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UWBT

Handheld *Bluetooth*® Wireless Temperature, Humidity and pH Logger/Transmitter Series

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Servicing North America:

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Toll-Free: 1-800-826-6342 (USA & Canada only)
Customer Service: 1-800-622-2378 (USA & Canada only)
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Section 1 - Getting Started

1.1 Introduction

The UWBT series of *Bluetooth*® wireless transmitters combines the accuracy of an industrial sensor with the convenience of modern technology. The UWBT transmitter handle reads data and transmits it to your smartphone or tablet via *Bluetooth* wireless communication to the UWBT App. A free PC application is also available, that can configure, download logged data, and upgrade UWBT firmware. With the UWBT app, you can pair with multiple transmitters and view their data in either digital, gauge, or graph format. The UWBT also allows you to log to your handheld transmitters or tablet memory at speeds ranging from 10 samples/second to 1 sample/minute. You can easily recharge the UWBT transmitters with its supplied USB cable or by simply replacing the supplied AA batteries. Items included in package.

1.2 Where To Find And Download The UWBT App

The UWBT mobile app is available for both smartphones and tablets running iOS and Android™ operating systems. The PC application is available for both Windows and Mac operating systems. All apps are free, and you can find the UWBT apps by searching for "Omega UWBT" in the following locations:

- Google Play Store (Android mobile app)
- iTunes (iOS mobile app)
- Omega.com (PC - Windows and Mac OS Software)
- Amazon Appstore (Android mobile app for an Amazon Fire smart phone or tablet)

1.3 Unpacking Your UWBT Shipment

Remove the packing list and verify that you have received all your equipment. If you have any questions about the shipment, please call OMEGA Customer Service at **1-800-622-2378** or **203-359-1660**. Customer Service can also be reached online via chat at **www.omega.com**, or via email: **cservice@omega.com**. When you receive the shipment, inspect the container and the equipment for any signs of damage.

NOTE:

Report any evidence of rough handling in transit or any damage to the shipping agent immediately. The carrier will not honor any damage claims unless all the shipping materials are saved for inspection. After examination and removal of contents, save packing material and carton in the event that reshipment is necessary.

The following items are supplied in the UWBT package:

- One (1) UWBT transmitter handle (in the sensor type ordered)
- Two (2) AA rechargeable NiMH batteries (installed)
- One (1) AC power adapter
- One (1) USB cable (mini-B to A connection)
- UWBT Quickstart Manual

1.3.1 UWBT Transmitter Models

Below are the different sensor connections offered for the UWBT transmitter models:

Thermocouple

- UWBT-TC-UST: universal female connector that accepts both standard male (OSTW Series) or miniature male (SMPW Series) mating connector
- UWBT-TC-M12: 4-pin M12 connector

RTD

- UWBT-RTD-TB: 3-position terminal block with easy plug-in connection
- UWBT-RTD-M12: 4-pin M12 connector

pH

- UWBT-pH: BNC connector for pH electrode and 2-position terminal block for temperature.

RH

- UWBT-RH: 8-pin M12 connector

NOTE:

The RH model comes supplied with its mating RH sensor with an 8-pin M12 connection.

Section 2 – Transmitter Instructions (Hardware)

2.1 Handle Diagram

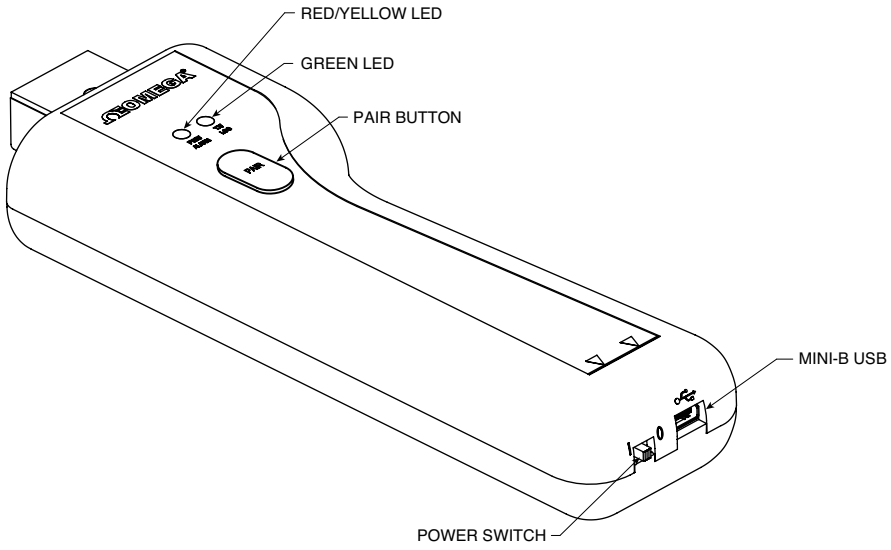
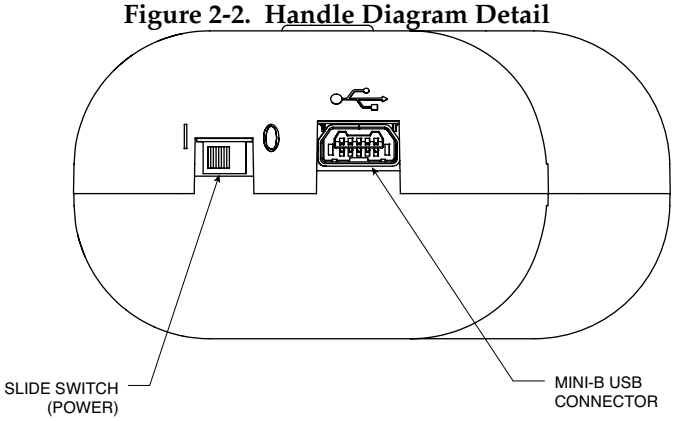


Figure 2-1. Handle Diagram

Figure 2-2. Handle Diagram Detail



2.2 Mounting The Transmitter On The Wall

The UWBT has been designed to allow for easy wall mounting. On the rear of the case there is a keyhole that fits a #4 screw (M3 metric). See the diagram below for overall case dimensions.

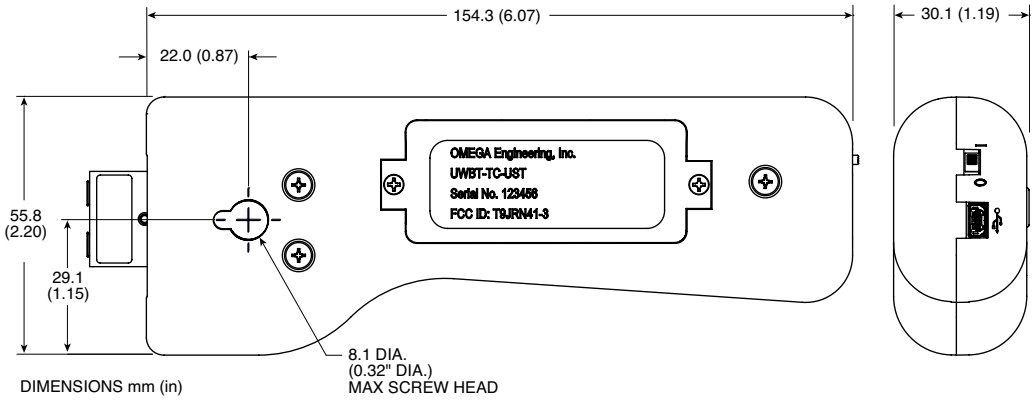


Figure 2-3. UWBT Transmitter Dimensions

2.3 Sensor Connections

2.3.1 UST Connection (for UWBT-TC model)

To connect a probe to the UWBT-TC-UST transmitter, plug the probe into the connector head. For standard and miniature size connectors, see the diagram below:

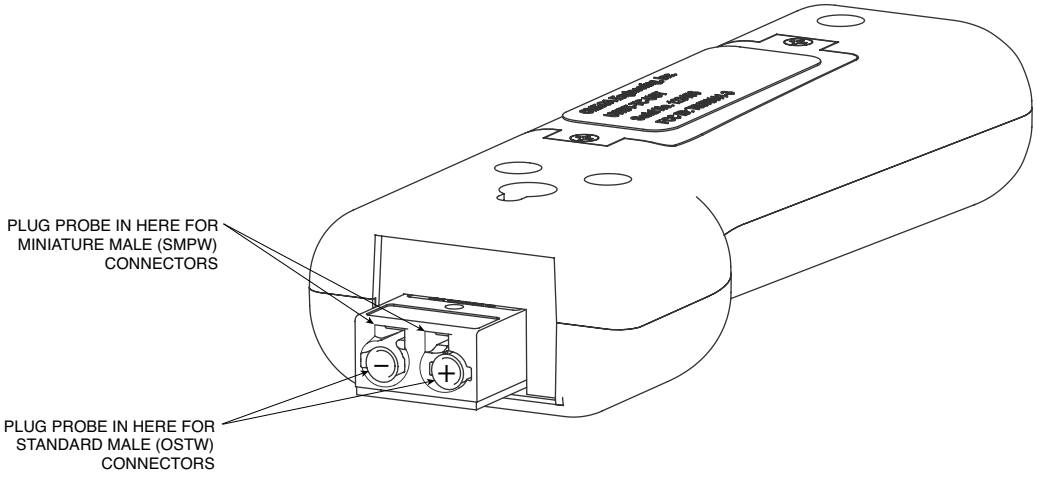


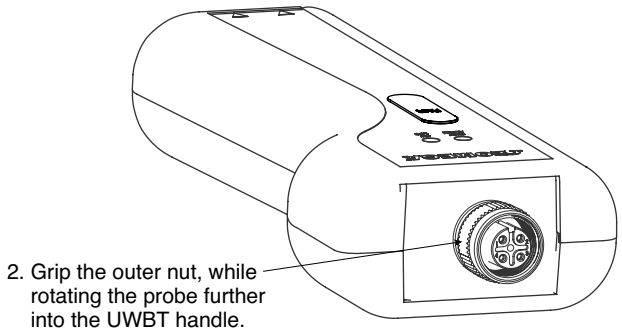
Figure 2-4. UWBT Thermocouple Probe Connection

2.3.2 M12 Connection (for UWBT-TC-M12 or UWBT-RTD-M12)

Both the thermocouple and RTD models of the UWBT are available with M12 connections.

To connect your M12 probe to the UWBT, see the diagram below:

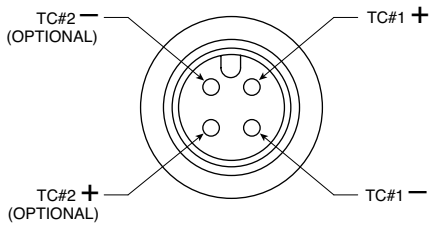
Figure 2-5. Connecting Your M12 Probe To The UWBT



UWBT-TC-M12 Wiring

The UWBT thermocouple models use standard pin connections, as shown below:

Figure 2-6. Standard Pin Connections For TC Models



UWBT-RTD-M12 Wiring

The RTD models use Wiring Option #1 (American style), as shown in the diagram below

Figure 2-7. RTD Models Wiring Option #1

2.3.3 Terminal Block Connection (for RTD Model)

The UWBT-RTD-TB comes with a 3-wire terminal block. The terminal block can be unplugged from the transmitter body, allowing for easier handling of the wires. See below:

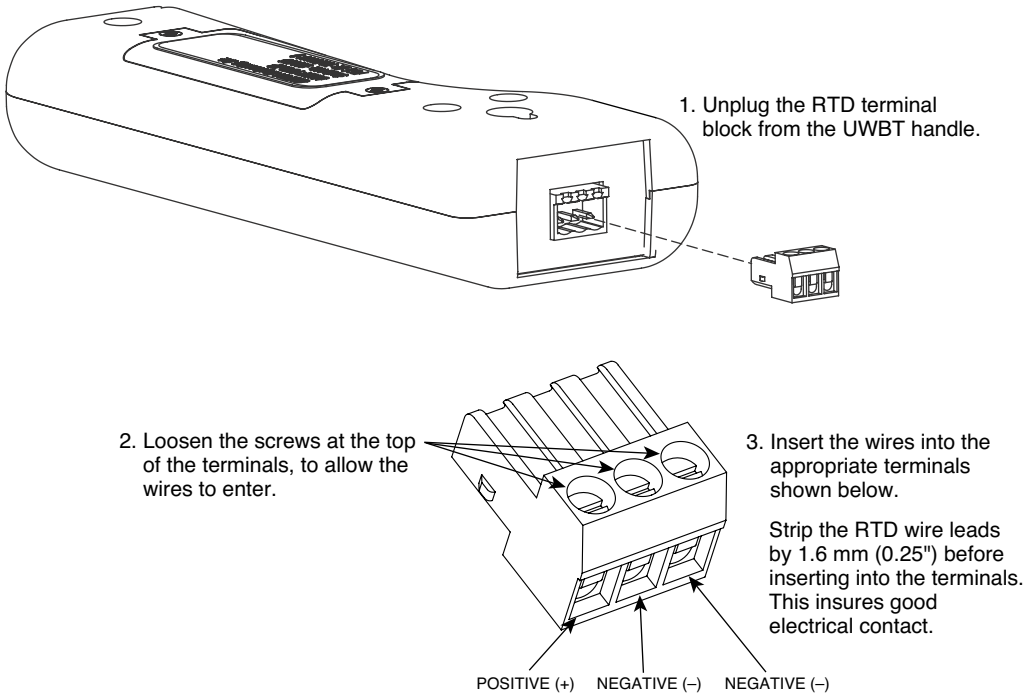


Figure 2-8. Terminal Block Connection

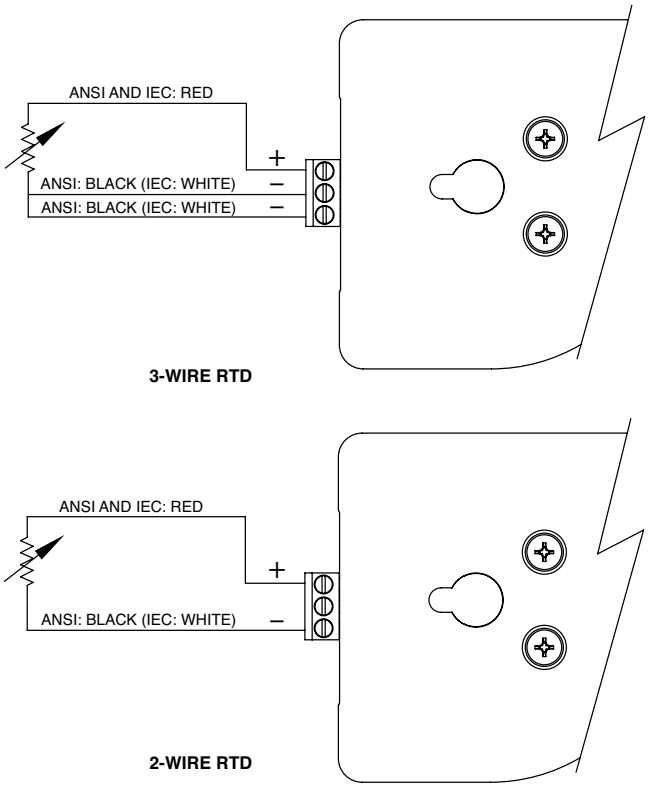


Figure 2-9. RTD Models Wiring

2.3.4 M12 Connection (for RH Model)

The UWBT-RH model is supplied with its mating M12 RH sensor probe. See below for instructions on connecting the probe:

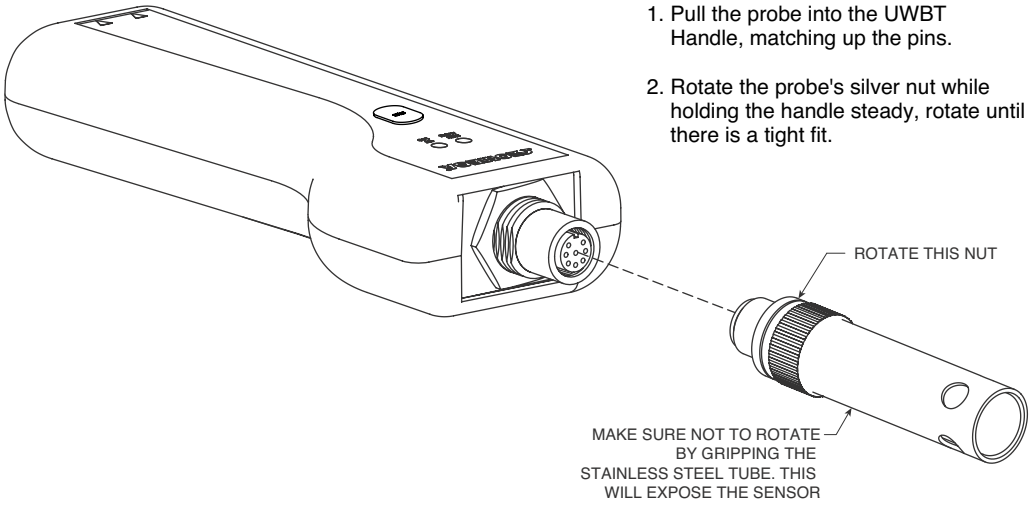


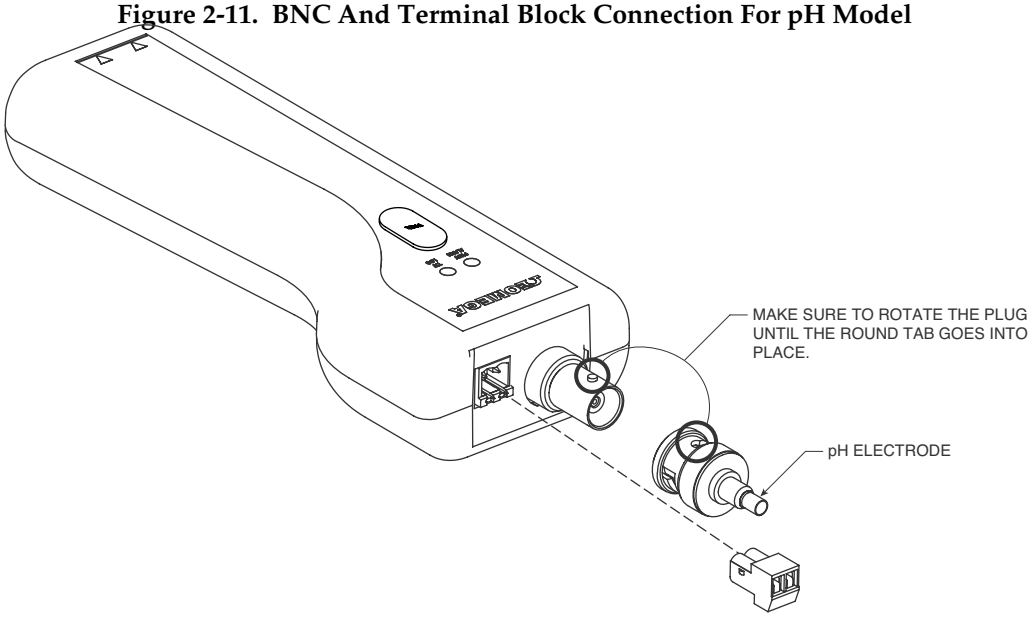
Figure 2-10. M12 Connection For RH Model

2.3.5 BNC & Terminal Block Connection (for pH Model)

The UWBT-pH model has connection for both a BNC connector (for a pH electrode) and a 2-wire RTD terminal block (for solution temperature compensation).

See below for instructions on connecting the pH and RTD sensors.

