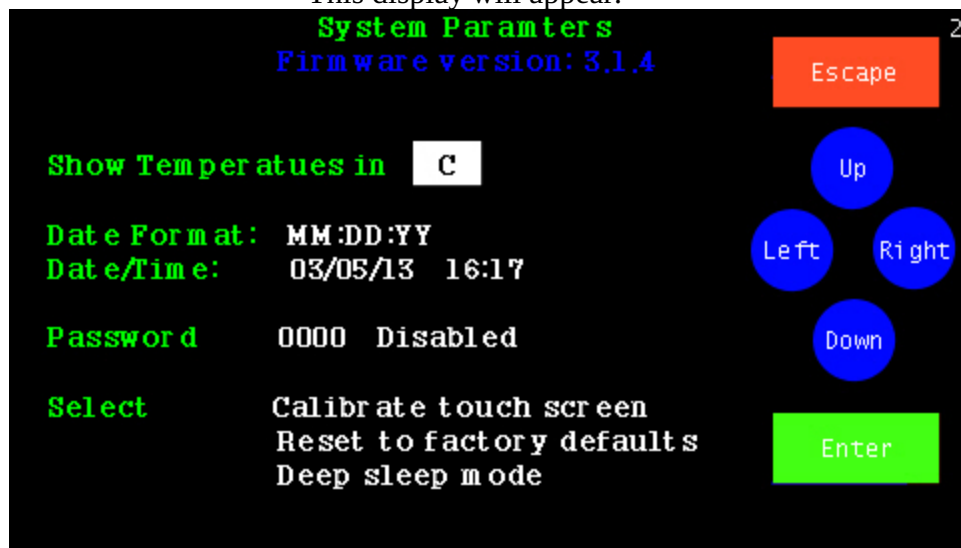## Quick Start

Your TV2 can be installed and operating in just a few minutes by following these simple steps.

1. Connect the TV2 to a power supply (computer or wall plug) and touch the LCD. If the display remains blank press reset by inserting a paper clip into the small hole to the left of the green LED on the face of the TV2. (see page 10).

This display will appear.

2. Touch 'Up' or 'Down' to select C° or F° and touch 'Enter'. The highlight will move to the next filed.

3. Touch 'Up' to select the date format (MM/DD/YY, DD/MM/YY or YY/MM/DD) and then 'Enter'. The date format defaults to the US style (MM/DD/YY).

4. Set the day, month, year, hour and minute in the appropriate field by scrolling through the possible values with 'Up' or 'Down' after moving to the appropriate field with 'Enter'.

   (Note: If you move to another field by touching 'Right' your changes will __not__ be recorded).

5. Touch 'Escape'. You will be asked to verify that you want to erase all data. Touch 'Right' to highlight YES and touch 'Enter'.

6. Touch 'Escape' to return to the previous menu.

The TV2 is now set and operating. Next TV2 will help you setup sensors and alarms

Setting up sensors

1. Plug the wired sensor into the TV2, or if you are using wireless sensor, place a 9vdc battery in the transmitter which is attached to the actual sensor.

2. After a few seconds, the TV2 will recognize the sensor and change the display to the Sensor Setup menu. The hour area of the <u>sample data</u> field will be highlighted.

   Note: If the TV2 does not 'see' your sensor you will need to link it or plug it into the TV2. The linking procedure is found in FAQ- pg 33.
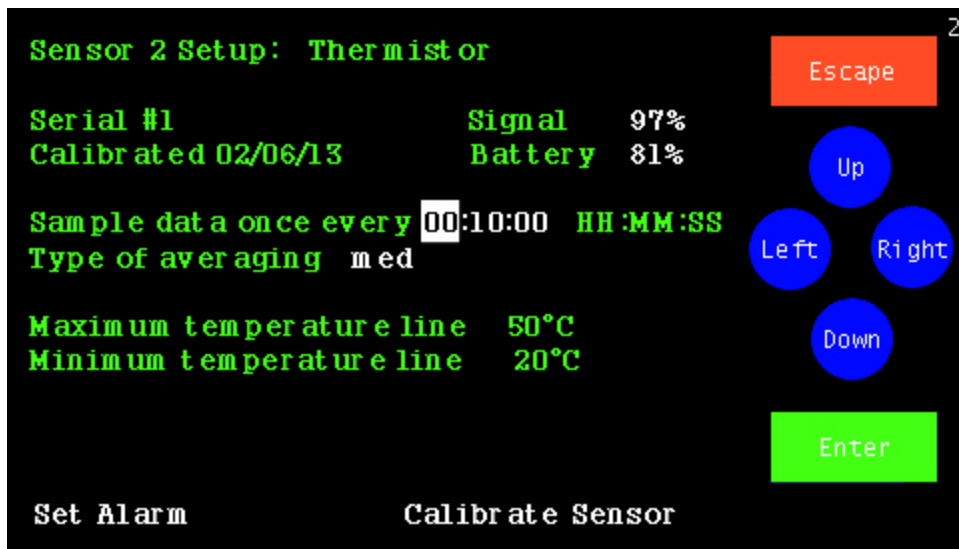

3. This determines how often the sensor will store a temperature.   You may scroll to any value between 1 min and 24 hrs with 'Up' or 'Down', touching 'Enter' to move to the next field, or accept the default by touching 'Enter'. The default value is ten minutes (00:10:00).

4. Select the type of averaging with 'UP', or 'Down' and touch 'Enter'. There are three possible selections.
   a. Fast – no averaging occurs. The exact measurement at the time of sampling will be stored and displayed. (Not normally used except during calibration)
   b. Medium- some averaging will take place so that minor temperature fluctuations will be filtered out. *(This is the default value).*
   c. Slow – additional averaging will occur. (Not normally used).

5. Set the chart max & min temperatures (Y axis) with 'Up' and 'Down'. **This does not set the alarm**. Setting these values has no effect on the alarm, what data is collected, or what is stored. It simply sets the upper and lower point of the Y-axis of the temperature chart shown on the TV2. Any temperature that falls outside these limits will show as a point at the top or the bottom of the display.
   Note: These limits can be adjusted at any time without affecting your data.

Setting the sensor alarms

6.   Highlight 'Set Alarm' and touch 'Enter'.
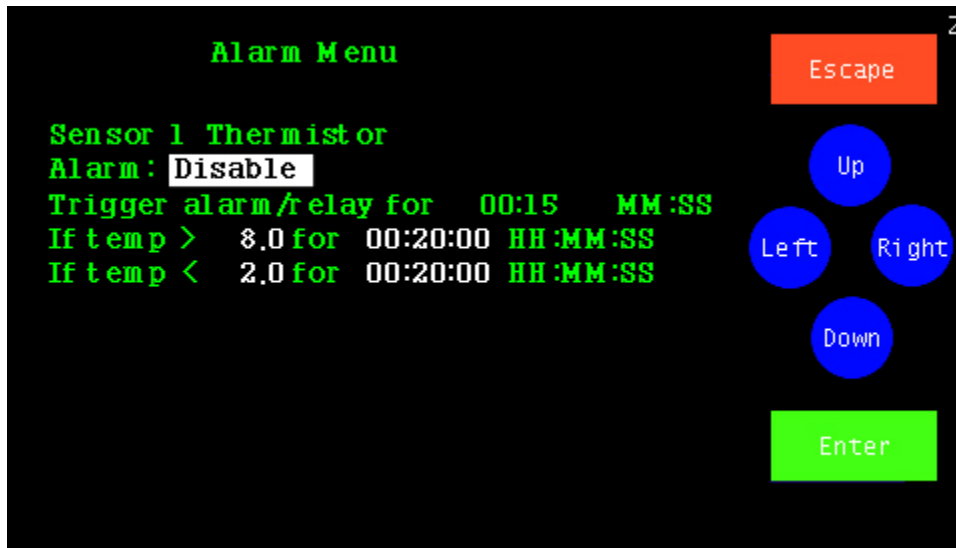
7.

8.   . The alarm for this sensor is disabled by default. To enable the alarm touch 'Up' and then 'Enter'.

   A. Set the trigger-alarm-time to any value between 0:00 and 99:00. This controls how long the alarm will sound and the relay will be closed.

     Note: If you are using an auto-dialer set it for at least 00:22 (22 seconds) but not longer than 06:00 (Six minutes).

   B. Scroll in the alarm upper limit and delay time and then the alarm lower limit and its delay time with 'Up' and 'Down' touching 'Enter' to move to each field in turn.

     Note: The delay time is how long the temperature must remain above the limit before the alarm occurs. This helps prevent false alarms.

9.   You do not need to enter the Calibration Menu at this time. (*For calibration procedures see the document Entitled 'Calibration Procedures' on the CD. It can also be downloaded from our website http://www.e2di.com/PDFs/Calibration Procedures.pdf)*

10.   Touch 'Escape' until you return to the Status Screen.

You are done!

