – Bat. 8
F-91952, Les Ulis Cedex

| | |
|--------|--------------------------|
| Phone | 33.1.64.46.00.85 |
| Fax | 33.1.64.46.94.38 |
| E-mail | info@harvardapparatus.fr |

Germany

Hugo Sachs Elektronik

Gruenstrasse 1
March-Hugstetten D-79232, Germany

| | |
|--------|--------------------|
| Phone | 49.0.7665.92.00.0 |
| Fax | 49.0.7665.92.00.90 |
| E-mail | info@hugo-sachs.de |
| Web | www.hugo-sachs.de |

Sweden

CMA Microdialysis AB

Torshamnsgatan 30A
SE-164 40 KISTA, Sweden

| | |
|--------|-----------------------|
| Phone | 46.8.470.10.00 |
| E-mail | cma@microdialysis.se |
| Web | www.microdialysis.com |

Spain

Panlab S.L.U.

C/ Energia, 112
08940 Cornellà (Barcelona), Spain

| | |
|--------|-----------------|
| Phone | 46.8.470.10.00 |
| Fax | 46.8.470.10.50 |
| E-mail | info@panlab.com |
| Web | www.panlab.com |

United Kingdom

Biochrom

1020 Cambourne Business Park
Cambourne, Cambridge, CB23 6DW UK

| | |
|--------|--------------------------|
| Phone | 44.1223.423.723 |
| Fax | 44.1223.420.164 |
| E-mail | enquiries@biochrom.co.uk |
| Web | www.biochrom.co.uk |

China

Harvard Apparatus China

Room 1902E • 19F, Building B
Zhong Shan Plaza
1065 West Zhong Shan Road
Changning District
Shanghai, China 200051

| | |
|-------|-----------------|
| Phone | 86.21.2230.5128 |
|-------|-----------------|