Figure 2-11. BNC And Terminal Block Connection For pH Model



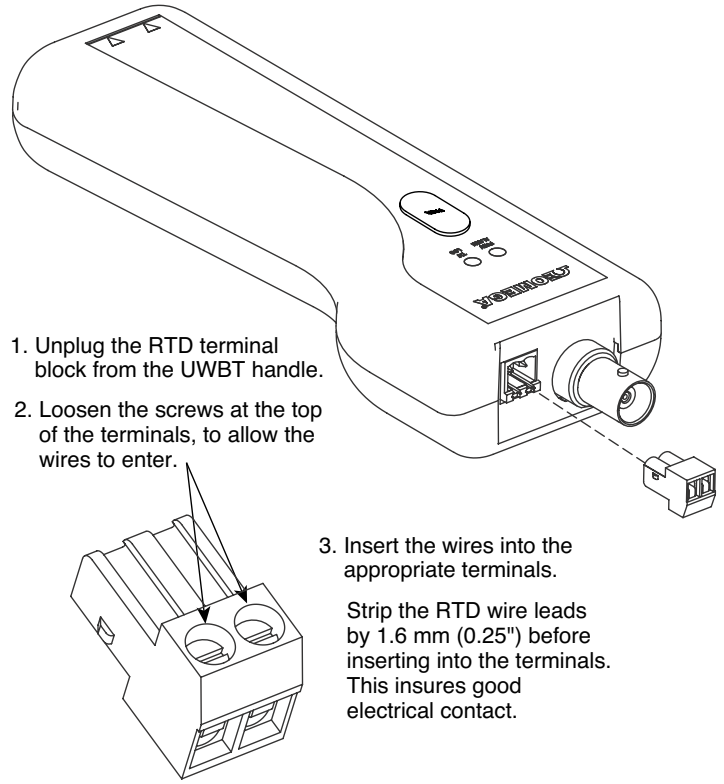


Figure 2-12. BNC And Terminal Block Connection For pH Model

2.4 LED Indication

The UWBT transmitter has two LEDs on the front face; these LEDs indicate the status of the transmitter in relation to the app. See below for information on what each LED signal means.

LED Action	(The red & yellow colors come from one LED)		Green LED	Transmitter Status
	Red LED State	Yellow LED State		
Red & Green LEDs blink alternatively.	Blinking	-	Blinking	Sensor Out of Range
Red & Green LEDs blink alternatively.	Blinking	-	Blinking	Sensor Open
Red LED blinks twice every 2 seconds.	Blinking	-	-	Low or High Alarm
Red LED blinks every 5 seconds.	Blinking	-	-	Low Battery
Green LED blinks every second.	-	-	Blinking	Downloading data from probe
Green LED blinks 3 times every 3 seconds.	-	-	Blinking being sent	*Bluetooth* Wireless Paired/ Data
Green LED blinks twice every 3 seconds.	-	-	Blinking	Internal logging on
Green LED blinks once every 3 seconds.	-	-	Blinking	The transmitter is on and connected to a sensor, but is not paired with a smart device.
Red LED blinks every second for 2 minutes, then unit switches off.	Blinking	-	-	*Bluetooth* wireless unpaired
Red LED blinks every second for 2 minutes, then stops.	Blinking	-	-	*Bluetooth* wireless enabled (searching to pair)
Red & Green LEDs blink twice together, then go off.	Blinking	-	Blinking	Factory Settings have been successfully re-installed on the transmitter.
Yellow LED is on continuously.	-	On	-	Battery Charging
Yellow LED blinks every second.	-	Blinking	-	Battery Fully Charged
Green & Red LEDs turn on for ½ second, then go off.	On	-	On	Transmitter has been powered up successfully
Red LED turns on for ½ of a second, then goes off.	On	-	-	Transmitter has failed to power up successfully
Green LED blinks 3 times, then the transmitter turns off.	-	-	Blinking	Transmitter has successfully powered off
Yellow & Red LEDs blink alternatively.	Blinking	Blinking	-	Transmitter internal memory is full.

2.5 Labels And Serial Number Info

The UWBT transmitter handle comes with 2 labels affixed to the enclosure. The front label gives you the basic information for operation, and the rear label provides information specific to your model and part.

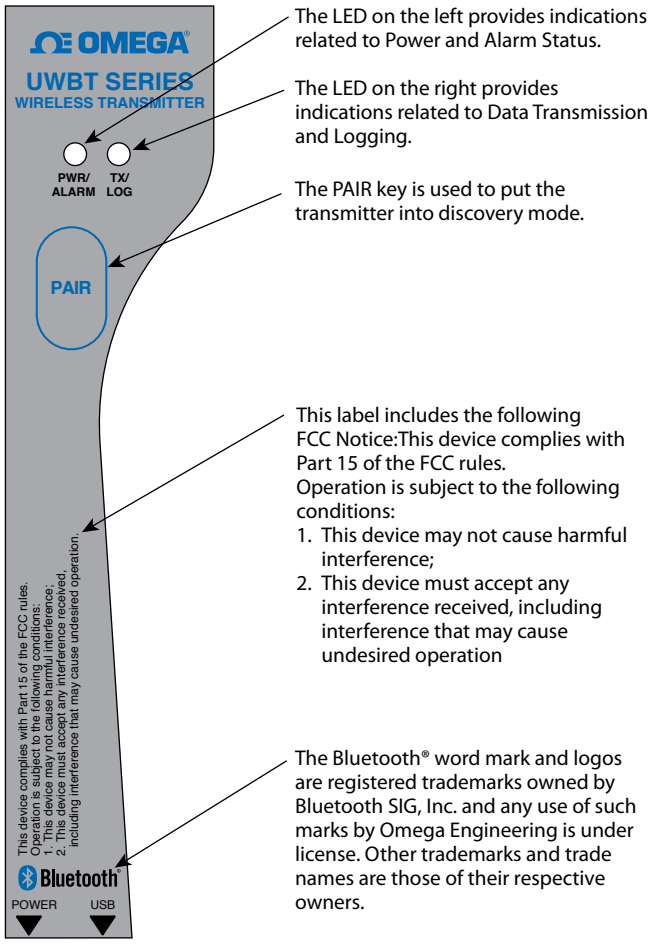


Figure 2-13. UWBT Front Label

The rear label is marked with international safety and hazard symbols in accordance with IEC standards (see section 9). It is important to read and follow all precautions and instructions in this manual before operating or commissioning this device as it contains important information relating to safety and EMC. Failure to follow all safety precautions may result in injury and or damage to your device. Use of this device in a manner not specified will void your warranty.

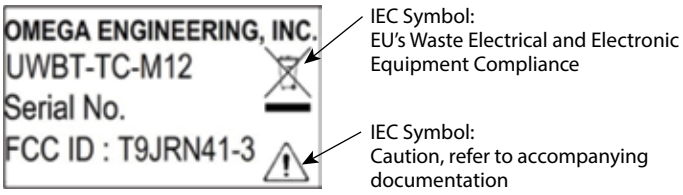


Figure 2-14. UWBT Rear Label

2.6 Batteries & Power

2.6.1 Charging The UWBT Transmitter

In order to ensure maximum battery charge upon use, make sure to fully charge the UWBT before using the transmitter. You will know the transmitter is fully charged when the yellow LED blinks once every second.

The UWBT transmitter handle is provided with two (2) AA NiMH rechargeable batteries installed. You can easily recharge the batteries by plugging the provided USB cable into the handle, and connecting to the AC adapter provided. You can also charge the unit by connecting the USB cable into the USB port of a PC/laptop.

NOTE:

Use only rechargeable NiMH batteries with your UWBT transmitter. Do not use Alkaline batteries.

2.6.2 Replacing The Rechargeable AA Batteries

In case you cannot connect to a power source to recharge the 2 NiMH batteries, you can replace them with 2 other rechargeable NiMH batteries. To replace the batteries, use a Phillips screwdriver to open the battery door as shown in the diagram below. Remove the batteries and replace as shown.

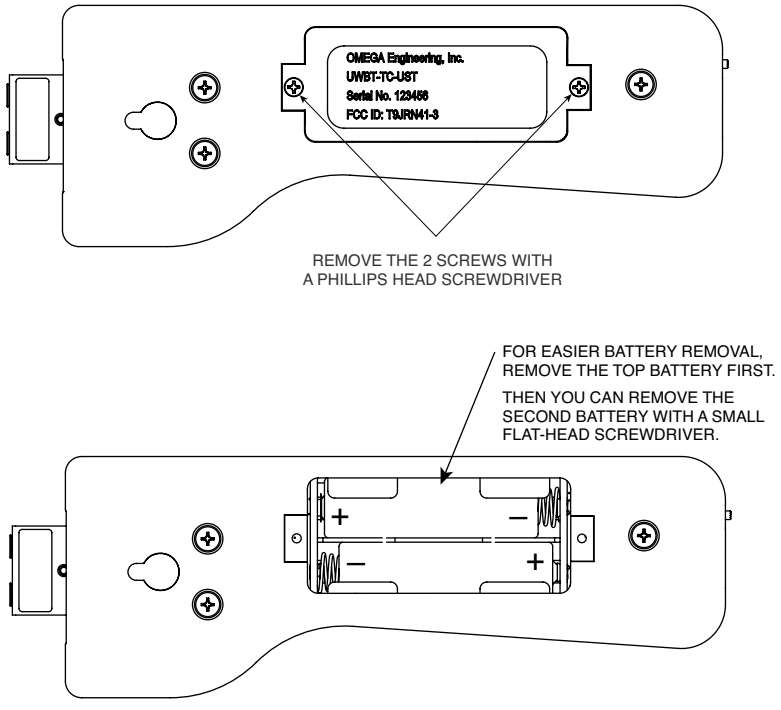


Figure 2-15. Replacing The Rechargable AA Batteries

2.6.3 Using The Power Switch To Restore Default Settings

The UWBT transmitter has the option to restore factory defaults without needing app intervention. Follow the instructions below to restore defaults on the transmitter:

1. Switch the UWBT transmitter OFF.
2. While the transmitter is still off, press and hold the Pair key.
3. Still holding the pair key, turn the slide switch to the ON position. Keep holding the Pair button for 5 seconds.
4. The Red and Green LEDs will blink twice together then go off, indicating that the factory defaults have been restored.

Section 3 - Software Instructions (iOS & Android)

The UWBT mobile app works on both smartphones and tablets. For tablets, the app works in both portrait and landscape mode; for smartphones, the app works in portrait mode only.

NOTE:

Please see the UWBT spec sheet on omega.com for a full list of tested iOS and Android enabled devices.

3.1 Connecting To The UWBT Transmitter

After downloading the Omega UWBT app, you will be able to connect your transmitter to your smart device. See Section 1 for where to find the apps online.

3.2 Using Cloud Services With The UWBT App

The UWBT app allows you to connect directly to most major cloud services, so that you can easily save and send your logged data. Below are instructions on setting up these services for use with the UWBT app.

NOTE:

iCloud uploads are only available on the UWBT iOS app.

iCloud does not require login when in use with the UWBT iOS app.

3.2.1 Google Drive

If you don't have a Google account go to https://accounts.google.com/signup, fill out the registration form and follow further instructions sent from Google team to activate the account. You need to add your newly created Google account to the device where you're going to use the UWBT application. Go to the device settings, select Accounts, then click add account->Google->existing and add your Google account Credentials. You can also skip online registration and go straight to the device and after selecting "add account" specify "Google->new account" and this will create a new account automatically for you.

If you already have an account you can go to the UWBT application, select the file to be sent from logging settings menu, select Google Drive from the cloud selection spinner box and press send. After that you will see a new pane with the Gmail accounts registered on your device:

NOTE:

Google Drive uploads from the UWBT app do not work for an Amazon Fire smart device.

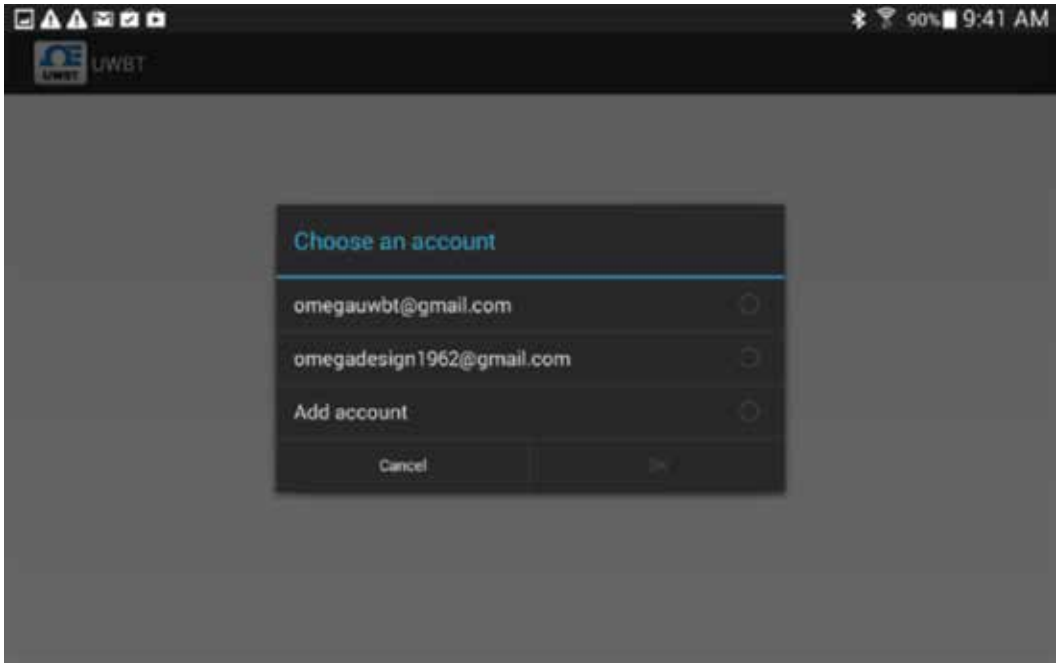


Figure 3-1. Gmail Account Creation

Select the account you want to send the file to and hit ok. You will then be returned to the UWBT app "Sign In, File Upload, Sign Out" menu. In this screen there is a lag as to when Google approves the sign in information. Wait for 5-10 seconds for the information to process; if you press "Sign In" a second time, you will be taken back to the Google log-in page unnecessarily.

For the first time you use this feature you will be asked for confirmation of the action you request:

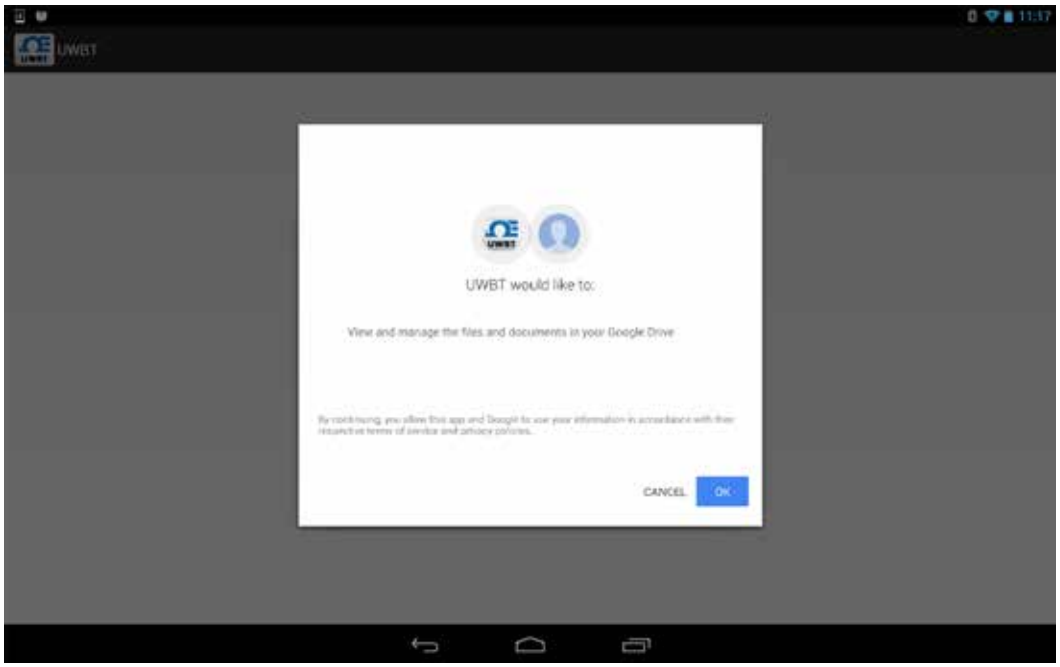


Figure 3-2. Google Confirmation

Click ok and your file will be uploaded to your Google Drive under "UWBT LogFiles" directory.

3.2.2 SugarSync

If you don't have a SugarSync account, go to the website, https://www.sugarsync.com/. If you wish to use a trial plan, select "Try Free for 30 Days" in the top of the registration form and then input your name and e-mail address. If you want to choose a paid plan, select the plan from the spinner menu and then input your name and email address. In either case, after sending registration form you will receive further instructions on how to activate your account in the e-mail address you input during registration.

If you already have a SugarSync account, you can go to the UWBT application, select the file to be sent from the Logging Settings menu, and select Sugar Sync from the cloud selection spinner box. Press send, and after that you will see a new pane with the following options:

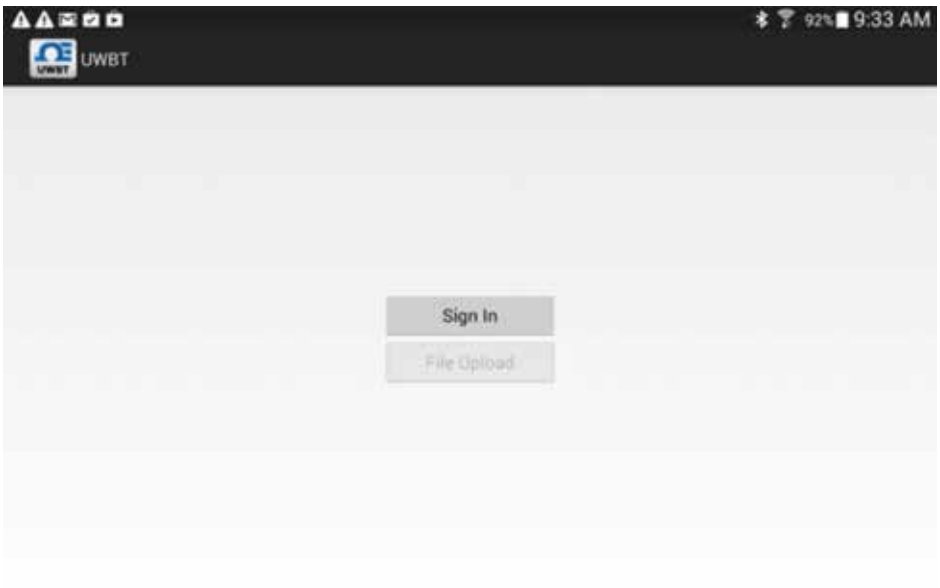


Figure 3-3. SugarSync Sign In

First you need to sign in. When you press the button you will see SugarSync sign-in page where you need to input your active SugarSync account credentials:

Figure 3-4. SugarSync Account Information

After successful authentication you will see the previous pane with the "File upload" button enabled. You can now upload the log file you've selected to your SugarSync cloud drive. The file will appear in the "Mobile Photos/ UWBTLOGFILES" directory.

NOTE:

SugarSync requires the user to sign in with username and password each time a file is uploaded.

3.2.3 Dropbox

If you don't have a Dropbox account go to the website https://www.dropbox.com/. Click the sign up button, fill out the registration form and follow further instructions on the website to activate the account.