Installation tips

1. **Planning -** Position the TV2 display close to an AC power source or your computer. The TV2 receives its power via a USB cable, which can be plugged into a computer or a wall transformer.   If you power the TV2 from your computer you will be able to auto-download data from the TV2 as well as send email or text alerts. Auto Downloading copies all of the data stored in the TV2 to your computer every few seconds.

2. Sensors:
   a. **Wired Sensors.** Decide where you are going to place each sensor. Each senor has a 20 foot wire which needs to be run to the TV2 display.

   b. **Wireless Sensors.** Position the sensors. If the sensors are inside a refrigerator or freezer position the transmitter (the black box) outside the refrigerator or freezer so the signal can be transmitted back to the TV2.

3. **Power for TV2.** Power is supplied through the USB cable. If you power the TV2 from your computer the TView software can automatically copy all logged data to your computer, update the alarm log and send email or text alerts if am alarm occurs.

4. **Backup Battery -** Three AA batteries are installed in the display unit to provide temporary power during a power outage. If a power outage occurs, the display will go to decrease the load on the batteries, however the batteries will eventually run out. Fully charged batteries will operate the TV2 in sleep mode for ~ 40 hours, depending on how often you are sampling data.

   Frequent power outages can drain the batteries. The icon in the bottom center of the display showing remaining battery life should be checked frequently. Any time the icon appears less than 1/3 full, the batteries should be replaced (see pg 33). This is done by removing the six screws on the back of the display and replacing the three AA batteries with new ones. Confirm that the TV2 is being powered through the USB cable before replacing the batteries so the clock continues to keep time.

   Note: If the battery voltage drops too low you will warned to replace the internal battery. Your stored data will not be affected even if the batteries are completely dead or removed, as all settings and data are stored in non-volatile memory. If a low battery condition does occur it is recommended that you copy your data to a computer with the TView software as an extra safety measure.

   Operational Tip: *If the power to the TV2 is interrupted, an alarm will sound and the relay will close. This 'power out' alarm can be disabled on the Main Menu if desired.*

The TV2

The Status Screen

| Current temperature. Updated once a minute.	Max/Min temperature recorded since the last reset. _Appears in red if the reading is too high or low._

Since the TV2 has an easy touch screen, additional information can be viewed by touching various 'hot spots'.

For example:

1. Touch a temperature to see the history chart for that sensor.
2. Touch a Max/Min area to reset it to zeros.
3. Touch 'Main Menu' to set or change various settings, such as the scale, the temperature sample rate, high-low alarms for each sensor, etc...

The LEDs and reset button at the bottom at the bottom center of the display.
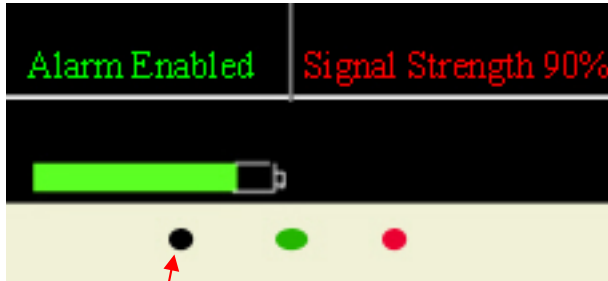
The green LED blinks once a second, indicating the display is collecting data and working normally. Even during a power outage this LED will continue to blink, indicating that it is collecting and storing temperatures from the sensors

The Red LED blinks when the display is operating on batteries. If an alarm occurs it will glow a steady red.

The small hole on the left of the green and red LEDs is the reset button. Insert the paper clip slowly until you feel the button press down. It will pop back up as soon as you release the paper clip and a system reset will occur. (Your settings and data will be preserved).

Navigating with Easy Touch

Where to touch

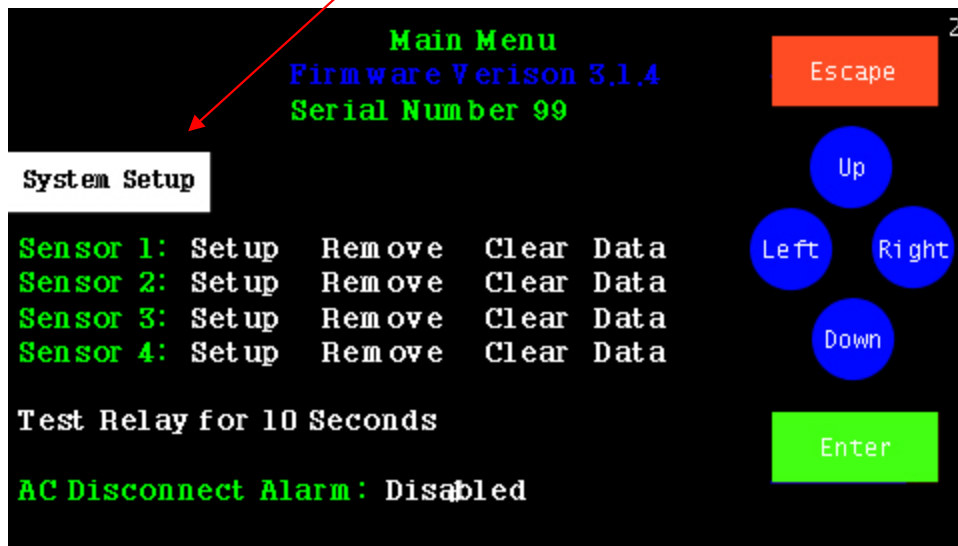Touch any temperature to see a temperature history chart for that sensor.

Sensor 1 - S/N 4		Sensor 2 - S/N 2	
64.2°F	Max/Min 74.0° 63.8°	−74.3°F	Max/Min − 70.1° − 74.3°
32%			
Alarm Enabled Battery 81%		Alarm Enabled Battery: 26%	

Sensor 3 - S/N 121		Sensor 4 - S/N 1	
41.2°F	Max/Min 42.0° 39.6°	−61.°F	Max/Min − 52.9° − 65.5°
Alarm Disabled Battery: 38%		Alarm Disabled Battery: 100%	

03/05/13 16:17:29

Main Menu

Touch 'Main Menu' to change settings.

Sensor 1 - S/N 4		Sensor 2 - S/N 2	
64.2°F	Max/Min 74.0° 63.8°	−74.3°F	Max/Min − 70.1° − 74.3°
32%			
Alarm Enabled Battery 81%		Alarm Enabled Battery: 26%	

Sensor 3 - S/N 121		Sensor 4 - S/N 1	
41.2°F	Max/Min 42.0° 39.6°	−61.°F	Max/Min − 52.9° − 65.5°
Alarm Disabled Battery: 38%		Alarm Disabled Battery: 100%	

03/05/13 16:17:29

Main Menu

Touch a Max/Min temperature to reset it

The Main Menu

Touch 'Main Menu' at the bottom of the Status Screen to enter the menu system.

When the Main Menu opens, the System Setup field will be highlighted. Touch 'Enter' to enter the System Setup Menu.

```
        System Paramters
      Firmware version: 3.1.4          2
                                   Escape

  Show Temperatues in   C            Up

  Date Format:  MM:DD:YY        Left    Right
  Date/Time:    03/05/13  16:17

  Password      0000  Disabled         Down

  Select        Calibrate touch screen
                Reset to factory defaults   Enter
                Deep sleep mode
```
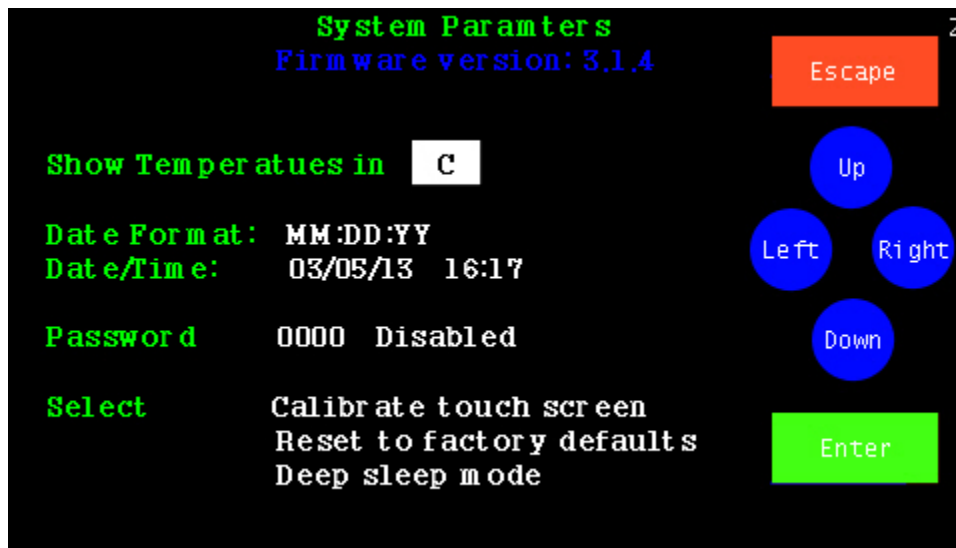
With the System Parameters menu you can change the temperature scale, the date and time, activate a password to restrict access to the menu system, reset all values to the factory default, and put the TV2 into a deep sleep mode.