NOTE:

For iOS users, it is recommended that you have the Dropbox app downloaded on your smart device. This allows for easier communication between the UWBT app and Dropbox when sending files.

If you already have an account you can go to the UWBT application, select the file to be sent from the Logging Settings menu, select Dropbox from the cloud selection spinner box and press send. After that you will see a new pane with the following options:

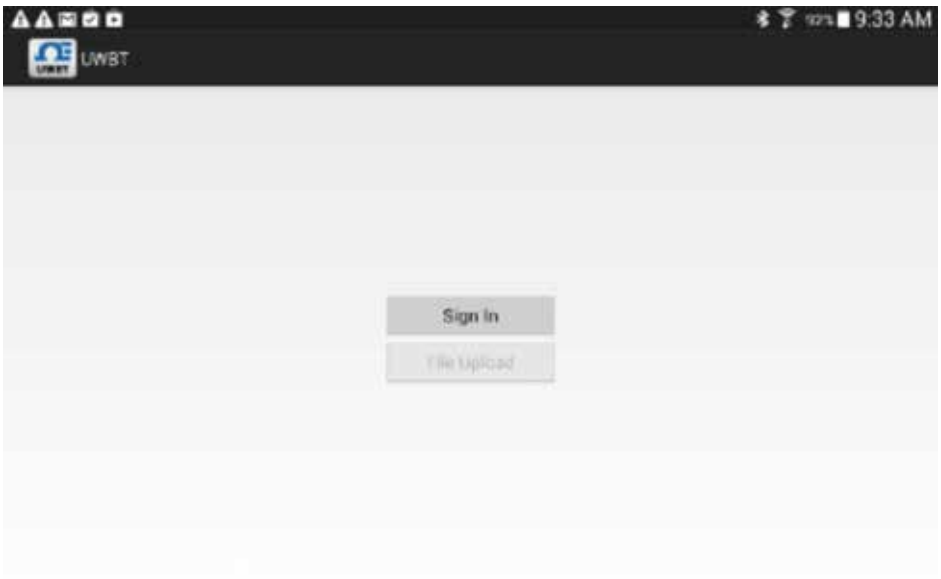


Figure 3-5. Dropbox Sign In

First you need to sign in. For the first time you upload a log file with UWBT you will see Dropbox sign-in page where you need to input your active Dropbox account credentials:

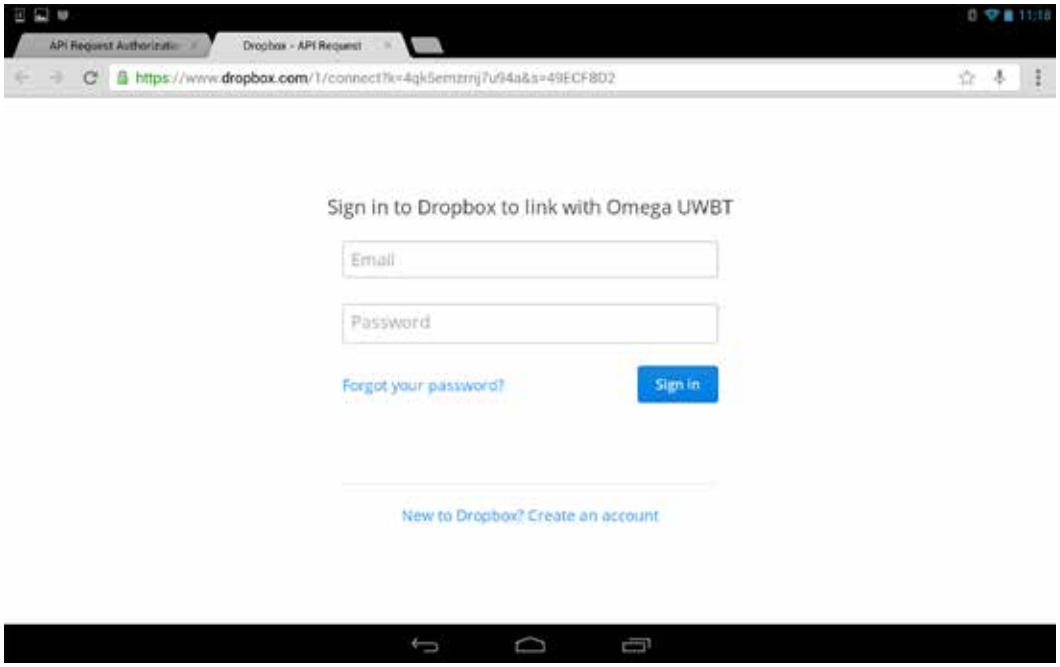


Figure 3-6. Dropbox Account Information

If you successfully log in for the first time you won't have to input your credentials in the future during uploading file. You will have to do is to confirm requested action for the last used account or sign in using another one:

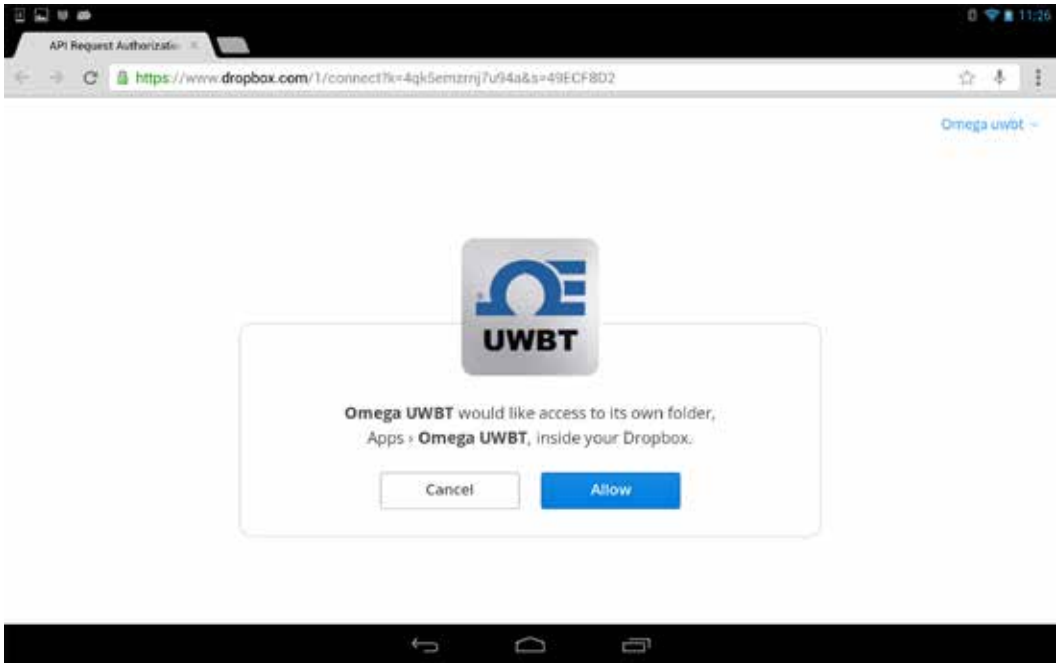


Figure 3-7. Dropbox Confirmation

After successful authentication you will see the previous pane with "File upload" button enabled. You can now upload the log file you've selected to your Dropbox cloud drive. The file will be automatically saved under "Apps/UWBT-ANDROID" directory.

3.2.4 OneDrive

If you don't have a OneDrive account go to https://onedrive.live.com/. Click the sign up button, fill out the registration form and follow further instructions on the website to activate the account.

If you already have a OneDrive account, you can go to the UWBT application, select the file to be sent from the Logging Settings menu, and select OneDrive from the cloud selection spinner box. Press send, and after that you will see a new pane with the following options:

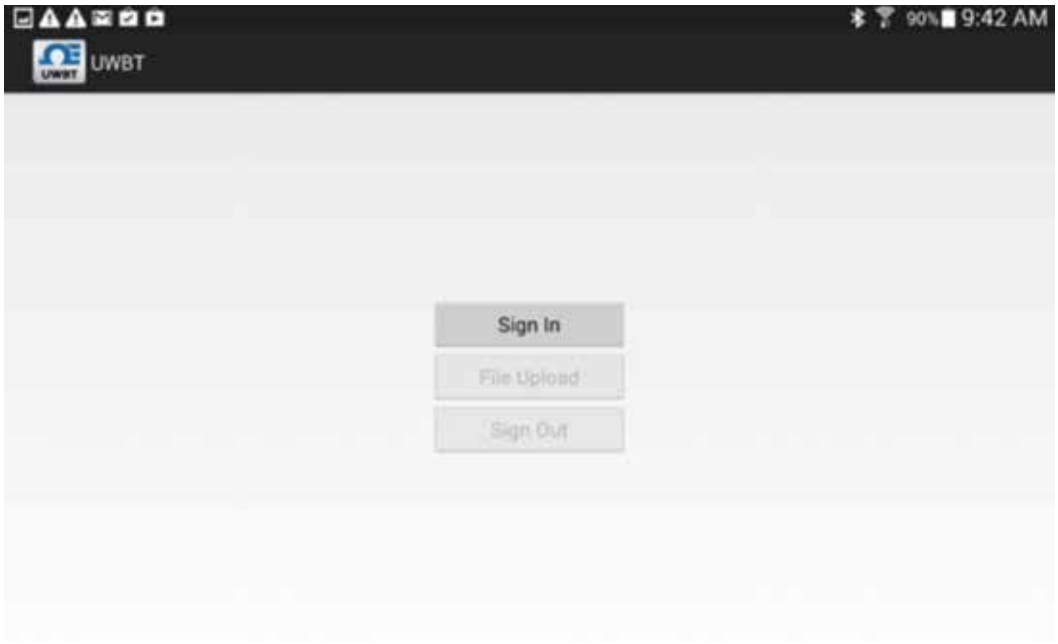


Figure 3-8. OneDrive Sign In

First you need to sign in. For the first time you upload a log file with UWBT you will see OneDrive sign-in page where you need to input your active OneDrive account credentials:

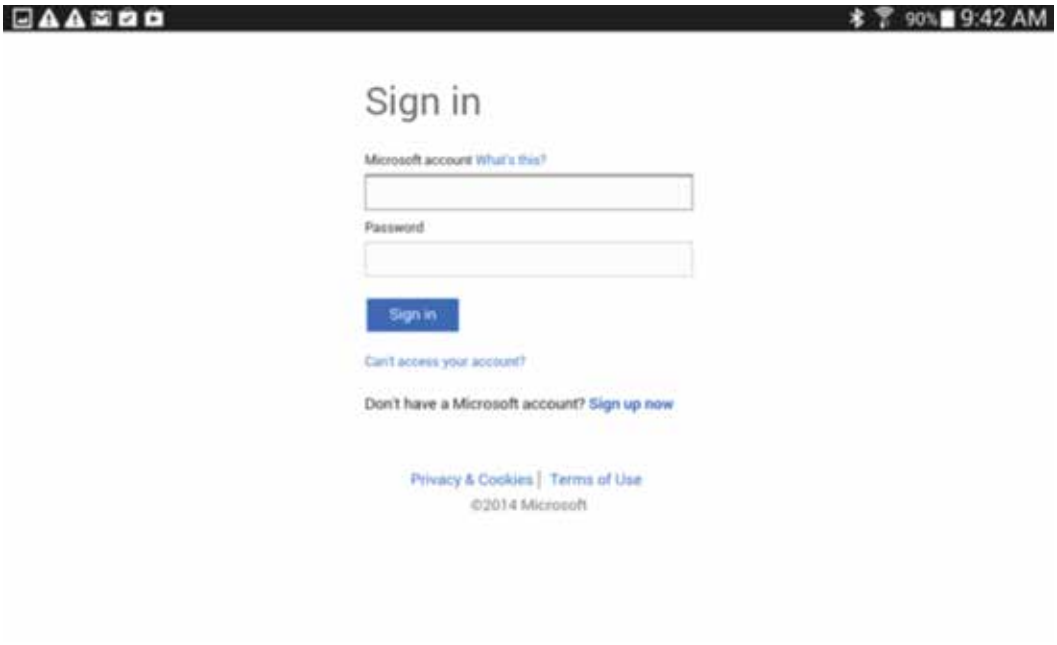


Figure 3-9. OneDrive Account Information

If you successfully log in for the first time you won't have to input your credentials in the future during file upload. You will only need to confirm the requested action for the last used account or sign in using another one:

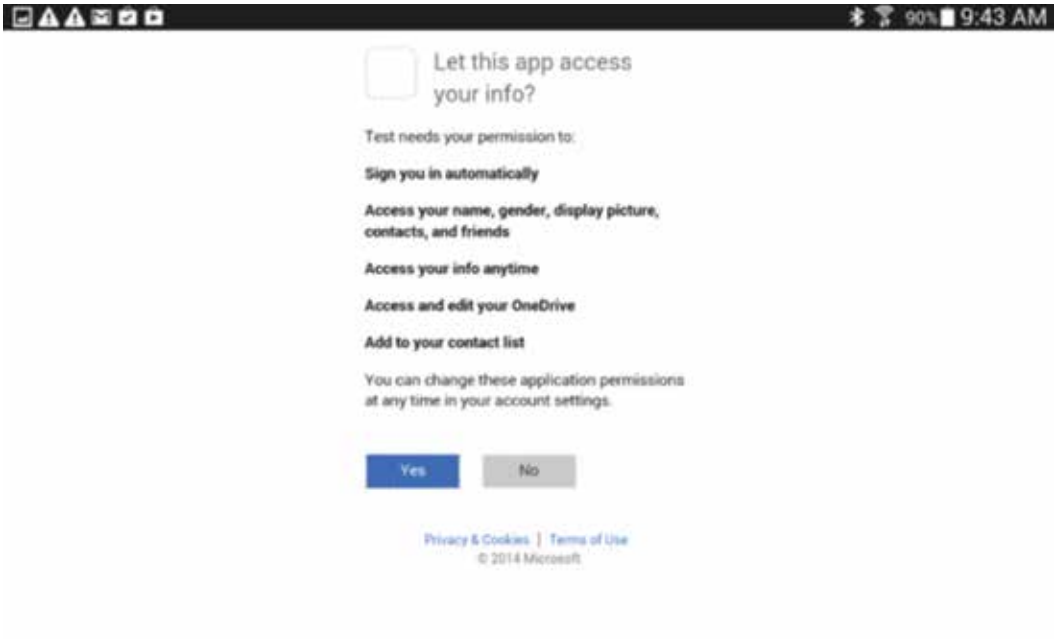


Figure 3-10. OneDrive Confirmation

After successful authentication you will see the previous pane with the "File upload" button enabled. You can now upload the log file you've selected to your OneDrive account. The file will be automatically saved under the "UWBT LogFiles" directory.

Section 4 - Software Instructions (iOS)

NOTE:

If you have upgraded to iOS version 8.0 or higher, you will need to reset settings in the smartphone or tablet's settings. On a phone, go to Settings → General → Reset → Reset Network Settings. On a tablet, go to Settings → Reset → Reset Network Settings. This will ensure that the UWBT app runs correctly with the operating system. Note that this may require resetting passwords for all of your Wi-Fi connections.

4.1 Pairing

In order to start communicating with the UWBT transmitter, you need to pair it with your smart device via *Bluetooth* wireless. For iOS devices, you must pair within the iOS settings before pairing within the UWBT app. Android devices only require pairing from within the UWBT app.

NOTE:

A smart device cannot pair with the UWBT transmitter if multiple transmitters of the same name are discoverable. For example, if there are two transmitters named "Chemistry Lab" switched on, your smart device will not be able to pair with either one. You must first change the name of one transmitter in order to pair properly.

4.1.1 Pairing Within Smart Device Settings Menu (iOS only):

1. Switch on your UWBT transmitter.
2. Hold down the transmitter's "Pair" button for 2 seconds, and Pairing in device settings – this will put the sensor in discovery mode.
3. Go to the Settings page of your smart device.
4. Select the *Bluetooth* wireless section.
5 Make sure your *Bluetooth* wireless functionality is turned on – the *Bluetooth* wireless slider should be showing a green background.
6. Tap the device to be paired via *Bluetooth* wireless.

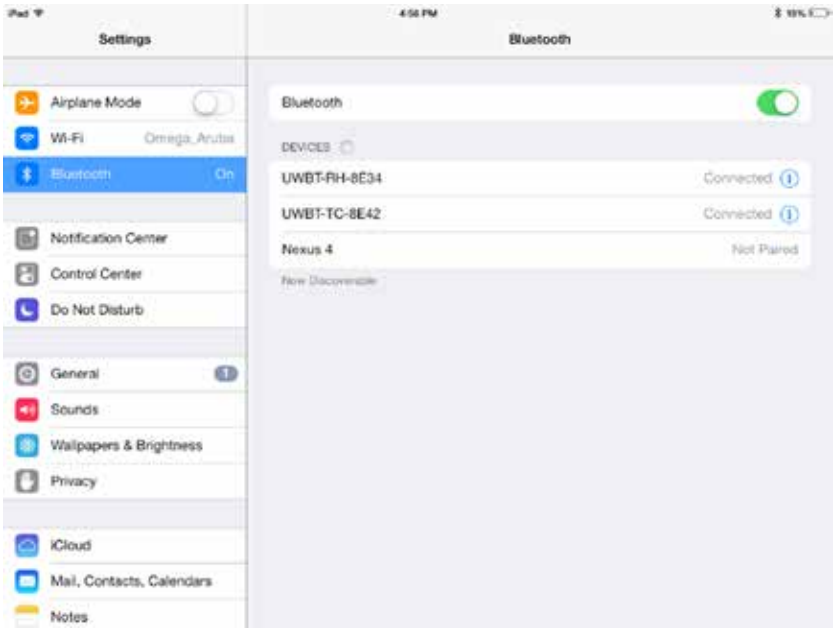


Figure 4-1. iOS Tablet Settings Menu

4.1.2 Pairing Within The UWBT App.

Follow the directions below to pair:

1. Make sure your UWBT transmitter is switched on.
2. Open the UWBT app.
3. In the UWBT app, go to the "Transmitter Pairing" settings

Figure 4-2. UWBT App As It Discovers Devices

4. In the "Discovered Transmitter" list, select the transmitter you would like to pair with.

5. Click on the "Pair" button.

Figure 4-3. Pairing Screen

6. You are ready to display and log data!

4.1.3 Pairing When Your Transmitter Is Not On The "Discovered Transmitter" List

In the case that you have already paired in the iOS setting, but your UWBT transmitter does not show up in the "Discovered Transmitter" list, follow the instructions below:

1. Quit and restart the UWBT app.

2. In your UWBT app, go to the "Transmitter Pairing" settings

3. Click the "Discover Transmitter" button

4. The transmitter should now show up in the "Discovered Transmitter" list

5. In the "Discovered Transmitter" list, select the transmitter you would like to pair with.

6. Click on the "Pair" button.

7. You are ready to display and log data!

4.1.4 Pairing Multiple Transmitters With One Smart Device

You are able to pair the UWBT iOS app with up to 3 different transmitters. After pairing with your first transmitter, repeat the steps above for each new transmitter you would like to use.

NOTE:

Make sure to pair with one transmitter at a time. Attempting to pair with multiple transmitters simultaneously may lead to pairing errors.

NOTE:

You cannot pair the same transmitter with multiple smartphones or tablets. In order to view a transmitter's information on a different tablet, you will need to unpair the transmitter from the UWBT app.