To make a change:

1. Make sure the proper field is highlighted by touching 'Left' or 'Right' until the desired field is reached. If the last field on the page is highlighted touching 'Right' will move the highlight to the first field on the page.

2. Once the field is highlighted, change the value by touching 'Up' or 'Down'. Appropriate values will be scrolled through.

Note: The longer you touch 'Up' or 'Down', the faster it will scroll through the possible choices. Once it reaches the last possible choice it will wrap around to the first choice.

3. Touch 'Enter' after selecting the proper value.

Note: It is possible to move to the next field by touching 'Right' but your change will not be saved. The change is only finalized by touching 'Enter'.

Operational Tip: *Touching 'Up' or "Down' scrolls through possible values at a fast rate. The longer you hold your finger on the screen, the faster it scrolls.*

Operational Modes

The TV2 has four operational modes: *Main; Chart; Trace, and Sleep.*
Main Mode

The screen is divided into sections showing each sensor's current reading along with the maximum and minimum temperature recorded for that sensor.

Elements of the display:

1. A current temperature and relative humidity, if appropriate, is displayed in large green letters. The max/min readings are also shown in green, unless one of the temperatures violated an alarm limit, in which case it will be red.

    Note: It is possible a max or min temperature was too high or low but an alarm was not triggered. This would happen if the violation was shorter than the delay time.

2. If a wireless sensor is not linked to the TV2, a message stating "Sensor Not Installed' will be displayed in that quadrant.

3. If a wireless sensor has been linked to the display but no signal is being received, a message stating "Sensor out of Range" is displayed.

4. The wireless sensors are being used the battery strength for that sensor is shown. If the battery level drops below 20% the number turns red, rather than the normal green color. (No battery strength is shown for wired sensors).

5. The battery icon shown at the bottom of the current status display is for the TV2 display backup-battery.

To see a history chart for a sensor, touch that sensor's temperature.

Chart for sensor #2

Hot Spots to switch sensors
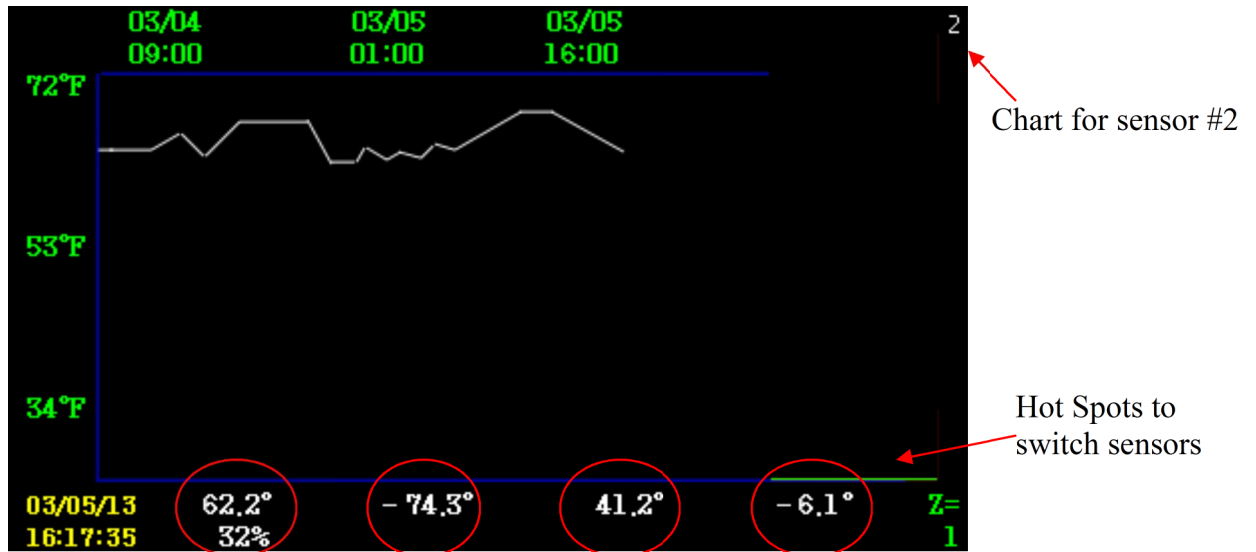
1. The temperature scale which appears as the Y-axis of the chart, is set in the sensor setup menu. (There could be temperatures above or below the Y-axis limits)

2. The number in the upper right hand corner of the display indicates which sensor's chart is being shown (sensor 2 in this example).

3. The time line along the top of the chart, the X-axis, indicates when the temperatures were collected. The dates on this line will change if you scroll left or right, or zoom out or in to view additional data.

4. The bottom two rows of the display show the current day and time along with the most recent reading from each sensor. Also shown, at the bottom right of the screen, is the zoom level. (See FAQ on page 35 for an explanation of this feature)

Use the hotspots to switch charts. Lightly touching any of the four temperatures on the bottom of the display will immediately change the screen to show that sensor's temperature history chart.

Note: *The TV2 stores a lot of data but eventually it fills up. Once it does, the newer data rolls over the oldest data. If you are sampling data every 10 minutes the last 1.5 years of data will be stored and can be viewed.*

Touching anywhere in body of the chart adds four navigation buttons as shown below so you can view additional information.

Touching the bottom blue triangle doubles the amount of data displayed on the chart (see zoom in FAQ).   The top blue triangle zooms into the display, so less data is displayed. The green triangle on the left scrolls backward, showing older data, while the green triangle on the right shows more recent data   To return to the status screen touch 'Escape'.
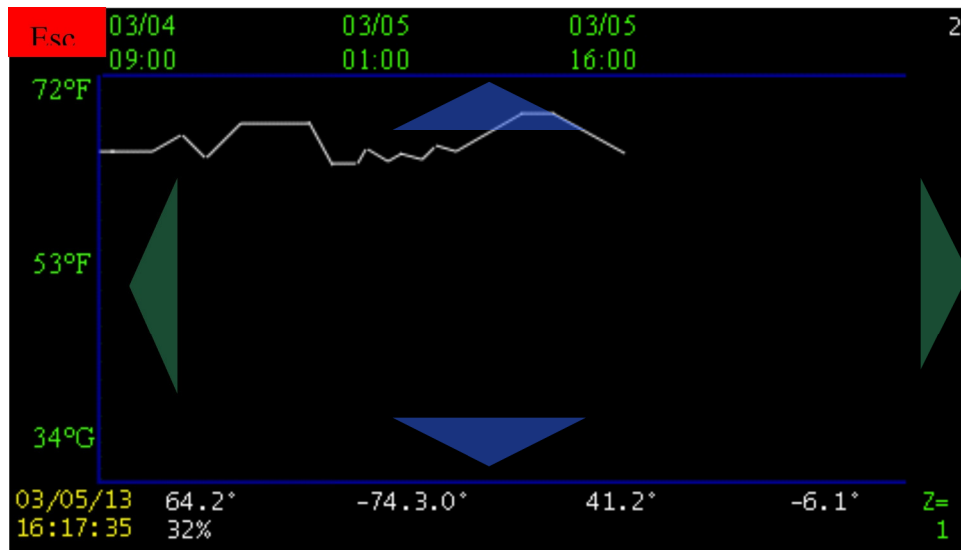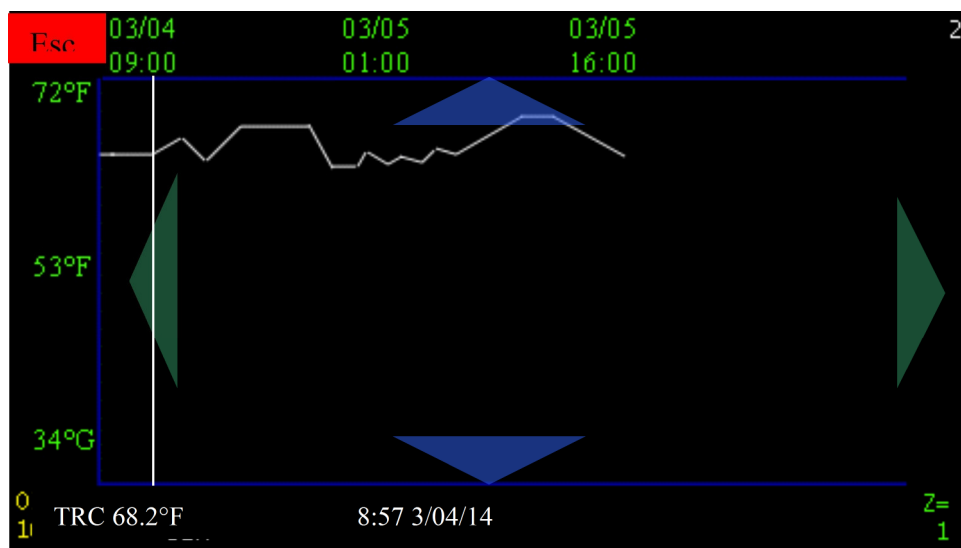

Trace mode hotspot.
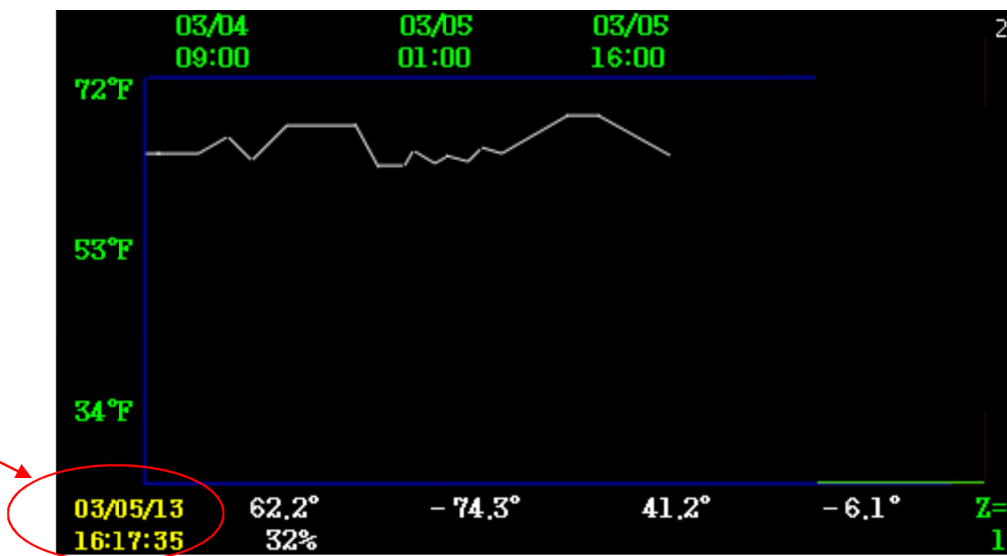
Touch the date area to enter the trace mode to highlight individual temperatures.

Trace Mode

In the trace mode, touching either green triangle will move the white vertical line back and forth to highlight individual temperatures. The temperature beneath the vertical line is shown, along with the day and time it was recorded, at the bottom of the display. (If the display is zoomed out both the high and low temperatures taken during the zoom interval will be shown).

To exit the trace mode touch 'Escape' at the top left of the display.

Sleep Mode

Intentionally Blank

1. In *Sleep Mode,* the display is blank. The TV2 automatically enters sleep mode after power to the TV2 is cut, to preserve the battery. *The TV2 will still collect data and perform all other functions while in the sleep mode.*

2. The TV2 operates normally while running on batteries performing all normal functions, including, taking and storing temperatures, sounding alarms and downloading data if auto downloads are setup.

Note: A deep sleep mode can be selected on the main menu, to turn off the TV2. In this mode only the clock continues to run. To exit from deep sleep touch the TV2 after supplying power. If the TV2 needs to be shut-off for a long period of time it should be placed in deep sleep mode to conserve the batteries.

Calibrating sensors

To calibrate a sensor, access the sensor setup menu by touching 'Main Menu' and 'Right' until the sensor setup area is highlighted.
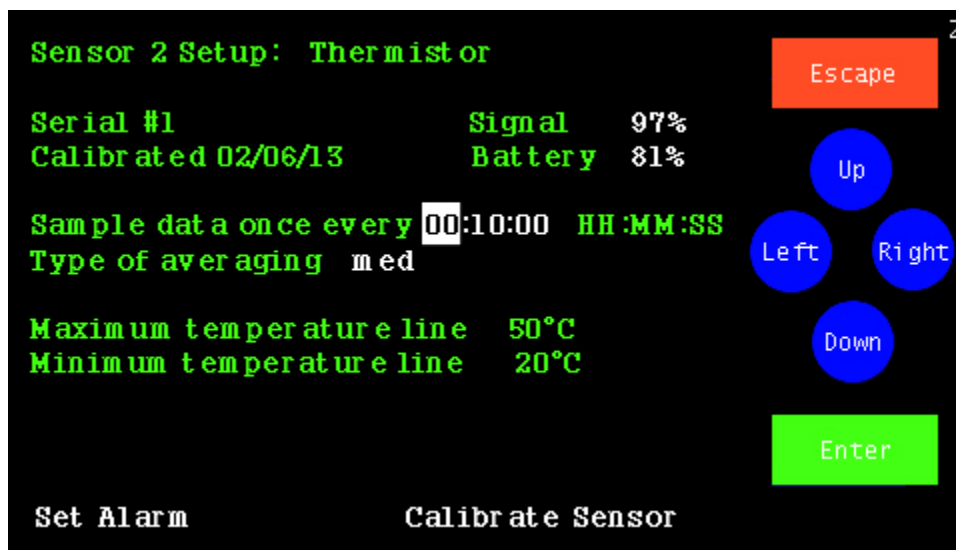
Touch 'Left' to highlight Calibrate Sensor and touch 'Enter". The calibration table for that sensors will be shown.

Calibration Table
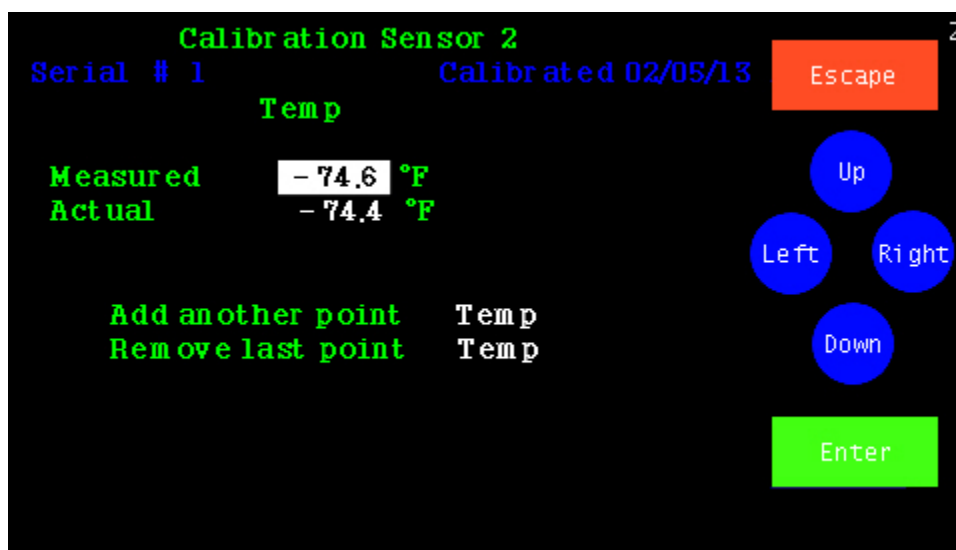
Calibration data entered here will be stored in TV2 for wireless sensors. The calibration data is stored on the sensor itself with wired sensors.

Each sensor can have up to three different calibration points. When the calibration screen first opens, only one point is listed, but you can add two additional points or remove points.

The 'measured value' is the temperature shown on the status screen, and the 'actual value' is what it should be reading.   This 'actual value' is most often obtained from another very accurate comparison instrument.

How TV2 uses this data:

1.   One point – Any temperature will be offset from the measured value.

2.   Two Points – Any temperature will be adjusted by the offset equal to the point on a line drawn between the two points.

3.   Three Points – Any temperature will be adjusted by the offset equal to the point on a line drawn between the three points. The line could be straight or the slope between point 1 and 2 could be different than the slope between point 2 and 3.

Note: Once either an actual value has been entered into one of these fields the values displayed in these fields will not change. Even if the TV2 sensor is showing some very different value on the current status screen the measured and actual value will be fixed at the values you keyed in during the calibration procedure.

(Suggested calibration procedures can be copied from the support page on the 2di web site or the CD that came with the TV2)