4.1.5 Unpairing A Transmitter From A Smart Device

To unpair a transmitter, follow the instructions below:

1. In your UWBT app, go to the "Transmitter Pairing" settings
2. Highlight the transmitter in the "Paired Transmitter" list
3. Click on the "Unpair" button
4. You will be prompted "Are you sure you want to unpair?" – Click "Yes"
5. Now you have successfully disconnected the UWBT transmitter. You can either turn the unit off using the slide switch, or pair it with another tablet/smartphone.

4.1.6 Lost Connection - Time Out

In order to save transmitter battery life, the UWBT is designed for a 2-minute connection timeout. This means that if your transmitter is switched on, but is not communicating with the smart device (is not paired) for 2 minutes or longer, it will go out of discovery mode. In the case that this happens, you will need to re-pair the device as outlined at the beginning of this chapter.

NOTE:

In the case that you repeatedly lose connection with your UWBT transmitter, try the following methods. First, close the app completely, by double-clicking the home key and swiping the UWBT app off of the page. After closing the UWBT app, forget the UWBT transmitter in your *Bluetooth* settings – go to 'Settings' → '*Bluetooth*' → select the 'Information' icon for your transmitter → click 'Forget this device'.

4.1.7 Transmitter *Bluetooth* Wireless RF Range

The UWBT transmitter may also unpair if you take your tablet out of its recommended *Bluetooth* wireless RF range. The UWBT transmitter may also unpair if you take your tablet out of its recommended *Bluetooth* wireless RF range. This range is shorter if there are obstructions such as walls between the transmitter and smart device. If the transmitter is disconnected, you will need to re-pair it to the smart device as outlined at the beginning of this chapter.

In the settings screen, there is a bar graphic that displays *Bluetooth* wireless signal strength. 5 filled bars indicate 100% signal strength, 4 bars indicate 80% signal strength, and so on. You can use this graphic to determine whether you are within the RF range.

The *Bluetooth* wireless signal strength indicator is only active in the Sensor Settings menu; it cannot be viewed from any other screen. Additionally, the signal strength is not displayed when logging onto your smart device.

Figure 4-4. *Bluetooth* Wireless Signal Strength

NOTE:

The *Bluetooth* wireless signal strength bar does not indicate the connectivity of the smart device to its local antenna (e.g., WiFi, 4G). That signal strength is shown only on the smart device, outside of the UWBT app.

4.2 UWBT App Display

The transmitter sensor value is displayed in 3 different formats:

- Digital
- Graph
- Gauge

4.2.1 Digital Format

The digital format displays the reading value in large numerical form. For relative humidity, the value resolution is zero decimal places. For temperature, the value resolution is one decimal place; for pH, the value resolution is two decimal places.

For Relative Humidity readings, the digital format displays three values – the RH value, the ambient temperature, and the dewpoint temperature.

In the case that your value exceeds the set high alarm, the text will display in red color. In the case that your values goes below the set low alarm, the text will display in blue color. If an alarm sound has been selected, the sound will be activated when the current value goes above the high alarm, or below the low alarm.

When connected to multiple UWBT transmitters, you can select which transmitter you are viewing directly from the digital screen. Click on the button labeled "Transmitter 1" and so on, and you can view the selected transmitter's data.

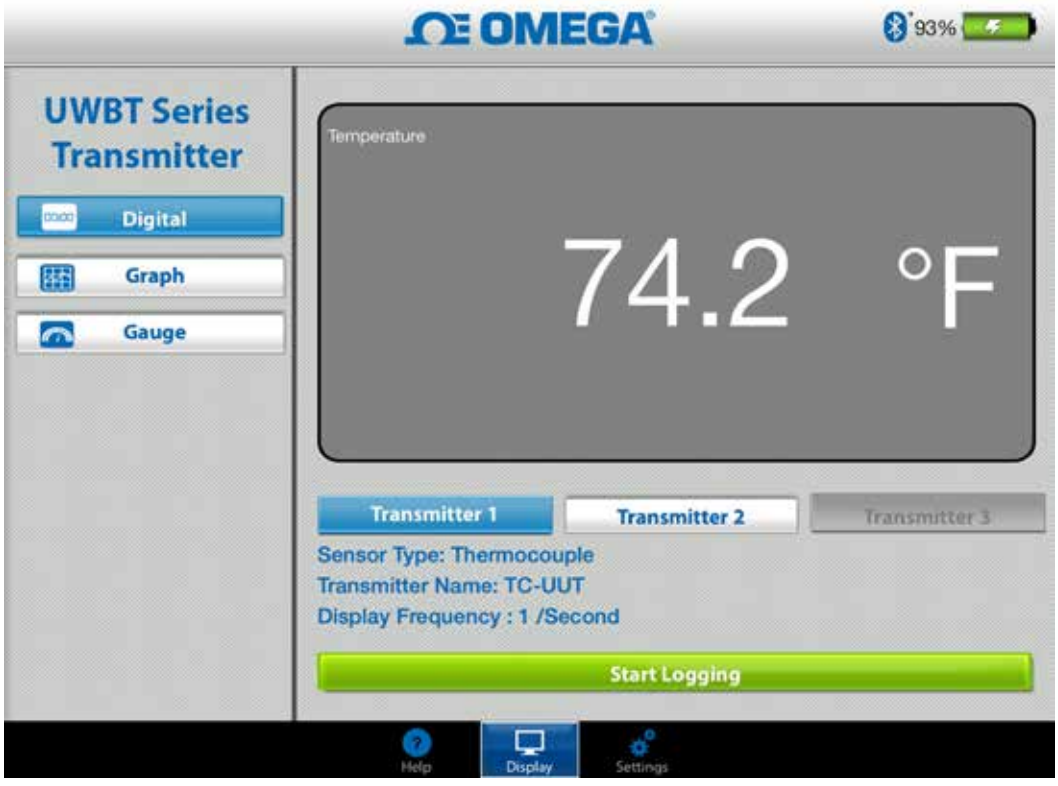


Figure 4-5. Digital Temperature Display

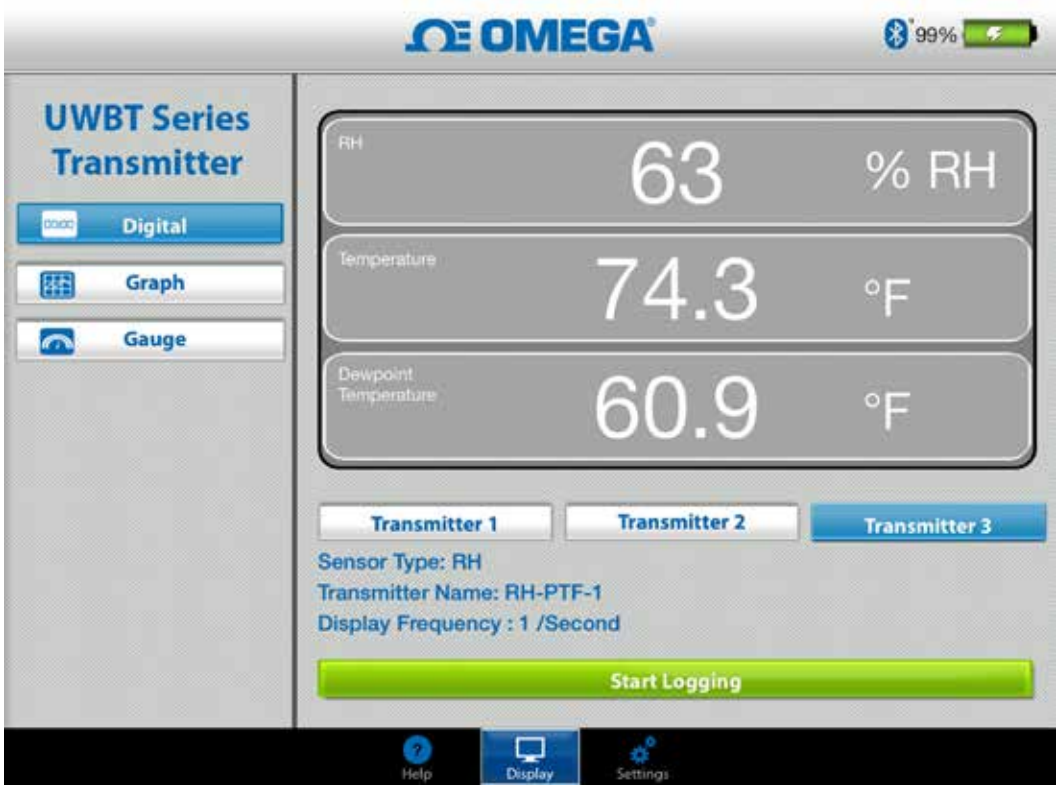


Figure 4-6. Digital RH Display

4.2.2 Graph Format

The transmitter data can be displayed in graph format. There are 3 options for the graph format:

- Live Graph
- Playback Graph
- Download from Transmitter

Live Transmitter Data

The live graph shows data as it is being captured by the transmitter. The measurement value is shown with a white line. For RH graphs, the temperature is shown with a white line (left Y-axis), and the RH percentage is shown with a green line (right Y-axis).

The high alarm value is displayed with a constant **red** line. The low alarm value is displayed with a constant **blue** line. If an alarm sound has been selected, the sound will be activated when the current value goes above the high alarm line, or below the low alarm line.

When connected to multiple UWBT transmitters, you can select which transmitter you are viewing directly from the current display screen. Click on the button labeled "Transmitter 1" and so on, and you can view the selected transmitter's data.

At the bottom of the Live Graph screen, you have the option to either allow the app to automatically scale the Y-axis, or set the parameters on your own. Auto-Scaling allows you to always see your data line, on the screen. To manually set the y-axis scaling, simply un-check the box labeled "Y-Axis Auto Scaling", and enter the preferred values.

You can record the live data directly from this screen. At the bottom half of the Live Graph screen, hit the "Start Logging" button. The data will be logged to the smartphone/tablet. While logging, the top left of your screen will show "REC" as a reminder.

NOTE:

For locally logged data, the log file's first record will be one time constant behind the time printed in the file name. For example, for logging at 1 sample per 30 seconds starting at 1:00:00, the first entry in the .csv file would be 1:00:30.

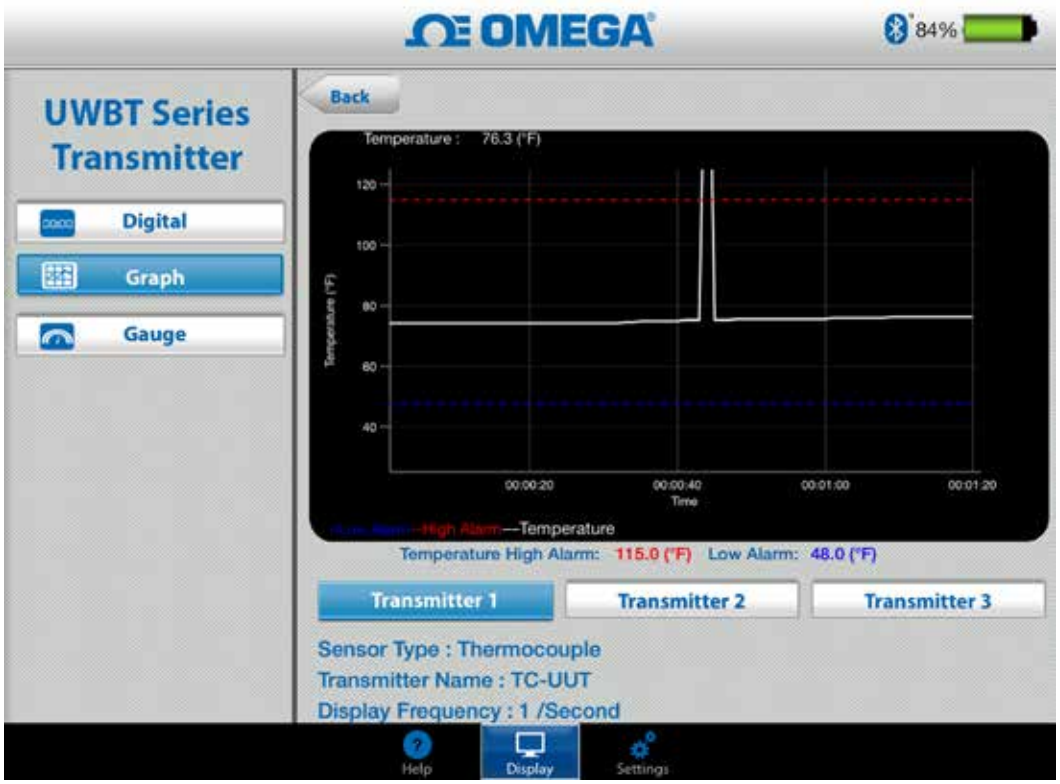


Figure 4-7. Live Temperature Graph With High And Low Alarms

Figure 4-8. Live RH Graph With High And Low Alarms

Playback Graph

The playback graph option allows you to view graph files that have already been saved to your smart phone/tablet device. These may be files that were either logged directly to the phone/tablet, or that have been "downloaded from transmitter" after using internal logging.

After selecting to "Playback Transmitter Data", you need to select the file you would like to view. The files you select are named after the Sensor Name + Date Logging Started + Time Logging Started.

The playback graph displays all of the data points on one screen. From there, you can zoom into the graph or zoom back out by pressing on the magnifying glass symbols in the top right area of the screen. Dragging your finger left and right anywhere on the graph also allows you to scroll through the timestamps.

The vertical line on the graph is the crosshair; you can drag the crosshair through the graph for detailed data point information. When resting on a crosshair, the top of the graph displays the data value and timestamp for that point.

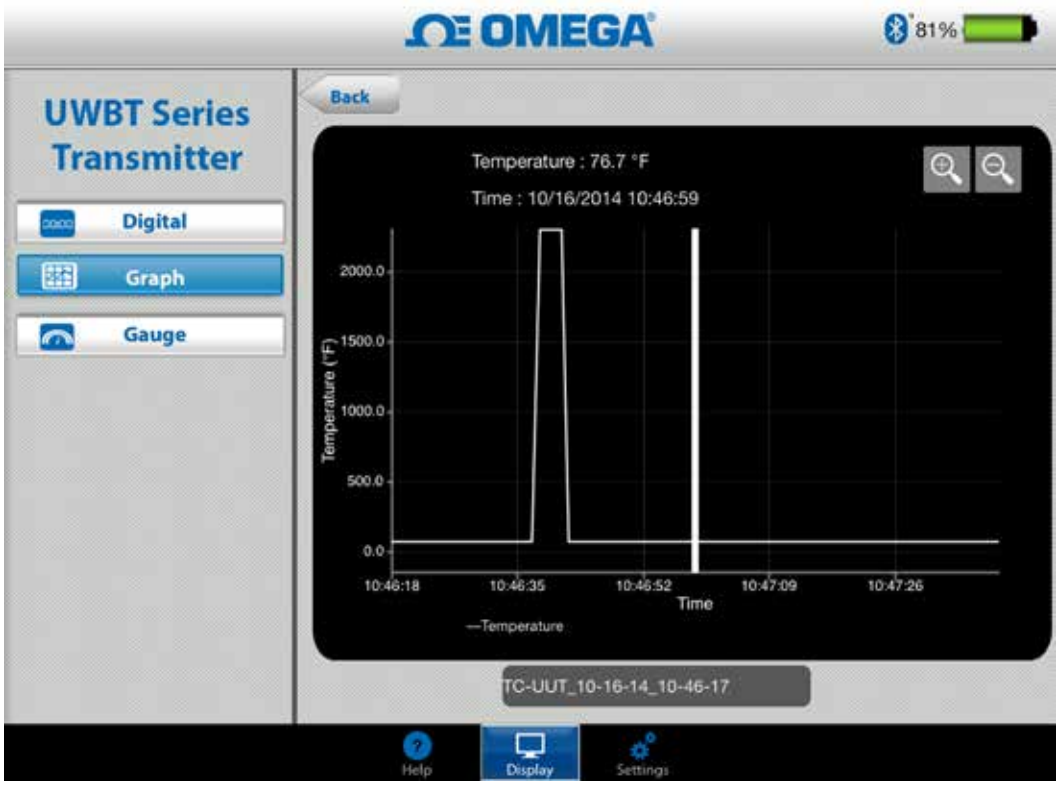


Figure 4-9. Playback Sensor Data Graph For Temperature

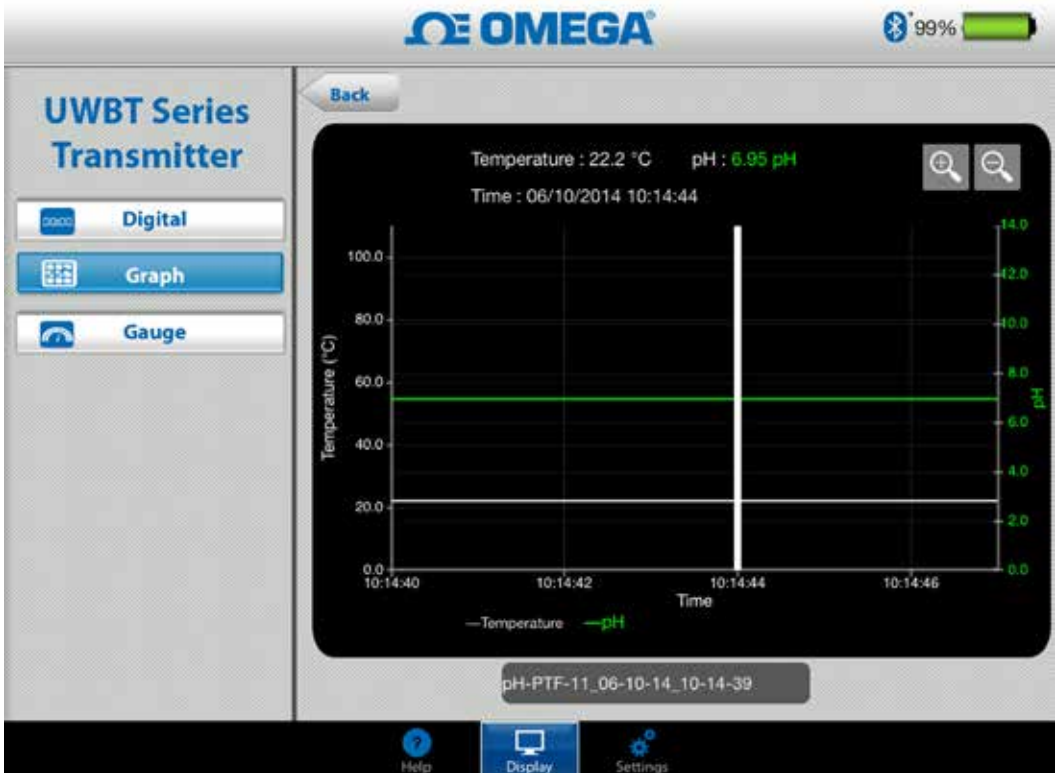


Figure 4-10. Playback Sensor Data Graph For RH

Download From Transmitter

After using the internal logging setting on your UWBT transmitter to record information, you need to download the data from the transmitter to your smart device. After doing so, you can then view playback graphs or send the logged data to an e-mail/cloud service.

When you select to "Download from Transmitter", the UWBT app immediately starts to download all log files that are saved on the transmitter. This process can take up to 2 minutes to complete.