TView Software

Copying data from the display

Downloading, or copying data from a TV2 to a computer is done via the USB cable. If you are powering your display with a wall adaptor you will need to plug the display into your computer with the USB cable to download data. You can unplug the USB cable from the power cube and plug it into a USB socket on your computer. This will not affect the data you have already collected.
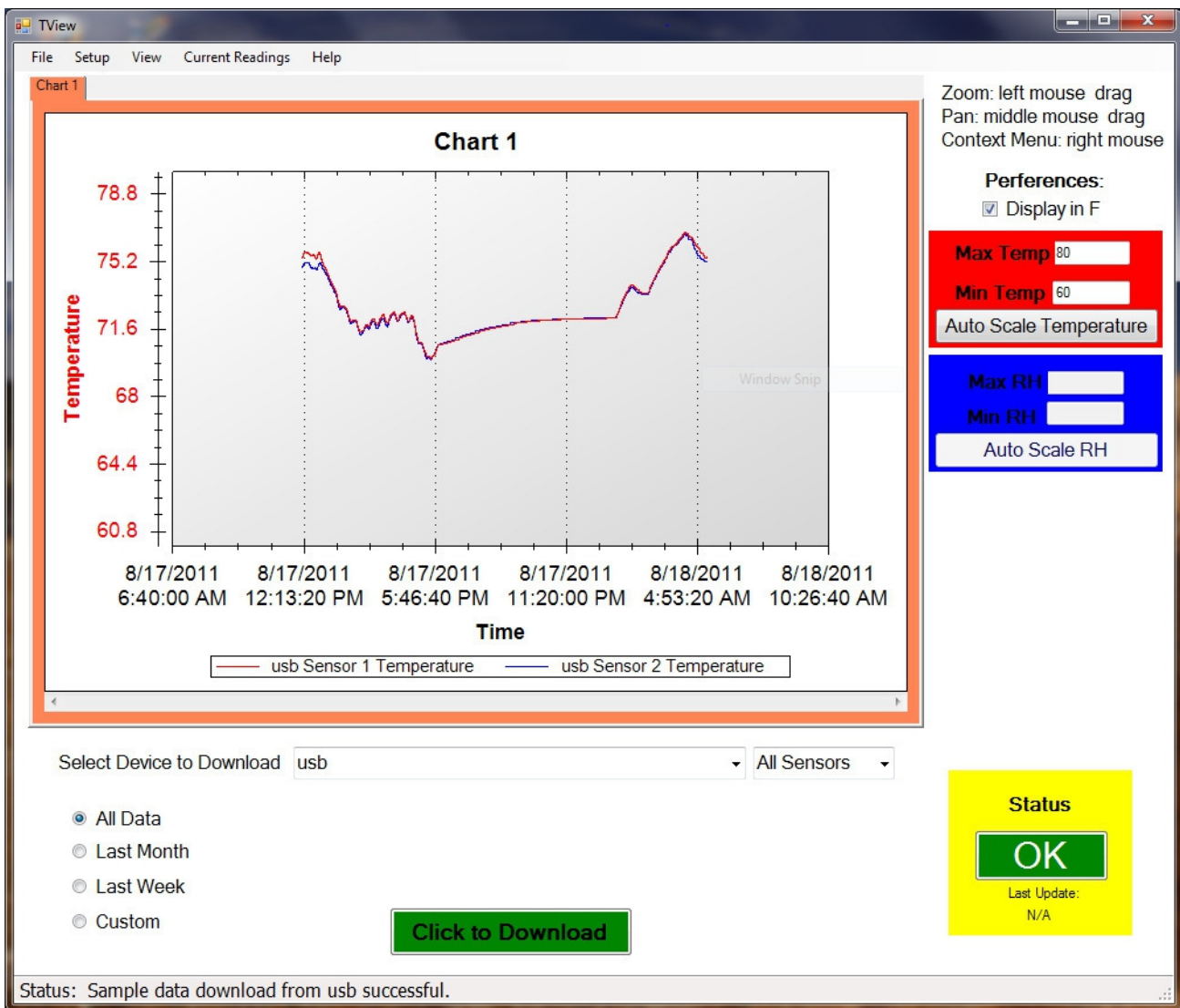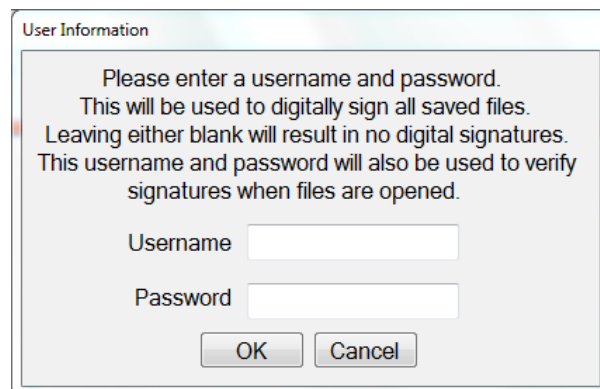
TView Software Users Guide

To obtain the free version of TView software:

1.　　Click on the 'Support' link on any page of our web site: http://www.e2di.com.

2.　　Click the link for the PC Download software and select the version you need.

3.　　Save it to your computer.

4.　　Unzip the file and click on Setup. *(If you have an older version of the software already installed on your computer you must uninstall it first).*

5.　　During the install process, a directory may be created and files will be written to your computer. Make sure you have rights to do so. You will also be given an opportunity to install the software in a directory other than the default directory. We recommend that you accept the default directory. This works just like any other Windows installation process.

6.　　Once the software is installed, click on the TView icon to open the program. The icon will be in the Two Dimensional Instruments folder. You can, of course, copy the TView icon to your desktop for convenience.

When you open the TView software a small popup window will ask for a user name and password. You may skip this step if you do not intend to save any of the files you copy from TV2**. However, if you intend to save** your data to your computer, you should enter a username and password to encrypt and sign your files for protection and to comply with 21 CFR 11 requirements. Once you save a file with a username and password you will not be able to open that file without supplying the same username and password.

User Information

Please enter a username and password.
This will be used to digitally sign all saved files.
Leaving either blank will result in no digital signatures.
This username and password will also be used to verify
signatures when files are opened.

Username　[   ]

Password　[   ]

[OK]　[Cancel]

To Copy Data from the TV2

When you open the TView software it begins scanning all serial ports to find TV2s. Once it finds one, a window will open asking for a name. This is strictly for your convenience; you can name it anything you want. Once you enter a name you can select it by that name..

TView continues to scan for TV2s asking you to name each until it has found them all. If you have other devices using serial ports that you do not want the software to scan, you can select the 'setup' tab, then 'communication setup' and then click on any of the listed serial ports you do **NOT** want TView to scan.

Once you have identified all of your TV2s, you are ready to copy data from them.

1. To copy data from a TV2 you must first select it. Click the small arrow on the right side of the box entitled 'Select Device to Download'. All known TV2s will be listed by name. Select the one you want to download data from..

a. Select the device to download by left clicking it.

b. Select the date range you want to download by clicking one of the buttons to the left of the green download button. The 'All Data' button is selected by default, so that all stored data for the selected sensor(s) will be downloaded and displayed. Clicking on last month, last week, or custom and setting a date range will cause only that data to be copied to the PC and displayed. *This can be tricky and may not work the way you think it should if the date on the TV2 is different than the one on the PC.*

c. Select either all ports or only the port you want to download by clicking on the small arrow to the right of the port selection area. The default is all ports.

> *Note: If a sensor has two channels, like temperature and humidity, both channels will downloaded when that sensor is selected*.

d. Click the 'Click to Download' button.
   i. If there is already data from the same TV2 on the chart you will be asked if you want to replace the existing data. If you answer yes, the displayed chart will be erased. If you do not want to erase the data, click 'no' and save the existing data before downloading additional data. You could also move the chart with existing data to another tab, by right-clicking on the chart.

2. By default, the TView will set the scale of the display so that the downloaded data will be positioned in the center of the chart. If you type a value in the Max Temp or Min Temp boxes to the right of the display, the scale will be adjusted accordingly.

3. Once the chart has been copied to your computer, the actual data can be moved around or zoomed into, to highlight a particular area.
   a. To zoom into a group of temperatures, draw a box around them with the mouse: Position the cursor at the top left hand corner of the area and while holding down the left mouse button move the cursor toward a lower right position. When the mouse button is released the chart will be rescaled to show only those temperatures within the box you have drawn. To return to all temperatures, click the right mouse button and select 'Undo all Zoom/Pan'.
   b. To move a plot to a different chart right click the mouse on the chart and select 'Move a Plot to another graph'.

Working with Charts

1. When TView is opened, a blank chart is displayed. It is listed as Chart 1 on the tab at the top of the chart and as the title of the chart. You can rename this by double-clicking on the tab and typing a description in the text box. This will rename the chart and the tab.