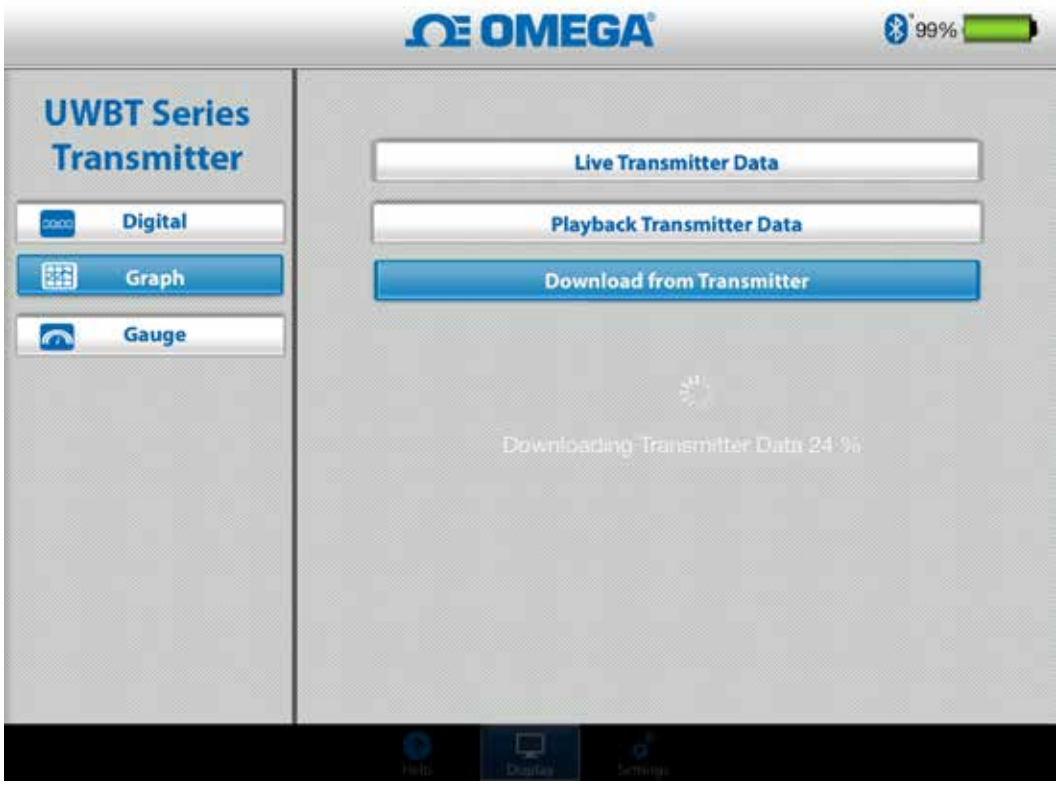


Figure 4-11. Downloading Log Files From Transmitter

Figure 4-12. Files Already Downloaded From Transmitter

NOTE:

If you are logging to your smartphone or tablet, you will not be able to view downloaded files. You will need to stop logging in order to view the log files.

	A	B	C
1	Transmitter Name :	TC-UUT-JF	
2	Sensor Type :	Thermocouple	
3	Logging Sample Rate :	1 /second	
4	Engineering Units :	Fahrenheit(F)	
5			
6	Time	Temperature	
7	10/22/2014 15:44:49	478.4	
8	10/22/2014 15:44:50	348.4	
9	10/22/2014 15:44:51	478.2	
10	10/22/2014 15:44:52	478.7	
11	10/22/2014 15:44:53	478.7	
12	10/22/2014 15:44:54	478.6	
13			

Figure 4-13. Sample CSV File

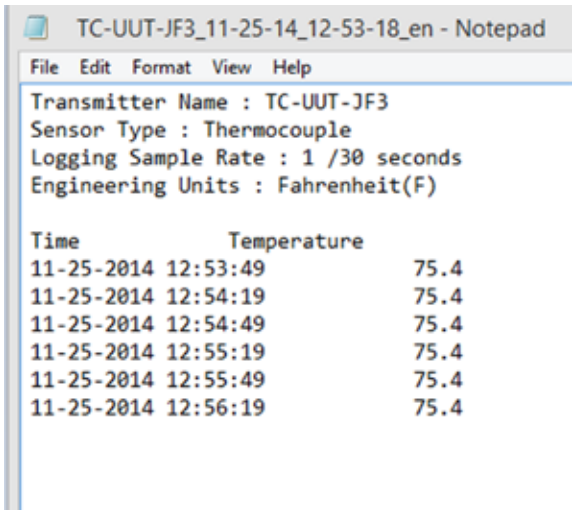


Figure 4-14. Sample TXT File

4.2.3 Gauge Format

The gauge format displays readings by pointing at the current value on a dial. As the value changes, the dial will move either left or right to point towards the new number. The value is also displayed in digital format at the bottom of the gauge.

For UWBT-RH models, there are two gauges on the screen. The gauge on the right displays the relative humidity (in percentages), and the gauge on the left displays the ambient temperature (in the units selected in the settings menu).

For UWBT-pH models, there are two gauges on the screen. The gauge on the right displays the pH value, and the gauge on the left displays the solution temperature (in the units selected in the settings menu).

On the inner perimeter of the gauge, there is a bar that goes from blue to green to red; these areas represent the values that are the low alarm, normal, and high alarm readings, respectively. If the values exceed the high alarm, their digital reading will show in red; if the values go lower than the low alarm, their digital reading will show in blue. If an alarm sound has been selected, the sound will be activated when the current value goes above the high alarm, or below the low alarm.

The range of the gauge is set automatically; you cannot change the numbers on the perimeter of the gauge.

When connected to multiple UWBT transmitters, you can select which transmitter you are viewing directly from the current display screen. Click on the button labeled “Transmitter 1” or so on, and you can view the selected transmitter’s data.

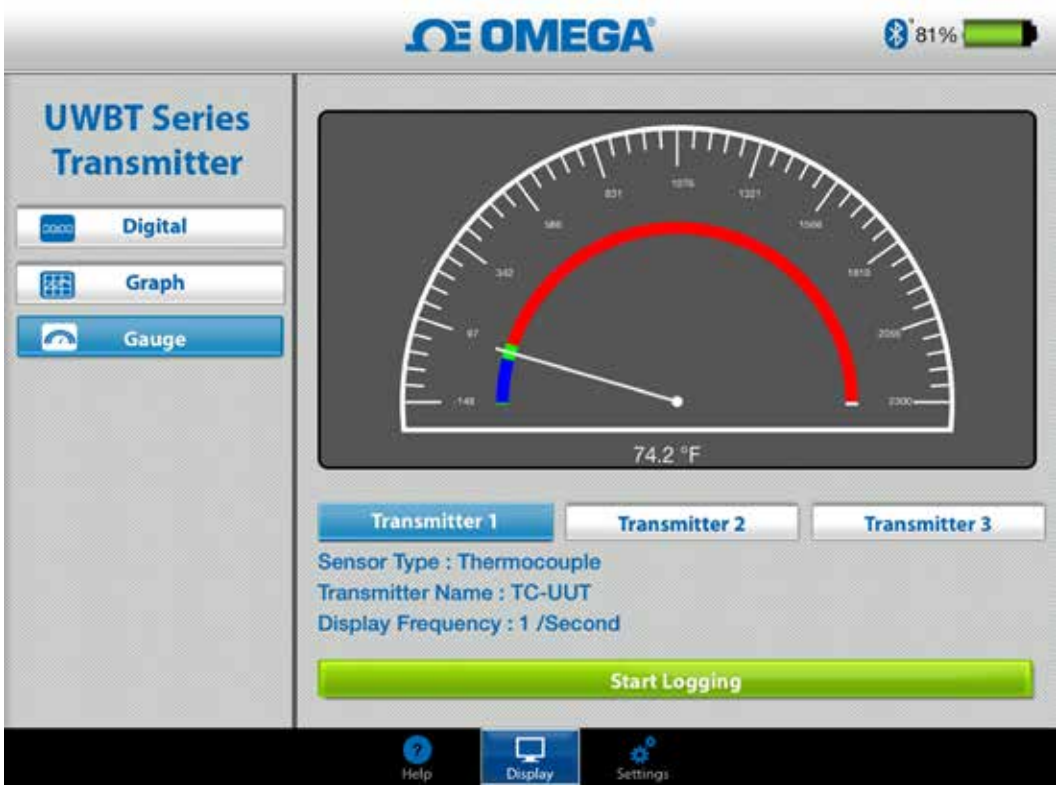


Figure 4-15. Temperature Gauge

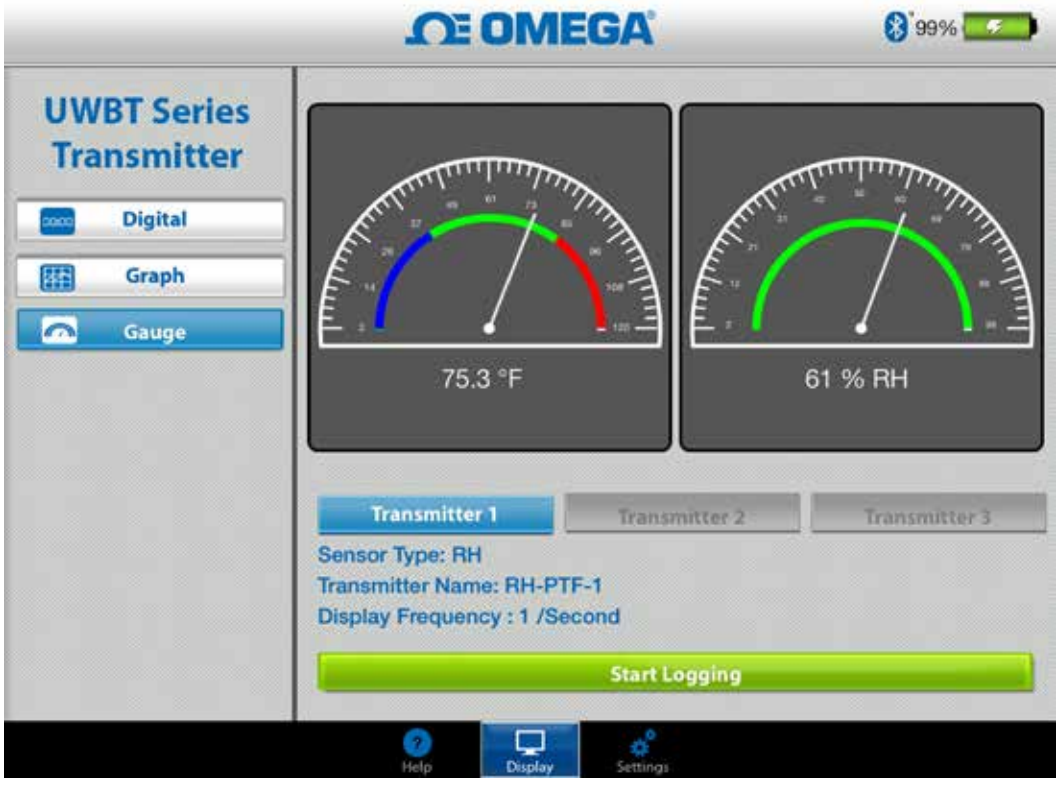


Figure 4-16. RH And Temperature Gauge

4.2.4 Battery Level Display

A transmitter battery level greater than 50% is indicated by a green battery graphic; the remaining battery percentage is also displayed next to the graphic.

Figure 4-17. Indication of 92% Battery Level

A transmitter battery level of 20 to 49% is indicated by a yellow battery graphic; the remaining battery percentage is also displayed next to the graphic.

Figure 4-18. Indication of 29% Battery Level (charging)

A transmitter battery level below 20% is indicated by a red battery graphic; the remaining battery percentage is also displayed next to the graphic.

Figure 4-19. Indication of 14% Battery Level (charging)

The addition of the lightning bolt symbol inside of the battery icon indicates that the two (2) AA NiMH batteries are in the process of being recharged.

NOTE:

It is recommended that you recharge your transmitter when you reach 20% battery level or lower. Using the transmitter below 20% battery level may make it difficult to pair with the UWBT app.

4.3 UWBT App Logging

Logging settings refer to the logging in smartphone/tablet which include the following parameters:

Logging Sampling Rate

Logging sampling rate refers to smartphone/tablet logging, which is one of two options. There are 4 logging rates available, ranging from 1 sample/second to 1 sample/minute.

Figure 4-20. Logging Rate Options

Select The File In txt/csv File

You can select the file in either text (TXT) or Excel (CSV) format to email or to send cloud services.

NOTE:

When logging to your smartphone or tablet, the maximum number of data points that can be saved in a single file is 100,000 for thermocouple and RTD probes; for pH probes the maximum is 200,000 (pH and temperature), and for RH probes the maximum is 300,000 (RH, temperature, and dew point). In the case that your logging session exceeds these limits, the UWBT app will close the file and create a new file and continue logging.

Select The Files To Be Sent

Files logged in the smartphone/tablet or downloaded from the transmitter internal memory could be sent to an email address or cloud service account in txt/csv file format as mentioned above. The downloaded files can be seen in the "Log File to Be Sent" field.

Figure 4-21. Viewing Log File To Be Sent

Enter email Address

Enter a valid email address using the custom keyboard entry.

Figure 4-22. Entry For E-mail Address

Send To Cloud Services

There are 5 cloud services available for sending log files. They are Dropbox, SugarSync, OneDrive, and Google Drive and iCloud. Please note that your cloud service account must already be activated in order to send files. See section 3 for more information on cloud services.

Figure 4-23. Cloud Service Options

NOTE:

After 'File Upload' is selected, there is a lag as to when the file is actually sent. Please wait 5-10 seconds for the data to be uploaded; pressing the 'Send' button multiple times will result in multiple e-mails being sent.

Internal Logging

You can select to log data in the UWBT transmitter internal memory by switching on the internal logging tab. The data will then be recorded directly to the transmitter, instead of requiring you to use up the smartphone or tablet memory. Please note that once you set the internal logging on, you cannot download any existing data from the transmitter.

Figure 4-24. Internal Logging Options

NOTE:

If you have turned your internal logging on, the settings options for that feature will be greyed out. You will need to turn internal logging off to change the settings.

Figure 4-24A. Internal Logging Options (Disabled when Internal Logging is on)

Internal Logging Frequency

You can log data to the internal memory of the transmitter in 5 different logging frequencies. The internal logging frequency can be set from 10 samples/sec to 1 sample/minute. For the RH transmitter, data cannot be logged at a rate of 10 samples/second.

Figure 4-25. Internal Logging Rate Options

Circular Buffer

Circular buffer is a very useful function which overwrites the oldest data when the transmitter's internal memory is full. You can set the circular buffer on or off using the slider shown above. If you set to switch off the circular buffer, the internal logging will stop when the internal memory is full.

Erase Internal Memory

You can erase the transmitter internal memory and start recording the data fresh if you choose to switch on the internal logging function. Erasing internal memory does not affect the files available on the tablet/smartphone.

Figure 4-26. Erasing Internal Memory

4.4 UWBT App Settings

You can pair with one or more UWBT *Bluetooth* wireless transmitters from the app. Once paired, you can change different settings of the device and save them back to the device. Here is a list of options under settings menu:

- Sensor Pairing
- Sensor Settings
- Alarms & Offset
- Logging Settings (see "Logging Settings" section for information)
- Languages
- Restore Default
- Save all settings

4.4.1 Settings Menu

Settings include the following parameters shown below. The description of each setting is explained in this section of the manual:

Figure 4-27. Settings Menu

4.4.2 Transmitter Pairing

See Section 4.1 ("Pairing") for detailed pairing instructions.

4.4.3 Sensor Settings

Sensor settings allow you to set the desired time axis, date format, display frequency for the live data, engineering units and so on. A sample of the settings for a thermocouple sensor is displayed below.

Figure 4-28. Thermocouple Sensor Settings Screen

Time Axis

There are two types of time axes. You can either set the time axis to elapsed time or real time mode. Elapsed time shows the data starting with 0:00 to the preferred time of data logging with a fixed time interval between the data points. Real time shows the data with a fixed real time interval between the data points. The live data can be displayed in Real time or Elapsed time format. The playback data can only be displayed in Real time format.

Figure 4-29. Time Axis Options

Date Format

You can pick the date format based on your personal preference. The formats available are DD-MM-YY or MM-DD-YY. The internal logging on the UWBT and logging on the tablet follows the date format selected.

NOTE:

Date and Time Format must be reset every time the transmitter is re-paired with the smart device.

Figure 4-30. Date Format Options

Sensor Type

There are 4 sensor types: T/C, RTD, pH and RH. At the top of the sensor settings page, you can see the information of the sensor you are currently displaying. If you are connected to multiple sensors, and need to see the information for a different one, you must go to the "Display" screen, and select the sensor you want to see. Then when you return to the "Sensor Settings" screen, you will see the new sensor information.

Figure 4-31. Viewing Sensor Name And Sensor Type

Display Frequency

There are 5 types of display frequencies that can be displayed on the screen. They range from 10 samples/second to 1 sample/minute. If you are connected to multiple sensors, the 10 samples/second frequency is not available. Additionally, 10 samples/second is not available for the RH sensor.

Figure 4-32. Display Frequency Options

Set Transmitter Date And Time

The UWBT transmitter can adopt the time and date settings that have been selected for your smart device. In order to change the date/time on your transmitter, you will need to change it on your smart device first.

1. Go to the tablet settings > General Settings
2. Set the date and time depending on your preference of country and time
3. Go to the UWBT software app
4. Click on the “Settings Menu” → “Sensor Settings”
5. Check the “Set Transmitter Date and Time” box and “Save all settings”
6. Go back. to the “Settings Menu”, and click on “Save All Settings”

Figure 4-33. Device Date And Time Settings

Bluetooth Wireless Signal

Bluetooth wireless signal strength can be viewed under the sensor settings screen. See the section titled "Connecting to the UWBT App" for more information.

NOTE:

It may take up to 30 seconds for the *Bluetooth* signal strength to appear in the Sensor Settings screen.

Transmitter Name

The UWBT *Bluetooth* wireless transmitter comes with a factory set default sensor name. You can change to a preferred sensor name by typing the new name in the field shown below, and then clicking the "Return" button. You also need to save the new name to the transmitter by clicking the "Save all Settings" button on the app. Once set to the new sensor name, the settings for sensor name are saved internally in the transmitter handle. You need to unpair and repair with the transmitter to reflect the new name; there is no need to switch off the tablet or transmitter.

After renaming your transmitter, follow these steps to re-pair with your newly named transmitter:

1. Unpair with your UWBT transmitter under the 'Transmitter Pairing' section
2. Go to your smart device's 'Settings' menu → Bluetooth section
3. Select the transmitter's old name, and 'Forget This Device'
4. Select the transmitter's new name in order to Connect
5. Return to the UWBT app, and continue the standard pairing process

NOTE:

Transmitter names cannot be saved in characters outside of the English alphanumeric set. Special characters (e.g. !@#.) also cannot be used.

NOTE:

Transmitter names are limited to 15 characters.

Figure 4-34. Changing The Transmitter Name

Thermocouple Sensor Type

Depending on the transmitter you are connected to, the settings for its sensor are available in the "Transmitter Settings" screen. Below are the different customizable settings for each sensor type. For example: There are 9 types of calibration for T/C sensors. They are J, K, E, T, R, S, N, C, and B. You can select the preferred thermocouple type by selecting from the "Subtype" drop down menu.

Figure 4-35. Viewing Sensor Type And Subtype For Thermocouple Sensor

RTD Settings

There are two types of RTD selection, PT100 (100 Ohms RTD) and PT1000 (1000 Ohms RTD).

Figure 4-36. Selecting RTD Value

Sub type: There are two types of curves that can be selected for RTD sensor from the dropdown menu. They are either American curve or European curve.

Figure 4-37. Selecting RTD Subtype

pH Fixed Solution Temperature

You can select the fixed solution temperature by typing the temperature input in the fixed solution temperature tab. This selection is used when the pH sensor does not have a built-in RTD temperature sensor. For pH sensors with the RTD sensor, you do not need to select the fixed temperature option. Simply connect the RTD portion of the pH sensor to the UWBT, and the transmitter will measure the temperature of the solution, and will compensate the pH value for the temperature measured.

Figure 4-38. Fixed Temperature For Solution

Units

There are 4 types of temperature engineering units which UWBT *Bluetooth* wireless transmitter can offer. They are Fahrenheit, Centigrade, Rankine and Kelvin. You can select either °F or °C or °R and K in the drop down menu.

Figure 4-39. Setting Temperature Units

4.4.4 Alarms And Offset

Alarms and offset settings allow you to set the alarm on/off, high alarm, low alarm, dead band and so on for the live data.

Figure 4-40. Viewing Alarm Conditions

Alarm Setting For PH

You can swap the button for pH or temperature depending on your preference of Alarm condition on the live data graph.

NOTE:

If you do not have an RTD temperature sensor connected on your UWBT-PH unit, the alarms for temperature will be greyed out.

Alarm Setting For RH

You can swap the button for RH or temperature depending on your preference of the Alarm condition on the live data graph.

Alarm Sound

There are 5 different types of alarm tones. Once you drop down the menu to select the particular sound, a two-second sample tone will be played.

NOTE:

When an alarm sound is enabled, the siren will sound for 5 seconds after entering the alarm condition. After the 5 seconds, the sound will stop, but the reading value will stay in the designated color (blue for low alarm, red for high alarm) as long as it is in the alarm condition.

Figure 4-41. Alarm Sound Options

High Temperature Alarm Value

You can set this alarm value to the highest value of the particular sensor by using custom key board entry. For example, you can set up to 2300°F for K-type thermocouple.

If you type in an alarm value that exceeds the limit of your sensor, the UWBT app will automatically set your high alarm to the highest possible value for that sensor.

Low Temperature Alarm Value

You can set this alarm value to lowest value of the particular sensor by using custom key board entry. For example, you can set up to -148°F for K-type thermocouple.

If you type in an alarm value that exceeds the limit of your sensor, the UWBT app will automatically set your low alarm to the lowest possible value for that sensor.

Figure 4-42. Entry For Temperature Values

Temperature Deadband

Deadband is the range through which the sensor reading can vary without prompting a change in alarm state. Once the sensor reaches a high or low alarm state, the alarm stays active until the reading reaches a value of either "high alarm value – deadband value" or "low alarm value + deadband value". Temperature deadband is always a positive number. Below are examples of deadband settings for temperature transmitters:

1. High alarm state - If you set the temperature deadband to 10°F and the high alarm value to 250°F, the device will be in a high alarm state (red LED blinks 2 times every 2 seconds) when the temperature measurement reaches 250°F or above. The device will stay in the alarm state until the temperature measurement reaches 240°F or below ("high alarm value – deadband value", which is 250°F - 10°F).
2. Low alarm state - If you set the temperature deadband to 10°F and the low alarm value to 50°F, the device will be in a low alarm state (red LED blinks 2 times every 2 seconds) when the temperature measurement reaches 50°F or below. The device will stay in the alarm state until the temperature measurement reaches 60°F or above ("low alarm value + deadband value", which is 50°F + 10°F).

Figure 4-43. Temperature Deadband Of 1°F

pH High Alarm

You can set the alarm value to the highest measurable value for the pH device. For example, the highest value you can set for pH high alarm is 14 pH.

pH Low Alarm

You can set alarm value to the lowest measurable value for the pH device. For example, the lowest value you can set for pH low alarm is 0 pH.

pH Deadband

pH dead band value is always a positive number. Below are examples of deadband settings for pH transmitters.

1. **High alarm state** - If you set pH deadband to 2 and the high alarm value to be 10 pH, the device will be on high alarm state (red LED blinks 2 times every 2 seconds) when pH measurement reaches 10pH or above. The device will stay in the alarm state until the pH measurement reaches 8pH or below ("high alarm value – deadband value").
2. **Low alarm state** - If you set pH deadband to 2 and the low alarm value to be 7 pH, the device will be on low alarm state (red LED blinks 2 times every 2 seconds) when pH measurement reaches 7pH or below. The device will stay in the alarm state until the pH measurement reaches 9pH or above ("low alarm value + deadband value").

Figure 4-44. pH Deadband Of 1

RH High Alarm

You can set alarm value to the highest measurable RH percentage by using custom key board entry. For example, you can only set up to 98% for RH high alarm.

RH Low Alarm

You can set alarm value to the lowest measurable RH percentage by using custom key board entry. For example, you can only set as low as 2% for RH low alarm.

RH Deadband

RH dead band should always be a positive number. RH dead band is useful to create high and low alarm hysteresis for RH. The following are examples of deadband settings for RH/Temp transmitters:

1. **High alarm state** - If you set the RH deadband to 5% and the high alarm value to 90%, the device will be in a high alarm state (red LED blinks 2 times every 2 seconds) when the RH measurement reaches 90% or above. The device will stay in the alarm state until the RH measurement reaches 85% or below ("high alarm value – deadband value").
2. **Low alarm state** - If you set the RH deadband to 5% and the low alarm value to 20%, the device will be in a low alarm state (red LED blinks 2 times every 2 seconds) when the RH measurement reaches 20% or below. The device will stay in the alarm state until the RH measurement reaches 25% or above ("low alarm value + deadband value").

Figure 4-45. RH Deadband Of 1% RH

Offset Correction

You can set a value for an offset correction number for reading your sensor input data. This could be a positive or negative number. The offset correction is added to the measured data, with the sum displayed and/or logged in the transmitter.

Figure 4-46. Offset Options

NOTE:

After alarm and offset settings are changed, the "Save All Settings" button must be pressed for the new changes to be saved in the device memory.

4.4.5 Languages

The UWBT app is available in 9 languages; they are English, Simplified Chinese, Korean, Japanese, Portuguese, German, French, Italian and Spanish. English is the default language selected in the app.

You can easily switch from one language to another. In the iOS app, once you have selected your new language, the change will take place immediately. After this language change has been implemented, the new settings are saved internally in the transmitter.

Figure 4-47. Language Options

4.4.6 Restore Defaults

The "Restore Defaults" option enables you to go back to the factory set default conditions in the UWBT transmitter. Below is a table of all the factory default settings.

Factory Default Settings	
Settings	**Default Value**
Temperature Units	°F
Graph X-Axis	Elapsed Time
Display Frequency	1 sample/second
Logging Frequency	1 sample/second
Log File Format	CSV
High Alarm Value	Maximum of the sensor's range
Low Alarm Value	Minimum of the sensor's range
Alarm Deadband	1°F, 1% RH, 0.1pH
Alarm Sound	Off
Offset Correction	0
Language	English
Date Format	MM-DD-YY

Figure 4-48. Restore Default Settings

4.4.7 Save All Settings

Any time that you change a setting (sensor, logging, etc.), you need to save all the new settings inside the tablet as well as the transmitter to put the settings into effect.

Figure 4-49. Save All Settings

Section 5 - Software Instructions (Android)

5.1 Pairing

Initial Pairing Instructions

In order to start communicating with the UWBT transmitter, you need to pair it with your smart device via *Bluetooth* wireless. Android devices only require pairing from within the UWBT app.

NOTE:

A smart device cannot pair with the UWBT transmitter if there are multiple transmitters of the same name are discoverable. For example, if there are two transmitters named "Chemistry Lab" switched on, your smart device will not be able to pair with either one. You must first change the name of one transmitter in order to pair properly.

5.1.1 Pairing within the UWBT app.

Follow the directions below to pair:

1. Make sure your UWBT transmitter is switched on.
2. Open the UWBT app.
3. In the UWBT app, go to the "Transmitter Pairing" settings
4. Hold down the transmitter's "Pair" button for 2 seconds, – this will put the sensor in discovery mode.
5. Click on the "Discover Transmitter" button

Figure 5-1. UWBT App As It Discovers Devices

6. In the "Discovered Transmitter" list, select the transmitter you would like to pair with.

7. Click on the "Pair" button.
8. The smart device will create a prompt asking if you would like to pair with the specific transmitter. Click "OK". (Please note that this prompt only pops up during your first time pairing with a transmitter.)

Figure 5-2. *Bluetooth* Wireless Pairing Request Screen

9. You are ready to display and log data

NOTE:

Having the transmitter paired with the UWBT app does not mean that transmission is active. You must either be in the "Display"/"Settings" screens, or be logging data, for the *Bluetooth* transmission to be active. Otherwise, the transmitter will unpair after 2 minutes.

5.1.2 Pairing When Your Transmitter Is Not On The "Discovered Transmitter" List

In the case that your UWBT transmitter does not show up in the "Discovered Transmitter" list, follow the instructions below:

1. Make sure that your UWBT transmitter is on.
2. In your UWBT app, go to the "Transmitter Pairing" settings
3. Hold down the transmitter's "Pair" button for 2 seconds, – this will put the sensor in discovery mode.
4. Click the "Discover Transmitter" button
5. The transmitter should now show up in the "Discovered Transmitter" list
6. In the "Discovered Transmitter" list, select the transmitter you would like to pair with.
7. Click on the "Pair" button.
8. You are ready to display and log data!

5.1.3 Pairing Multiple Transmitters With One Smart Device

You are able to pair the UWBT Android app with up to 4 different transmitters. After pairing with your first transmitter, repeat the previous steps for each new transmitter you would like to use.

NOTE:

Make sure to pair with one transmitter at a time. Attempting to pair with multiple transmitters simultaneously may lead to pairing errors.

NOTE:

You cannot pair the same transmitter with multiple smartphones or tablets. In order to view a transmitter's information on a different smart device, you will need to unpair the transmitter from the UWBT app.

5.1.4 Unpairing a Transmitter From A Smart Device

To unpair a transmitter, follow the instructions below:

1. In your UWBT app, go to the "Transmitter Pairing" settings
2. Highlight the transmitter in the "Paired Transmitter" list
3. Click on the "Unpair" button
4. You will be prompted "Are you sure you want to unpair?" – Click "yes"
5. Now you have successfully disconnected the UWBT transmitter. You can either turn the unit off using the slide switch, or pair it with another tablet/smartphone.

5.1.5 Lost Connection - Timeout

In order to save transmitter battery life, the UWBT is designed for a 2-minute connection timeout. This means that if your transmitter is switched on, but is not communicating with the smart device (is not paired) for 2 minutes or longer, it will go out of discovery mode. In the case that this happens, you will need to re-pair the device as outlined at the beginning of this chapter.

5.1.6 Transmitter *Bluetooth* Wireless RF Range

The UWBT transmitter may also unpair if you take your tablet out of its recommended *Bluetooth* wireless RF range. This range is shorter if there are obstructions such as walls between the transmitter and smart device. If the transmitter is disconnected, you will need to re-pair it to the smart device as outlined at the beginning of this chapter.

In the settings screen, there is a bar graphic that displays *Bluetooth* wireless signal strength. 5 filled bars indicate 100% signal strength, 4 bars indicate 80% signal strength, and so on. You can use this graphic to determine whether you are within the RF range.

The *Bluetooth* wireless signal strength indicator is only active in the Sensor Settings menu; it cannot be viewed from any other screen. Additionally, the signal strength is not displayed when logging onto your smart device.

Figure 5-3. *Bluetooth* Wireless Signal Strength

NOTE:

The *Bluetooth* wireless signal strength bar does not indicate the connectivity of the smart device to its local antenna (e.g., WiFi, 4G). That signal strength is shown only on the smart device, outside of the UWBT app.

5.2 UWBT App Display

The transmitter sensor value is displayed in 3 different formats:

- Digital
- Graph
- Gauge

5.2.1 Digital Format

The digital format displays the reading value in large numerical form. For relative humidity, the value resolution is zero decimal places. For temperature, the value resolution is one decimal place; for pH, the value resolution is two decimal places.

For RH readings, the digital format displays three values – the RH value, the ambient temperature, and the dewpoint temperature.

In the case that your value exceeds the set high alarm, the text will display in red color. In the case that your value goes below the set low alarm, the text will display in blue color. If an alarm sound has been selected, the sound will be activated when the current value goes above the high alarm, or below the low alarm.

When connected to multiple UWBT transmitters, you can select which transmitter you are viewing directly from the digital screen. Click on the button labeled "Transmitter 1" and so on, and you can view the selected transmitter's data.

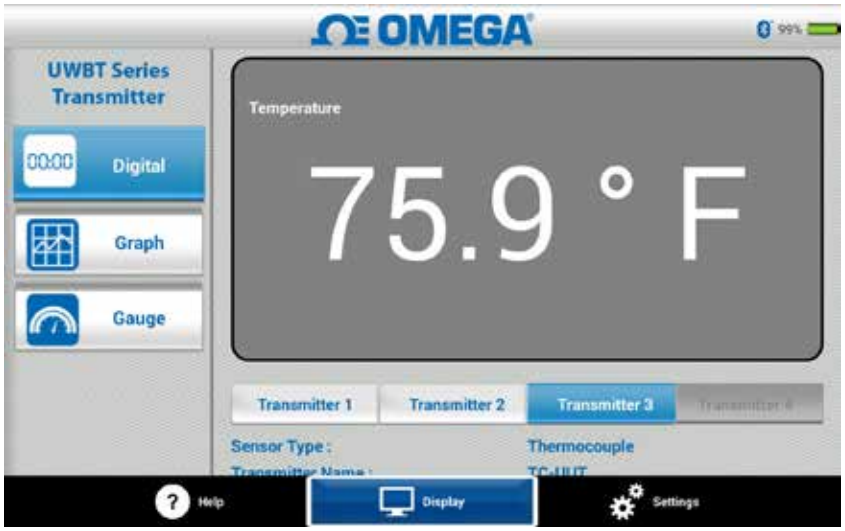


Figure 5-4. Digital Temperature Display

Figure 5-5. Digital RH Display

5.2.2 Graph Format

The transmitter data can be displayed in graph format. There are 3 options for the graph format:

- Live Graph
- Playback Graph
- Download from Transmitter

Live Transmitter Data

The live graph shows data as it is being captured by the transmitter. The measurement value is shown with a white line. For RH graphs, the temperature is shown with a white line (left Y-axis), and the RH percentage is shown with a green line (right Y-axis).

The high alarm value is displayed with a constant **red** line. The low alarm value is displayed with a constant **blue** line. If an alarm sound has been selected, the sound will be activated when the current value goes above the high alarm line, or below the low alarm line.

When connected to multiple UWBT transmitters, you can select which transmitter you are viewing directly from the current display screen. Click on the button labeled "Transmitter 1" and so on, and you can view the selected transmitter's data.

At the bottom of the Live Graph screen, you have the option to either allow the app to automatically scale the Y-axis, or set the parameters on your own. Auto-Scaling allows you to always see your data line, on the screen. To manually set the y-axis scaling, simply un-check the box labeled "Y-Axis Auto Scaling", and enter the preferred values.

You can record the live data directly from this screen. At the bottom half of the Live Graph screen, hit the "Start Logging" button. The data will be logged to the smartphone/tablet. While logging, the top left of your screen will show "REC" as a reminder.

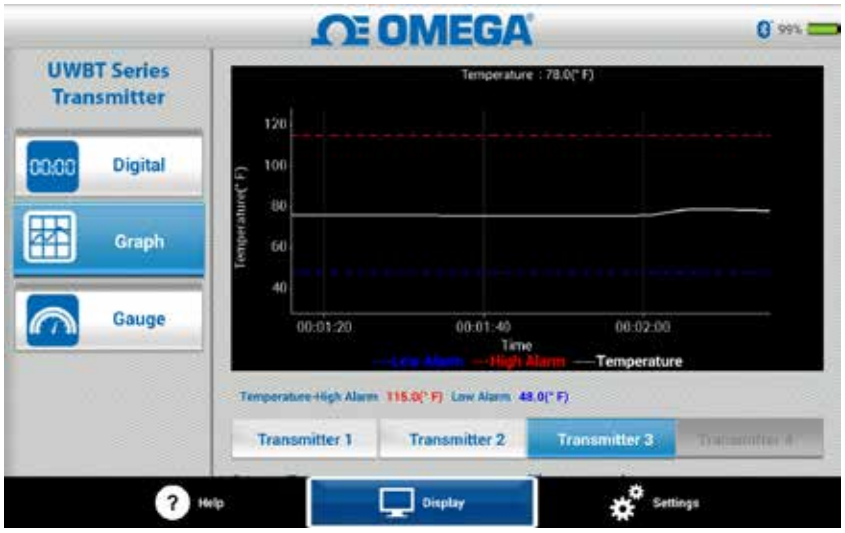


Figure 5-6. Live Temperature Graph With High And Low Alarms

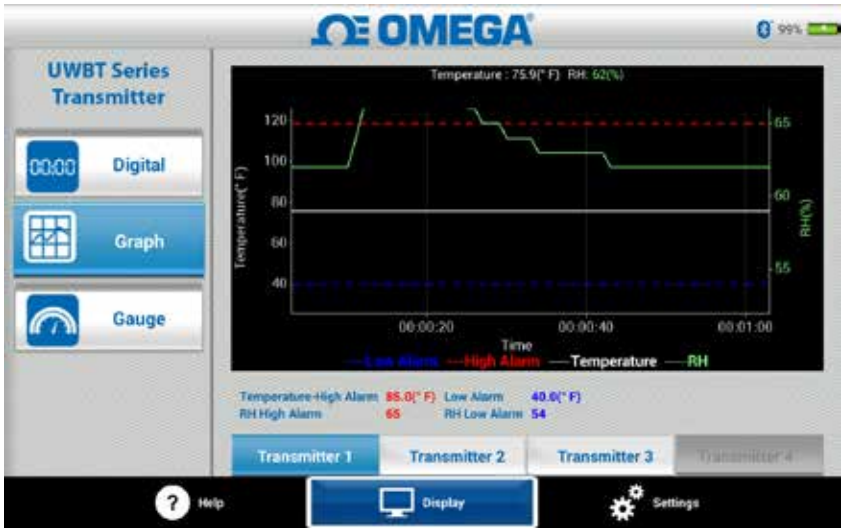


Figure 5-7. Live RH Graph With High And Low Alarms

Playback Graph

The playback graph option allows you to view graph files that have already been saved to your smart phone/tablet device. These may be files that were either logged directly to the phone/tablet, or that have been "downloaded from transmitter" after using internal logging.

After selecting to "Playback Transmitter Data", you need to select the file you would like to view. The files are named after the Sensor Name + Date Logging Started + Time Logging Started.

The playback graph displays all of the data points on one screen. From there, you can zoom into the graph or zoom back out by pressing on the magnifying glass symbols in the top right area of the screen. Dragging the time stamp axis left and right also allows you to scroll through the entire graph.

You can use your finger to select crosshairs on the graph. Tapping anywhere on the graph screen will prompt the vertical line to move closer to your finger.

For more precise movement, you can hold and drag the vertical line across the graph. When resting on a crosshair, the top of the graph displays the data value and timestamp for that point.

Figure 5-8. Playback Sensor Data Graph For Temperature

Figure 5-9. Playback Sensor Data Graph For pH

Download From Transmitter

After using the internal logging setting on your UWBT transmitter to record information, you need to download the data from the transmitter to your smart device. After doing so, you can then view playback graphs or send the logged data to an e-mail/cloud service.

When you select to "Download from Transmitter", the UWBT app immediately starts to download all log files that are saved on the transmitter. This process will take up to 2 minutes to complete.