2. You can hover over any point of the curve with the mouse cursor to see the value, the date and the time it was saved.

3. A temperature scale is on the left of the chart and a RH scale, if humidity has been copied is the right side of the chart.   You can change the temperature scale to Fahrenheit by clicking the box to the right of the chart under preferences. You can also set the Y-axis for temperature and humidity by typing a value into the boxes provided.
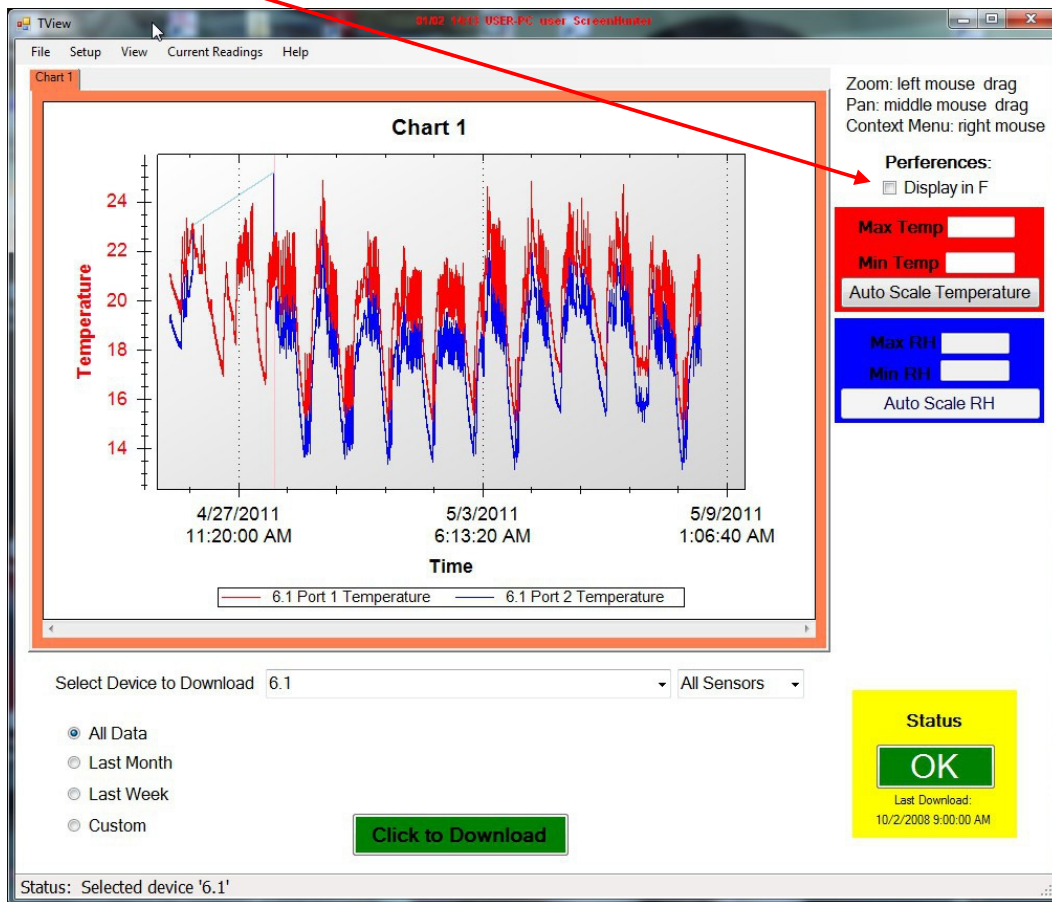
Drop-Down Tabs

1. The 'File', 'Setup', 'View, 'Current Readings', and 'Help' tabs:

   a.   File
   - *i.*   New Chart. This creates an empty chart with new tab to the right of any already displayed tabs. The tab and chart description can be changed by double clicking on the tab and typing the new name in the text box. Multiple charts, each with its own tab can be created.

   - *ii.* Open Chart. This command allows the user to open a file previously saved and stored on a computer. You will be prompted for a file name. Only files with a file extension of TXV can be opened.   You must enter a Username and Password if the chart was originally saved with a Username and Password (see iii below).

        Note: It is not possible to load the same file into more than one chart or to change any part of a file displayed in TView.

   - *iii.* Save Chart. This saves the active chart to your computer . The saved chart will be encrypted and have a TXV suffix. It is <u>encrypted with the username and password you entered when the program was opened</u>.

   - *iv.* Export Chart to .XLS. This exports the chart shown on the active tab to an XLS file that can be opened with Microsoft's Excel. Each sensor's data will be transferred to a separate worksheet on the Excel chart. It is possible to change this data in Excel.

   - *v.*   Print Chart. Sends the active chart to a printer. If there is more than one plot on the chart, you should use a color printer so you can tell the plots apart from each other. The chart looks better in landscape mode that portrait mode.

   - *vi.* Close chart. This immediately erases the selected chart and deletes it from your computer.

   - *vii.* Run in System Tray. This minimized the TView program and moves it to the background. This is useful if you are auto-downloading to your computer and want to leave the program running without seeing it on your desktop.

   - *viii.*   Exit. This closes the program and stops any further activity.

b. Setup tab:

 i. Manage TV2s. Used to rename a TV2 and determine which port it is attached to. *You can view the available ports on your computer with Device Manager found in the hardware section of Properties of the 'My Computer' program.*
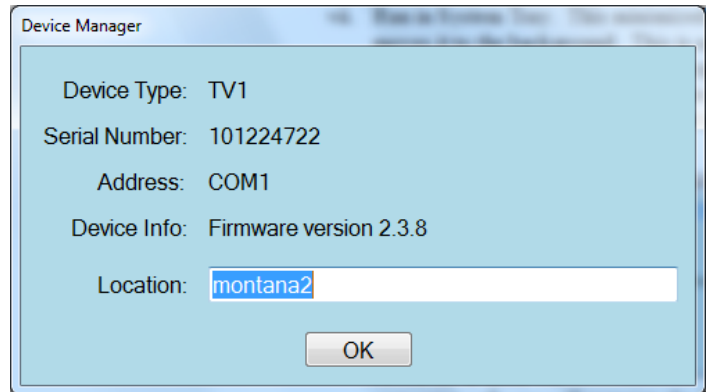
 ii. Schedule Download. Once scheduled, data will automatically be written to your file ever few minutes.

  1. Select the TV2 to be downloaded by clicking 'Add New Device' and selecting the one you want.
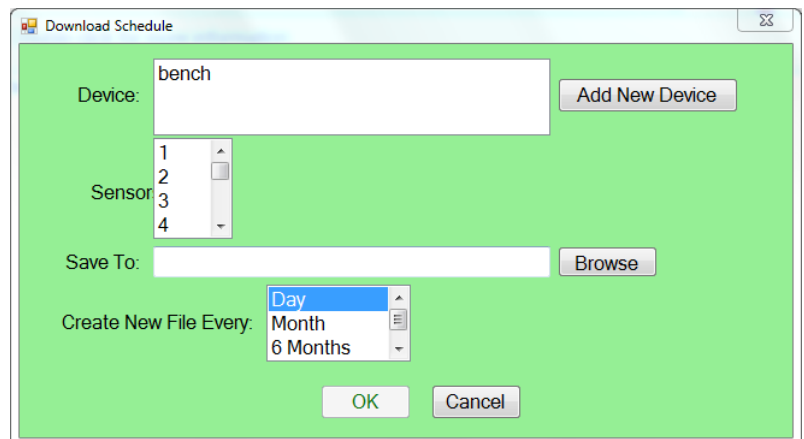
  2. Highlight the sensors you want included in the Download by clicking each one.

  3. Type in the file name and specify the location on your computer where you want the data stored. The file name will be proceeded by a year, month and possibly the day depending on how often you want a new file created.

  4. How often to start a new file.

  Note: You must have rights to create and to write files on your computer when you schedule an auto download.

 iii. Email Alerts. This will only appear if you have TView with email alerts.
  Step by step instructions for setting the email alerts can be found under the 'Help' tab.

 IV. Update ThermaViewer Firmware

Your TV2 can be updated with new firmware with the TView program. The update file will be coded for your TV2 and is non-transferable.
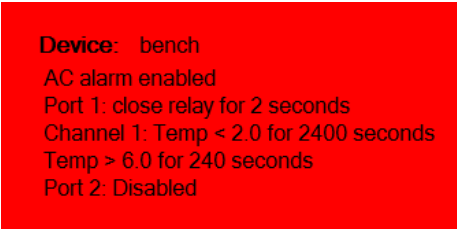
a. Click on this field and browse to the file sent to you by 2di. Click on the file and wait while the new firmware is uploaded to your TV2. This will take ~ 15 seconds, during which the screen will be blank. Once the file has successfully been installed, the TV2 will reboot. Your already collected data and settings will normally be preserved.

b. It is possible that your data may be erased during this operation so be sure and save a copy before attempting updating your firmware.

Note: If you use an update file to update a TV2 with a different serial number it will cause the TV2 to stop working. If this occurs you must return it to 2di for reprogramming.
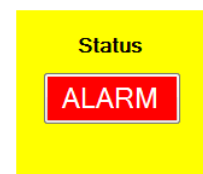
c. **View tab:**

To view alarm settings or logs, the TView software must be in Auto-Downloading mode.

i. Alarm setting. Shows alarm setting for a particular TV2. When you select this, TView queries all attached TV2s for alarm settings.