Figure 5-10. Downloading Log Data From Transmitter

Figure 5-11. Files Already Downloaded From Transmitter

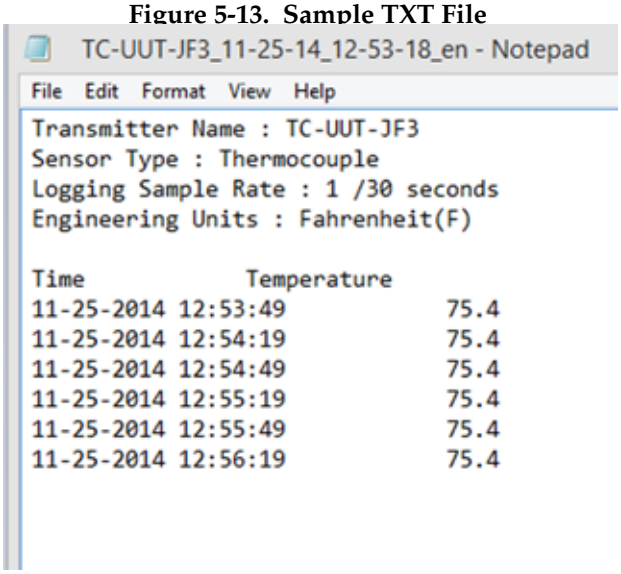
NOTE:

If you are logging to your smartphone or tablet, you will not be able to view downloaded files. You will need to stop logging in order to view the log files.

	A	B	C
1	Transmitter Name :	TC-UUT-JF	
2	Sensor Type :	Thermocouple	
3	Logging Sample Rate :	1 /second	
4	Engineering Units :	Fahrenheit(F)	
5			
6	Time	Temperature	
7	10/22/2014 15:44:49	478.4	
8	10/22/2014 15:44:50	348.4	
9	10/22/2014 15:44:51	478.2	
10	10/22/2014 15:44:52	478.7	
11	10/22/2014 15:44:53	478.7	
12	10/22/2014 15:44:54	478.6	
13			

Figure 5-12. Sample CSV File

Figure 5-13. Sample TXT File



5.2.3 Gauge Format

The gauge format displays readings by pointing at the current value on a dial. As the value changes, the dial will move either left or right to point towards the new number. The value is also displayed in digital format at the bottom of the gauge.

For UWBT-RH models, there are two gauges on the screen. The gauge on the right displays the relative humidity (in percentages), and the gauge on the left displays the ambient temperature (in the units selected in the settings menu).

For UWBT-pH models, there are two gauges on the screen. The gauge on the right displays the pH value, and the gauge on the left displays the solution temperature (in the units selected in the settings menu).

On the inner perimeter of the gauge, there is a bar that goes from blue to green to red; these areas represent the values that are the low alarm, normal, and high alarm readings, respectively. If the values reach or exceed the high alarm, their digital reading will show in red; if the values reach or go lower than the low alarm, their digital reading will show in blue. If an alarm sound has been selected, the sound will be activated when the current value goes above the high alarm, or below the low alarm.

The range of the gauge is set automatically; you cannot change the numbers on the perimeter of the gauge.

When connected to multiple UWBT transmitters, you can select which transmitter you are viewing directly from the current display screen. Click on the button labeled “Transmitter 1” or so on, and you can view the selected transmitter’s data.

Figure 5-14. Temperature Gauge

Figure 5-15. pH and Temperature Gauge

5.2.4 Battery Level Display

A transmitter battery level greater than 50% is indicated by a green battery graphic; the remaining battery percentage is also displayed next to the graphic.

Figure 5-16. Indication Of 92% Battery

A transmitter battery level of 20 to 49% is indicated by a yellow battery graphic; the remaining battery percentage is also displayed next to the graphic.

Figure 5-17. Indication Of 29% Battery

A transmitter battery level below 20% is indicated by a red battery graphic; the remaining battery percentage is also displayed next to the graphic.

Figure 5-18. Indication Of 14% Battery

The addition of the lightning bolt symbol inside of the battery icon indicates that the two (2) AA NiMH batteries are in the process of being recharged.

NOTE:

It is recommended that you recharge your transmitter when you reach 20% battery level or lower. Using the transmitter below 20% battery level may make it difficult to pair with the UWBT app.

5.3 UWBT App Logging

Logging settings refer to the logging in smartphone/tablet which include the following parameters:

Logging Sampling Rate

Logging sampling rate refers to smartphone/tablet logging, which is one of two options. There are 4 logging rates available, ranging from 1 sample/second to 1 sample/minute.

Figure 5-19. Logging Rate Options

Select The File In txt/csv File

You can select the file in either text (TXT) or Excel (CSV) format to email or to send cloud services.

NOTE:

When logging to your smartphone or tablet, the maximum number of samples that can be saved in a single file is 100,000 for thermocouple and RTD probes; for pH probes the maximum is 200,000, and for RH probes the maximum is 300,000. In the case that your logging session exceeds these limits, the UWBT app will close the file and create a new file and continue logging.

Select The Files To Be Sent

Files logged in the smartphone/tablet or downloaded from the transmitter internal memory could be sent to an email address or cloud service account in txt/csv file format as mentioned above. The downloaded files can be seen in the "Log File to Be Sent" field.

Figure 5-20. Viewing Log Files To Be Sent

Enter E-Mail Address

Enter a valid email address using the custom keyboard entry.

Figure 5-21. Custom Keyboard Entry For E-Mail Address

Send To Cloud Services

There are 4 cloud services available for sending log files. They are Dropbox, SugarSync, OneDrive and Google Drive. Please note that your cloud service account must already be activated in order to send files (See Section 3 for more information on cloud services).

Figure 5-22. Cloud Service Options

NOTE:

After 'File Upload' is selected, there is a lag as to when the file is actually sent. Please wait 5-10 seconds for the data to be uploaded; pressing the 'Send' button multiple times will result in multiple e-mails being sent.

Internal Logging

You can select to log data in the UWBT transmitter internal memory by switching on the internal logging tab. The data will then be recorded directly to the transmitter handle, instead of requiring you to use up the smartphone or tablet memory. Please note that once you set the internal logging on, you cannot download any existing data.

Figure 5-23. Internal Logging Options

NOTE:

If you have turned your internal logging on, the settings options for that feature will be greyed out. You will need to turn internal logging off to change the settings.

Figure 5-23A. Internal Logging Options (Disabled when Internal Logging is on)

Internal Logging Frequency

You can log data to the internal memory of the transmitter in 5 different logging frequencies. The internal logging frequency can be set from 10 samples/sec to 1 sample/minute. For the RH transmitter, data cannot be logged at a rate of 10 samples/second.

Figure 5-24. Internal Logging Rate Options

Circular Buffer

Circular buffer is a very useful function which overwrites the oldest data when the transmitter's internal memory is full. You can set the circular buffer on or off using the slider shown above. If you set to switch off the circular buffer, the internal logging will stop when the internal memory is full.

Erase Internal Memory

You can erase the transmitter internal memory and start recording the data fresh if you choose to switch on the internal logging function. Erasing internal memory does not affect the files available on the tablet/smartphone.

Figure 5-25. Erasing Internal Memory

5.4 UWBT App Settings

You can pair with one or more UWBT *Bluetooth* wireless transmitters from the app. Once paired, you can change different settings of the device and save them back to the device. Here is a list of options under the settings menu:

- Sensor Pairing
- Sensor Settings
- Alarms & Offset
- Logging Settings (see "Logging Settings" section for information)
- Languages
- Restore Default
- Save all settings

5.4.1 Settings Menu

Settings include the following parameters shown below. The description of each setting is explained in this section of the manual:

Figure 5-26. Settings Menu

5.4.2 Sensor Pairing

See the section titled "Connecting to the UWBT Transmitter for detailed pairing instructions."

5.4.3 Sensor Settings

Sensor settings allow you to set the desired time axis, date format, display frequency for the live data, engineering units and so on. A sample of the settings for a thermocouple sensor is displayed below.

Figure 5-27. Thermocouple Sensor Settings Screen

Time Axis

There are two types of time axes. You can either set the time axis to elapsed time or real time mode. Elapsed time shows the data starting with 0:00 to the preferred time of data logging with a fixed time interval between the data points. Real time shows the data with a fixed real time interval between the data points. The live data can be displayed in Real time or Elapsed time format. The playback data can only be displayed in Real time format.

Figure 5-28. Time Axis Options

Date Format

You can pick the date format based on your personal preference. The formats available are DD-MM-YY or MM-DD-YY. The internal logging on the UWBT and logging on the tablet follows the date format selected.

NOTE:

Date and Time Format must be reset every time the transmitter is re-paired with the smart device.

Figure 5-29. Date Format Options

Sensor Type

There are 4 sensor types: T/C, RTD, pH and RH. At the top of the sensor settings page, you can see the information of the sensor you are currently displaying. If you are connected to multiple sensors, and need to see the information for a different one, you must go to the "Display" screen, and select the sensor you want to see. Then when you return to the "Sensor Settings" screen, you will see the new sensor information.

Figure 5-30. Viewing Transmitter Name

Display Frequency

There are 5 types of display frequencies that can be displayed on the screen. They range from 10 samples/second to 1 sample/minute. If you are connected to multiple sensors, the 10 samples/second frequency is not available. Additionally, 10 samples/second is not available for the RH sensor.

Figure 5-31. Display Frequency Options

Set Transmitter Date And Time

The UWBT transmitter can adopt the time and date settings that have been selected for your smart device. In order to change the date/time on your transmitter, you will need to change it on your smart device first.

1. Go to tablet settings.
2. Set the date and time depending on your preference of country and time.
3. Go to the UWBT software app.
4. Go to the "Settings" menu → click on "Sensor Settings"
5. Check the box for "Set Transmitter Date & Time"
6. Go back to the "Settings" menu → click on "Save all Settings".

Figure 5-32. Device Date And Time Setting

Bluetooth Wireless Signal

Bluetooth wireless signal strength can be viewed under the sensor settings screen. See the section titled "Connecting to the UWBT App" for more information.

NOTE:

It may take up to 30 seconds for the *Bluetooth* signal strength to appear in the Sensor Settings screen.

Transmitter Name

The UWBT *Bluetooth* wirelesss transmitter comes with a factory set default sensor name. You can change to a preferred sensor name by typing the new name in the field shown below, and then clicking the "Done" button. You also need to save the new name to the transmitter by clicking the "Save all Settings" button on the app. Once set to the new sensor name, the settings for sensor name are saved internally in the transmitter handle. You need to unpair and repair with the transmitter to reflect the new name; there is no need to switch off the tablet or transmitter.

NOTE:

Sensor names cannot be saved in characters outside of the English alphanumeric set. Special characters (e.g. !@#.) also cannot be used in setting the transmitter name.

NOTE:

Transmitter names are limited to 15 characters.

After renaming your transmitter, follow these steps to re-pair with your newly named transmitter:

1. Unpair with your UWBT transmitter under the 'Transmitter Pairing' section
2. Go to your smart device's 'Settings' menu → Bluetooth section
3. Select the transmitter's old name, and select 'Unpair'
4. Return to the UWBT app, and continue the standard pairing process.

Figure 5-33. Changing The Transmitter Name

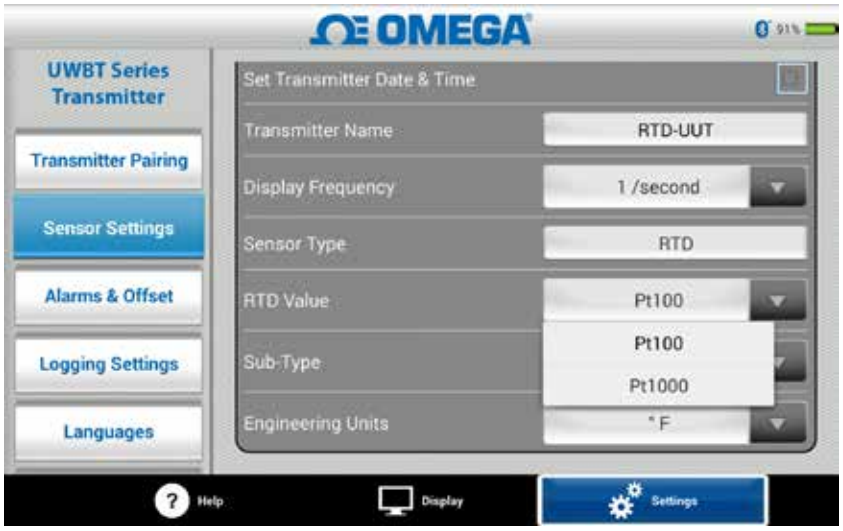
Thermocouple Sensor Type

Depending on the transmitter you are connected to, the settings for its sensor are available in the "Transmitter Settings" screen. Below are the different customizable settings for each sensor type. For example: There are 9 types of calibration for T/C sensors. They are J, K, E, T, R, S, N, C, and B. You can select the preferred thermocouple type by selecting from the "Sub-type" drop down menu.

Figure 5-34. Viewing Sensor Type And Sub-type For Thermocouple Sensor

RTD Settings

There are two types of RTD selection, PT100 (100 Ohms RTD) and PT1000 (1000



Ohms RTD).

Figure 5-35. Selecting RTD Value

Sub type: There are two types of curves that can be selected for RTD sensor from the dropdown menu. They are either American curve or European curve.

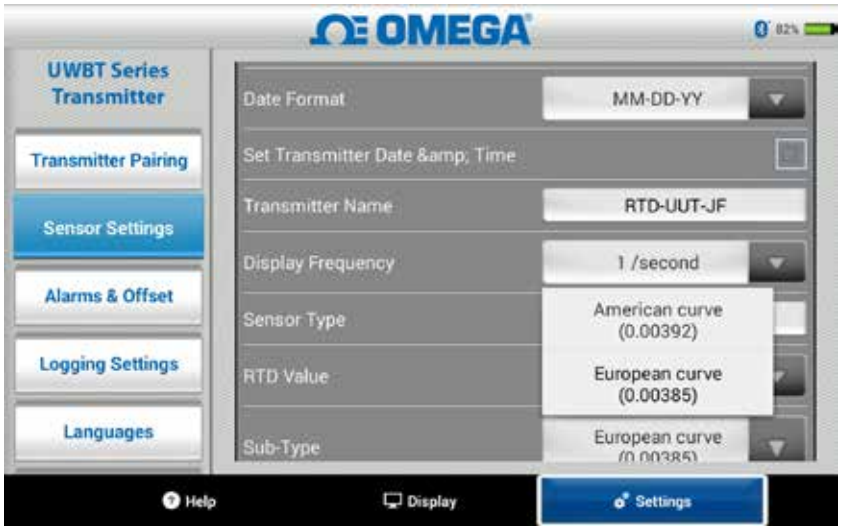


Figure 5-36. Selecting RTD Sub-type

PH Fixed Solution Temperature

You can select the fixed solution temperature by typing the temperature input in the fixed solution temperature tab. This selection is used when the pH sensor does not have a built-in RTD temperature sensor. For pH sensors with the RTD sensor, you do not need to select the fixed temperature option. Simply connect the RTD portion of the pH sensor to the UWBT, and the transmitter will measure the temperature of the solution, and will compensate the pH value for the temperature measured.

Figure 5-37. Setting Fixed Temperature For Solution

Units

There are 4 types of temperature engineering units which UWBT *Bluetooth* wireless transmitter can offer. They are Fahrenheit, Centigrade, Rankine and Kelvin. You can select either °F or °C or °R and K in the drop down menu.

Figure 5-38. Setting Temperature Units

5.4.4 Alarms And Offset

Alarms and offset settings allow you to set the alarm on/off, high alarm, low alarm, dead band and so on for the live data.

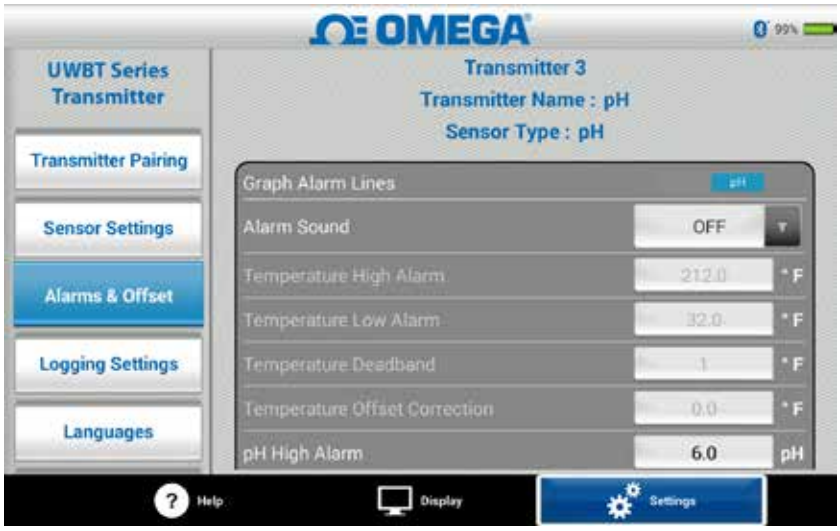


Figure 5-39. Viewing Alarm Conditions

Alarm Setting For PH

You can swap the button for pH or temperature depending on your preference of Alarm condition on the live data graph.

NOTE:

If you do not have an RTD temperature sensor connected on your UWBT-PH unit, the alarms for temperature will be greyed out.

Alarm Setting For RH

You can swap the button for RH or temperature depending on your preference of the Alarm condition on the live data graph.

Alarm Sound

There are 5 different types of alarm tones. Once you drop down the menu to select the particular sound, a two-second sample tone will be played.

NOTE:

When an alarm sound is enabled, the siren will sound for 5 seconds after entering the alarm condition. After the 5 seconds, the sound will stop, but the reading value will stay in the designated color (blue for low alarm, red for high alarm) as long as it is in the alarm condition.

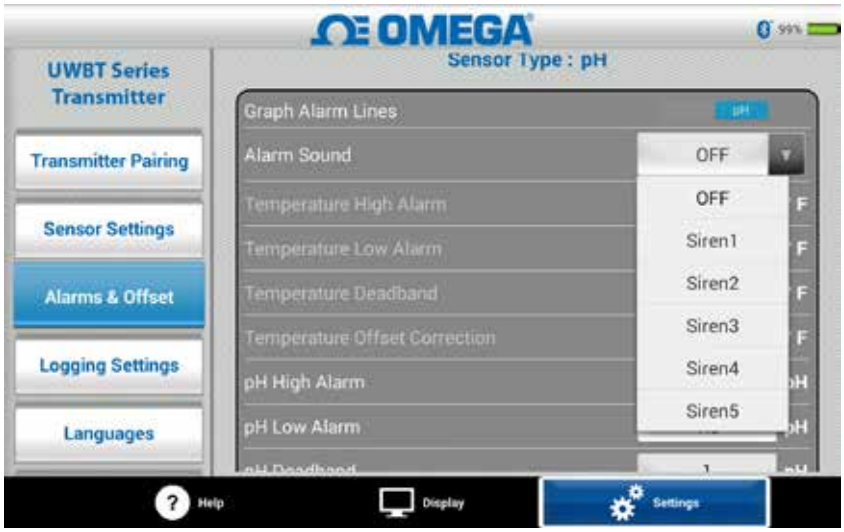


Figure 5-40. Alarm Sound Options

High Temperature Alarm Value

You can set this alarm value to the highest value of the particular sensor by using custom key board entry. For example, you can set up to 2300°F for K-type thermocouple.

If you type in an alarm value that exceeds the limit of your sensor, the UWBT app will automatically set your high alarm to the highest possible value for that sensor.

Low Temperature Alarm Value

You can set this alarm value to lowest value of the particular sensor by using custom key board entry. For example, you can set up to -148°F for K-type thermocouple.