Device: bench
AC alarm enabled
Port 1: close relay for 2 seconds
Channel 1: Temp < 2.0 for 2400 seconds
Temp > 6.0 for 240 seconds
Port 2: Disabled

ii. Alarm log. Shows a record of all alarms for all TV2s being auto-downloaded. This display is accessed when the user clicks on the status button at the lower right of the TView program. If a known TV2 goes into alarm mode, the status button will indicate that an alarm has occurred by displaying the word 'Alarm' in red letters to alert the user. By double clicking this button the alarm log will be shown. After reviewing the alarm, click 'Mark as Reviewed' to hide it or right click an alarm and delete to remove the alarm from this list.
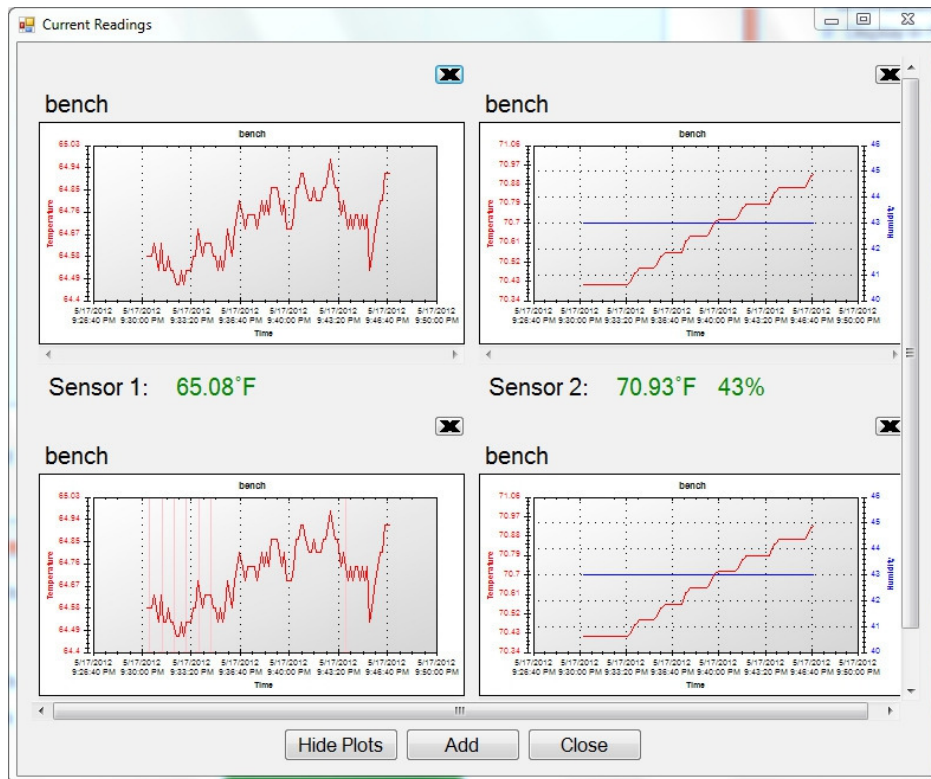
Status

ALARM

d. Current Readings: This screen displays real time data from TV2's sensors. Data does not have to be auto-downloading but the TV2 must have been detectable by the TView software.

1)

When this window opens it will be blank. To add a sensor to this screen click the 'Add' button and select the TV2 to which the sensor is attached. A popup will list the sensors attached to that TV2.
Select one or more of them by clicking on it . The last 100 readings will be displayed in the chart along with the current temperature. You can add additional sensors to this page. Clicking the 'Hide chart' button will hide the chart and display only the numeric reading. The charts are updated every few seconds.

(*Note: These temperatures are the actual temperatures taken by the sensor, which may or may not be the same as the logged temperatures, depending on how you are averaging data.*)

2) A plot can be removed by clicking on the X in the upper right area of the chart.

3) If a plot is displayed and an alarm occurs for that sensor, the temperature will turn red and the alarm status button on the main page will be updated.

e. Help:

1. 'User guide'.

2. Email Alert Setup. This word document contains a step-by-step guide to implementing the Email Alert Setup.

3. 'TView Diagnostics Menu' will be used when requested by a 2di technician. All activity of the TView software is archived. This information can be saved to a file and emailed to 2di.
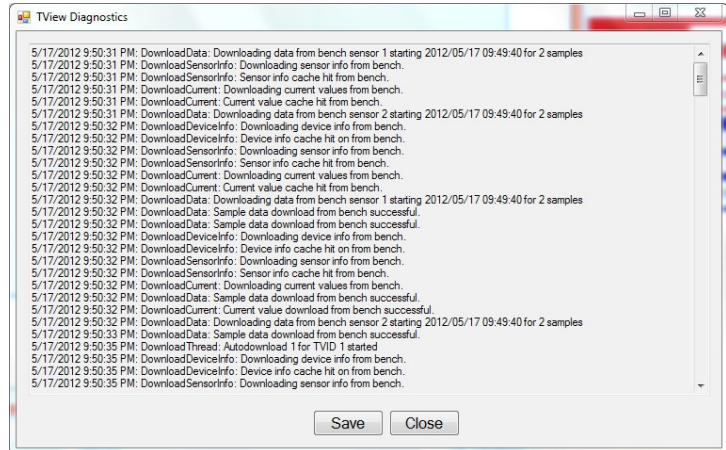
4. 'TView Communications Diagnostics' Menu archives all communications between TView and TV2s for support and troubleshooting.

5. 'Save Diagnostics file to send to 2di'. This will save the diagnostic file to your computer so that it can be emailed to 2di for help in troubleshooting.
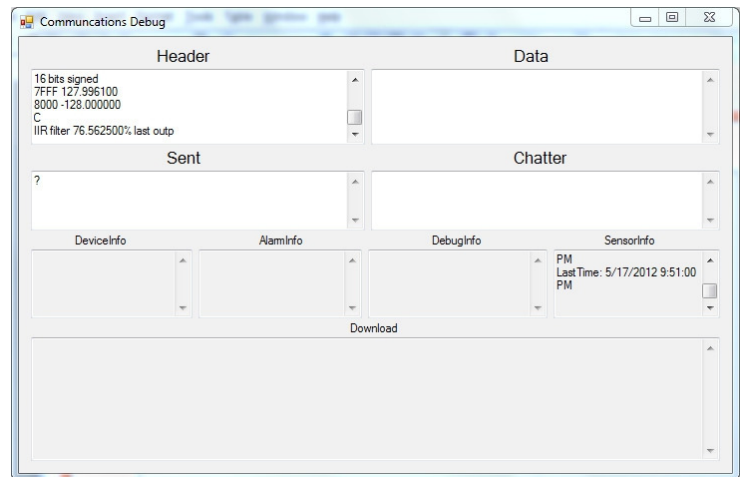
FAQ

1. Can I tell if a temperature high/low alarm occurred by looking at the display?
   Yes – If an alarm was triggered an upper-case "A" is placed on the chart at the time the alarm began and a lower-case "a" at the time the alarm was silenced or expired.

2. How can I tell if the sensors are linked to the TV2?
   If the display shows a temperature that sensor is linked to the base station. If it is not linked a message indicating that will be displayed instead of a temperature.

3. How to Link wireless Sensors

   If a sensor is not linked, touch 'Enter'. Highlight 'Add' for the sensor you want to add and touch 'Enter'. The display will then change.

   There are two ways to complete the linking of the sensor.
   1. Remove and re-attach the battery in the transmitter attached to the sensor
   2. Press the reset button on the sensor.

   A red light on the sensor will blink indicating that the sensor is sending a signal to the TV2. Once the TV2 receives this signal, you will asked of you want to link the sensor. Highlight yes by touching 'Right' and touch 'Enter'.
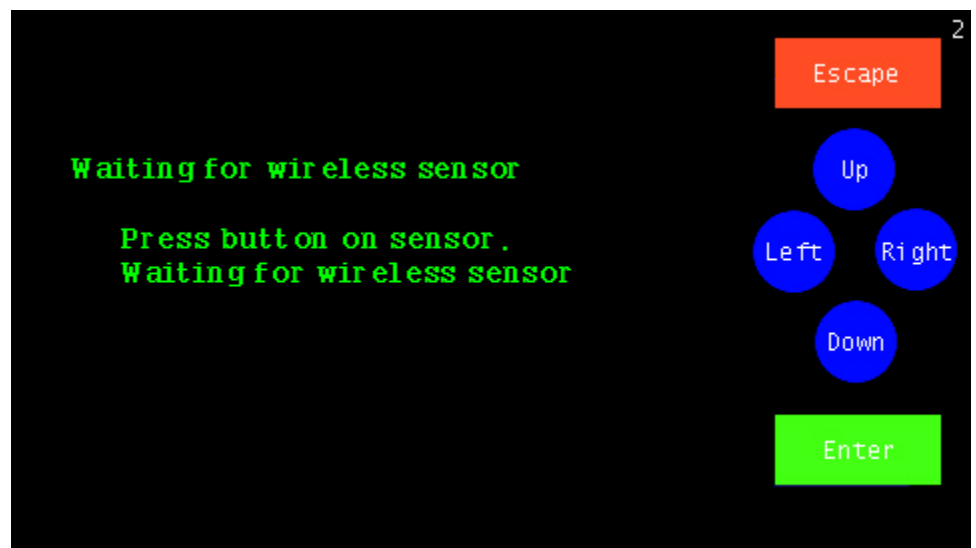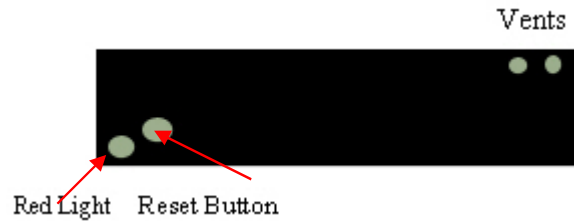
4. What should I do if the sensor quits transmitting data?
   Reposition the sensor. Replace the battery and as a last resort re-link the sensor (see above).

5. What do I need to know about wireless sensors?
   a. Battery in the Sensor - The 9-volt battery shipped with sensors will power the transmitter for the sensors for approximately 1 year. This will vary depending on where the sensor is located and on how often you are saving temperatures to the log. For example, sensors placed inside a refrigerator will have much less battery life.

   Note: Use an Alkaline battery. Not a Lithium battery, which can cause unexpected results.

   b. The battery charge for each sensor is displayed on the TV2 Status screen   Once the battery drops below 20% a 'change battery in sensor X' message will be shown on the Current Status display.

   c. Range - The unobstructed range for the sensors is ~ 100 feet. If the sensor is used indoors, the range will most likely be less. If there are walls or partitions between the sensor and the TV2 the range will definitely be less.

   d. Accuracy – The accuracy of the temperature is dependent on the accuracy of the sensor being used.
      i. Internal or external Thermistors ±0.3°C
      ii. Relative Humidity sensors ±3.0%.
      iii. Standard thermocouple accuracy. Depends on the type. (see page 4 above)
      iv. Digital wired sensors ±1.0°C

   e. Sensor LED. Every time the sensor transmits a signal the small red LED on the end of the sensor illuminates. This should occur between every 11 and 20 seconds.

   f. Sensor reset button. Used to link the sensor to the TV2.

6. Can the wireless sensors be calibrated?
   Yes. The calibration data is, however, stored in the TV2 to which the sensor is linked, so if you unlink a sensor and link it to a different display you will need to reenter the calibration data.   A sample calibration procedure can be obtained from our web site or

from the CD that came with your TV2. It is just a sample procedure. Your calibration service or QC department may have a different procedure.

7. How is the data transmitted from the sensor to the TV2?
    The sensor is attached to a transmitter which sends a signal to the TV2 which has a built-in base station that receives data. This transmission uses 433mhz.

8. What is the purpose of the Zoom-out and Zoom-in buttons on the TV2 chart display?
    a. The amount of data displayed by the chart on the TV2 changes according to the Zoom setting. One data point is plotted in each column if the chart is zoomed in completely (Zoom =1X).

    b. Touching the '**ZOOM-OUT'** button (green triangle at the bottom of the chart display) causes more than one data points to appear in each column. The data on the TV2 can be zoomed out 10 times (Zoom =10X). This means that the user can see between 4 months and 256 years of data on one screen, depending on how often the sensor is collecting data. In any zoomed-out mode more than one collected measurement appears in each column. The recorded measurements are displayed as a high-low vertical bar.

        1. So, for example, if the TV2 is set to Zoom=2X then each column will show two temperatures connected by a vertical line whose top is the higher temperature and whose bottom is the lower temperature.

        2. If the chart is zoomed out further than 2X to say Zoom = 6X, the measurements (in this case all 32 of them) will appear as a single vertical line with the highest of the 32 temperatures being the top of the line and the lowest of the 32 temperatures as the bottom of the line.   The TV2 can display between 1 and 512 measurements in each column. The **ZOOM-OUT** green triangle can be touched ten times (Zoom=10X), which will show the maximum amount of data. This method of displaying multiple measurements in the same column allows the TV2 to display large amounts of data in the same way that stock prices are displayed with high-low bars covering a period of time.

9. Can I use wireless sensors inside fridges and freezers?
    a. Sensors with internal Thermistors can be used within a fridge but the range is dramatically shortened, and the cold temperature will shorten the battery life of the sensor.

    b. Sensors with external Thermistors or thermocouples are made to be used with freezers and refrigerators. All external sensors have two parts. The transmitter (the black box with the battery) that is placed outside the fridge or freezer, and the actual sensor which is attached to the transmitter by a wire. Only the actual sensor should be placed inside the freezer.

10. What is the purpose of the sensor serial number?

> The sensor serial number shown on the Sensor Setup menu and the current status screen is a channel number between 1 and 256. You cannot link sensors with the same channel number to the same TV2. Each sensor linked to a TV2 must have a unique channel number. If you do have two sensors with the same serial number return one of them to the factory for reprogramming.

11. What type of wireless sensors can be used with TV2?

   a. Interior thermistor – The thermistor is mounted inside the black sensor pod along with the transmitter. These are most often used inside rooms or containers kept at room temperature.

   b. Interior thermistor & humidity – Thermistor and RH sensors are mounted directly on the board inside the black sensor pod along with the transmitter. These sensors are normally used to measure room temperature and humidity.

   c. Exterior thermistor – A thermistor on a wire is plugged into the black transmitter. This is the same type of thermistor used for the interior thermistor sensor, and is used to monitor cold storage units, such as refrigerators or freezers.

   d. Thermocouple – K, J or T type thermocouples that plugs into the black transmitter and are used for extreme temperature conditions. Each type has it's own temperature range which can go from cryogenic temperatures to as high as 1250°C.

12. Can I change the date and time without loosing data?

> If you are set the date or time **back**, and data stored in the monitor ***will be cleared*** (You will be warned before any data is actually cleared). You can move the time forward **1 hour or less** without losing data. A data gap will appear in the temperature line. If you move the time forward more than one hour the old data will be erased.

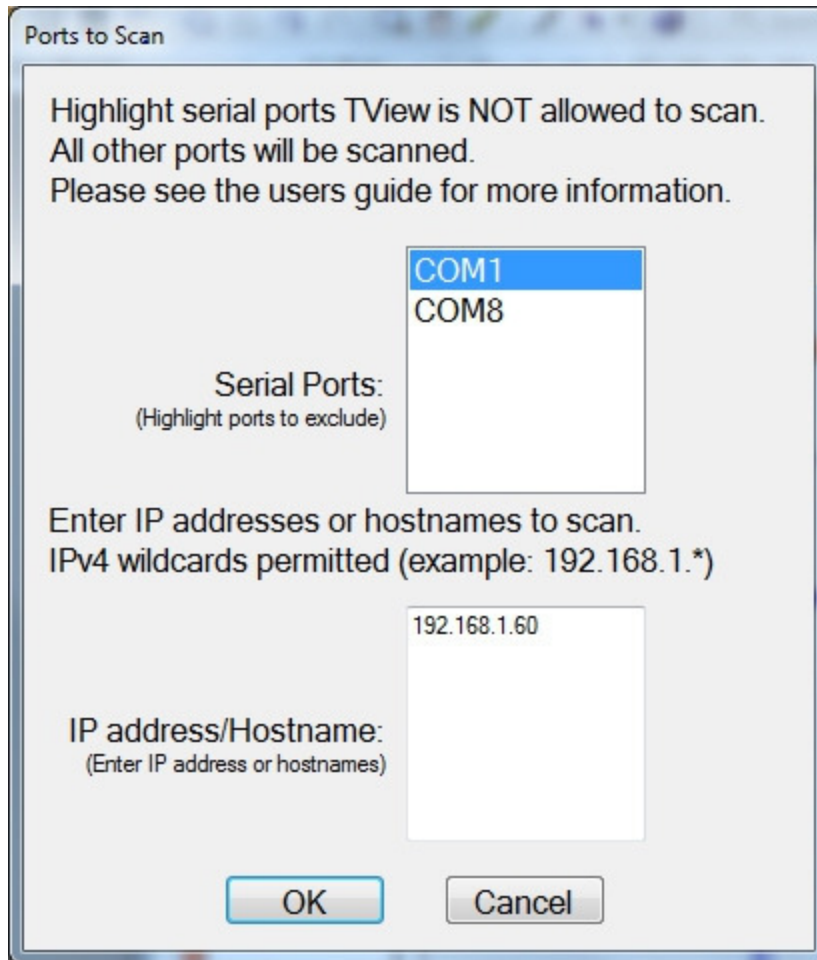13. How much data can be exported to Excel with the TView program?

> When you open a file with Excel that has been saved with TView only the first 65000 data points will be saved. (This is a limitation of the Excel program not the TV2 or TView). The TView program has no such limitation and will save and display all data.

14. Can I move TV2 to a new location without losing data?

> Yes. Go to the Main menu by touching 'Enter' twice and touch 'Right' to highlight 'Deep Sleep Mode'. Touch 'Enter'. The monitor will go into a deep sleep mode during which the clock will continue to run but nothing else will occur. Once TV2 is repositioned and power supplied, touch the screen and it will reboot. If the display does not immediately wake up press the 'Reset' button with a paper clip. Your previously collected data will still be there and will display properly.

Configure TView

To configure TView to communicate with a TV2 on you LAN, call up TView and click on 'Setup' and then click on 'Communication Setup'. The menu shown below will be displayed.

Type in the IP address of the TV2 in the lower white square and click 'OK'. After a few minutes the normal TView popup menu for naming a TV2 will be displayed, so you can provide a name. Once that is completed TView 'knows' where this TV2 is located and can download data from it.

Viewing the Temperature over the Internet

To access the TV2 from outside the LAN a static IP address should be used and port forwarding must be setup on your modem by your IT department.

The TV2 will serve up a web page when accessed with a browser so the current conditions can be seen from any where over the internet. Your IT department will provide the IP address to access the web page below with a browser.

You will be able to view the information below but you can not make changes to the TV2 or go to the chart display remotely.