If you type in an alarm value that exceeds the limit of your sensor, the UWBT app will automatically set your low alarm to the lowest possible value for that sensor.

Figure 5-41. Keyboard Entry For Temperature Values

Temperature Deadband

Deadband is the range through which the sensor reading can vary without prompting a change in alarm state. Once the sensor reaches a high or low alarm state, the alarm stays active until the reading reaches a value of either "high alarm value – deadband value" or "low alarm value + deadband value". Temperature deadband is always a positive number. Below are examples of deadband settings for a temperature transmitter.

High alarm state - If you set the temperature deadband to 10°F and the high alarm value to 250°F, the device will be in a high alarm state (red LED blinks 2 times every 2 seconds) when the temperature measurement reaches 250°F or above. The device will stay in the alarm state until the temperature measurement reaches 240°F or below ("high alarm value – deadband value", which is 250°F - 10°F).

Low alarm state - If you set the temperature deadband to 10°F and the low alarm value to 50°F, the device will be in a low alarm state (red LED blinks 2 times every 2 seconds) when the temperature measurement reaches 50°F or below. The device will stay in the alarm state until the temperature measurement reaches 60°F or above ("low alarm value + deadband value", which is 50°F + 10°F).

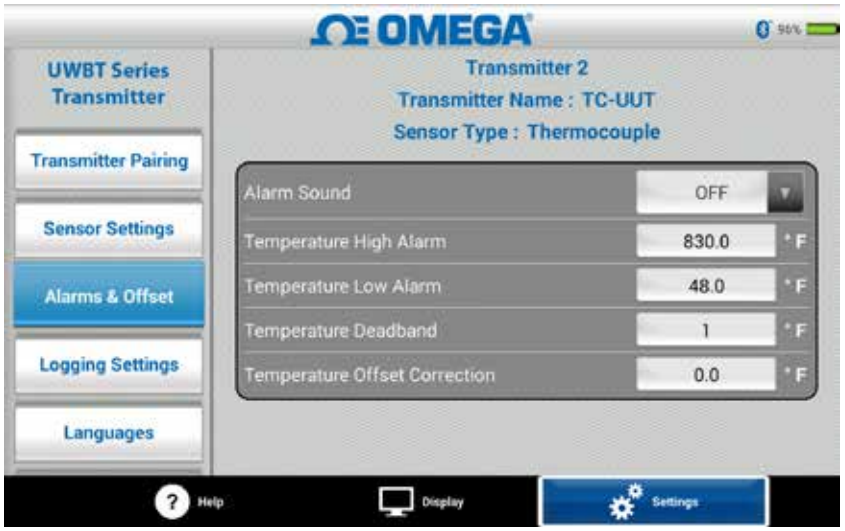


Figure 5-42. Temperature Deadband Of 1°F

pH High Alarm

You can set the alarm value to the highest measurable value for the pH device. For example, the highest value you can set for pH high alarm is 14 pH.

pH Low Alarm

You can set alarm value to the lowest measurable value for the pH device. For example, the lowest value you can set for pH low alarm is 0 pH.

pH Deadband

pH dead band value is always a positive number. Below are examples of deadband settings for pH transmitters.

High alarm state - If you set pH deadband to 2 and the high alarm value to be 10 pH, the device will be on high alarm state (red LED blinks 2 times every 2 seconds) when pH measurement reaches 10pH or above. The device will stay in the alarm state until the pH measurement reaches 8pH or below ("high alarm value – deadband value").

Low alarm state - If you set pH deadband to 2 and the low alarm value to be 7 pH, the device will be on low alarm state (red LED blinks 2 times every 2 seconds) when pH measurement reaches 7pH or below. The device will stay in the alarm state until the pH measurement reaches 9pH or above ("low alarm value + deadband value").

Figure 5-43. pH Deadband Of 1

RH High Alarm

You can set alarm value to the highest measurable RH percentage by using custom key board entry. For example, you can only set up to 98% for RH high alarm.

RH Low Alarm

You can set alarm value to the lowest measurable RH percentage by using custom key board entry. For example, you can only set as low as 2% for RH low alarm.

RH Deadband

RH dead band should always be a positive number. RH dead band is useful to create high and low alarm hysteresis for RH. The following are examples of deadband settings for RH/Temp transmitters:

High alarm state - If you set the RH deadband to 5% and the high alarm value to 90%, the device will be in a high alarm state (red LED blinks 2 times every 2 seconds) when the RH measurement reaches 90% or above. The device will stay in the alarm state until the RH measurement reaches 85% or below ("high alarm value – deadband value").

Low alarm state - If you set the RH deadband to 5% and the low alarm value to 20%, the device will be in a low alarm state (red LED blinks 2 times every 2 seconds) when the RH measurement reaches 20% or below. The device will stay in the alarm state until the RH measurement reaches 25% or above ("low alarm value + deadband value").

Figure 5-44. RH Deadband Of 1% RH

Offset Correction

You can set a value for an offset correction number for reading your sensor input data. This could be a positive or negative number. The offset correction value is added to the measured data, with the sum displayed and/or logged in the transmitter.

Figure 5-45. Offset Options

NOTE:

After alarm and offset settings are changed, the "Save All Settings" button must be pressed for the new changes to be saved in the device memory.

5.4.5 Languages

The UWBT app is available in 9 languages; they are English, Simplified Chinese, Korean, Japanese, Portuguese, German, French, Italian and Spanish. English is the default language selected in the app.

You can easily switch from one language to another. Once you have selected your new language, the application will prompt you to close the app in order for the change to take effect. You then need to restart the UWBT app and repair your sensor. After this language change has been implemented, the new settings are saved internally in the transmitter.

Figure 5-46. Language Options

5.4.6 Restore Defaults

The "Restore Defaults" option enables you to go back to the factory set default conditions in the UWBT transmitter. Below is a table of factory default settings.

Factory Default Settings	
Settings	**Default Value**
Temperature Units	°F
Graph X-Axis	Elapsed Time
Display Frequency	1 sample/second
Logging Frequency	1 sample/second
Log File Format	CSV
High Alarm Value	Maximum of the sensor's range
Low Alarm Value	Minimum of the sensor's range
Alarm Deadband	1°F, 1% RH, 0.1pH
Alarm Sound	Off
Offset Correction	0
Language	English
Date Format	MM-DD-YY

Figure 5-47. Factory Default Settings

Figure 5-48. Restore Default Settings

5.4.7 Save All Settings

Any time that you change a setting (sensor, logging, etc.), you need to save all the new settings inside the tablet as well as the transmitter to put the settings into effect.

Figure 5-49. Save All Settings

Section 6 - Software Instructions (PC App)

The UWBT PC application allows you to communicate with four different UWBT models. This application allows you to:

- Connect with UWBT transmitters using USB 2.0 ports
- Configure thermocouple, RTD, pH and RH transmitters
- Update transmitters' firmware
- Change the transmitter settings such as low/high alarms and offsets, sensor sub-type, and transmitter's name
- Start/stop logging in the transmitter internal memory and download data saved in the transmitter memory to your PC.
- Calibrate your UWBT transmitter

NOTE:

This application supports Windows Operating System (Windows 7 and Windows 8) and Mac Operating System (Snow Leopard, Mountain Lion and Lion) with Java Runtime Environment (JRE) version 1.6 (32-bit only) and up installed. This application can be installed on any tablet running a full Windows OS such as Windows Surface running Windows 8.1. This application does not support Windows RT.

6.1 Installing PC Application

To install the UWBT PC application on your computer follow these steps:

1. Download the latest UWBT PC application release from the Omega website.
2. After download is completed, open the directory where the download was saved
3. Click and run the UWBT PC app executable file (.exe). The application and its drivers will be installed automatically.
4. After application is fully installed, a shortcut is created on your computer desktop and "UWBT Libusb" directory is created in the C: drive of your PC. This directory contains the drivers for all UWBT transmitter models.

6.2 Home Screen Description

The "Home Screen" allows you to connect/disconnect UWBT transmitters, display transmitter's sensor live data, update firmware, and download logged data from the transmitter to your PC.

Discover Transmitter:

Clicking the "Discover Transmitter" button searches for UWBT transmitters connected to USB ports of the PC. The maximum number of UWBT transmitters that can be discovered is four.

Figure 6-1. UWBT PC App Launch Screen

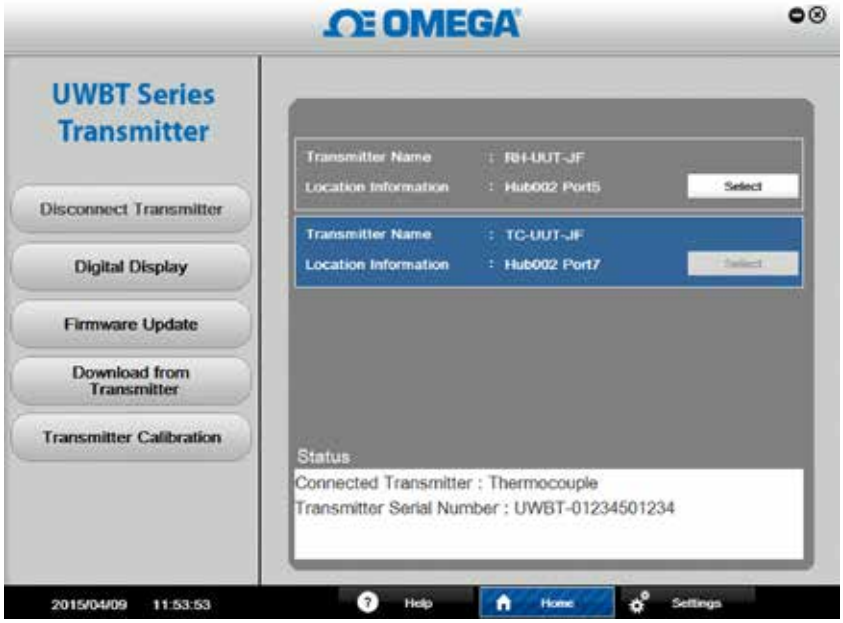


Figure 6-2. UWBT PC App Home Screen

After being discovered, only one UWBT transmitter can be connected with the PC app at a time. You can connect to any of the discovered transmitters by clicking the "Select" button next to the transmitter's name. You can also switch the transmitter you are connected to by clicking on the "Select" button next to the new transmitter of your choice. The application will automatically disconnect from the previous transmitter, and connect to the new one.

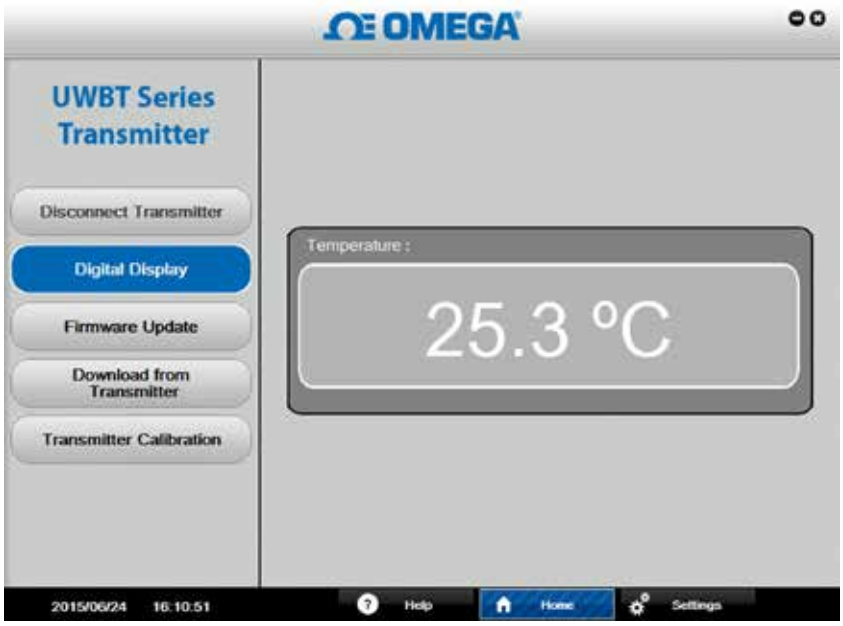
NOTE:

The "Discover Transmitter" button's name changes to "Disconnect Transmitter" after an UWBT transmitter is connected.

Digital Display:

Clicking the "Digital Display" button will display real time sensor data in a digital format. "Sensor Open" will be displayed when no sensor is connected to the UWBT transmitter inputs

Figure 6-3. Digital Display - Thermocouple Transmitter



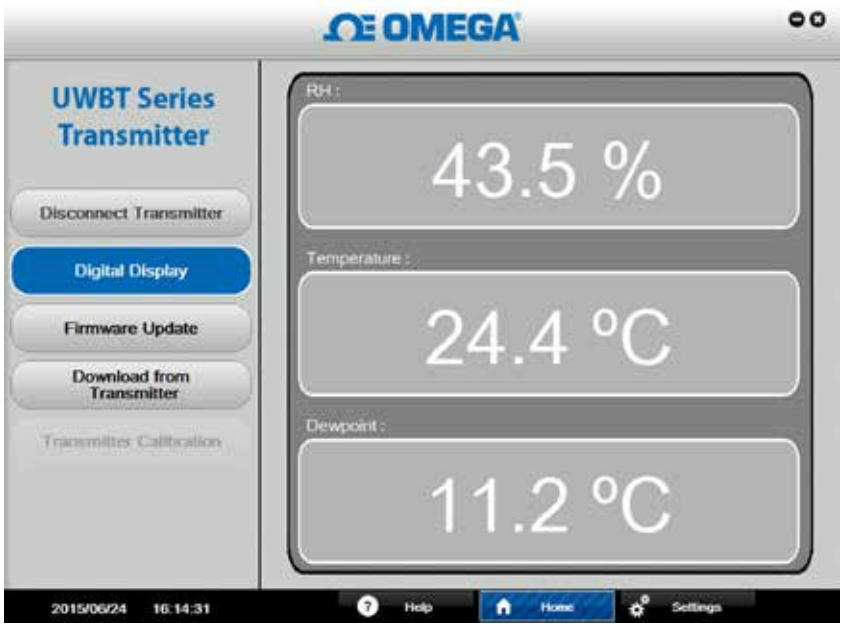


Figure 6-4. Digital Display - RH/Temperature Transmitter

Firmware Update:

Clicking the "Firmware Update" button allows you to update the firmware of the connected UWBT transmitter. When the "Firmware Update" button is clicked, the "Status" box will display the type of UWBT transmitter that is connected. Make sure the firmware file is compatible with the "Discovered Transmitter" type shown in the "Status" box.

To update the firmware:

1. Click on the "Select" button to browse for the .HEX firmware file
2. Click on "Update Firmware" to flash the new firmware to the UWBT transmitter
3. Your screen should read: "Programming Successful" and "Verify Successful" as shown on the image below.

Figure 6-5. Firmware Update

Download From Transmitter:

This function allows you to download any logged data from the UWBT transmitter internal memory to your PC. This data can be downloaded in .txt or .csv formats. Each logging session saved in the transmitter internal memory is downloaded with its own file name by the PC app. To download the logged internal data:

1. Click on the "Download from Transmitter" button
2. Browse to the directory where you would like to save the data on your PC as shown in the image below
3. Enter "File Name" for the files to be downloaded. The application uses this name to create a folder where all the logged data files will be saved under. The same name is used as a prefix with the Time Stamp as the file names inside the folder.
4. Select the file format you would like the logged files to be saved in (.txt or .csv)

Figure 6-6. Download From Transmitter Screen

5. Click "Save" to download the saved data to the selected location on your PC.

Transmitter Calibration

The PC application (Windows or Mac) provides transmitter field calibration. You can calibrate your transmitter as follows:

NOTE:

Although the UWBT-RH transmitter sensor cannot be field calibrated, you can replace the RH sensor in the field. The replacement sensor is Omega part number TH-SP.

Thermocouple Model – UWBT-TC:

This is a 3 point calibration. You need to calibrate the input for K type thermocouple. You can calibrate the device using 4 different engineering units: Fahrenheit, Kelvin, Celsius and Rankine. In order to change the engineering units go to the settings screen, select the engineering unit and click save all settings button. The following steps show sample calibration of UWBT-TC input using thermocouple simulator and degrees Celsius as an engineering unit:

- Select K-type thermocouple from the "Sensor Settings" screen
- Select the Low Set Point Temperature option. Set the thermocouple input and the text box to -96°C. Press the Calibrate button.
- Select the High Set Point Temperature option. Set the thermocouple input and the text box to 1093 °C. Press the Calibrate button.
- Select the Cold junction Temperature option. Measure the ambient temperature around the thermocouple cold junction, set the thermocouple input to the measured temperature and enter the value in the text box. Press the Calibrate button.

The unit is now calibrated for all different types of Thermocouple inputs. You can always go back to Factory calibration by pressing the Restore Defaults button.

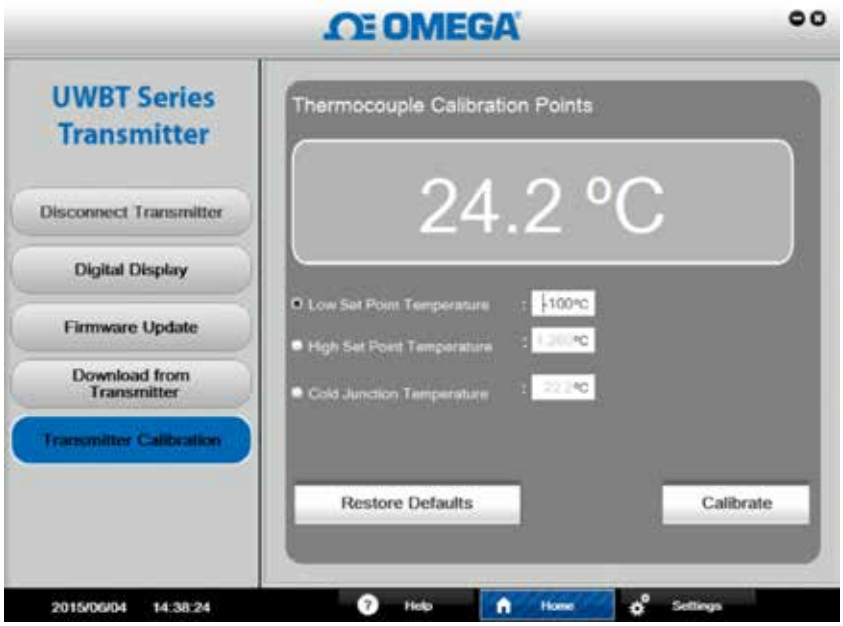


Figure 6-7. Thermocouple Model Calibration

RTD Model – UWBT-RTD:

This is a two point calibration. You can calibrate the device using 4 different engineering units: Fahrenheit, Kelvin, Celsius and Rankine. Below example uses degrees Celsius as an Engineering unit. In order to change the engineering units go to the settings screen, select the engineering unit and click save all settings button. You need to calibrate the input for a Pt100 European curve. Using a precision decade box:

- Select Pt100 and European Curve from the "Sensor Settings" screen
- Select the Low Set Point Temperature option. Set the decade box to 48Ω and the text box to -130°C. Press the Calibrate button.
- Select the High Set Point Temperature option. Set the decade box to 389 Ω and the text box to 845°C. Press the Calibrate button.

To calibrate for a PT1000 RTD European Curve, using a precision decade box:

- Select Pt1000 and European Curve from the "Sensor Settings" screen.
- Select the Low Set Point Temperature option. Set the decade box to 480Ω and the text box to -130°C. Press the Calibrate button.
- Select the High Set Point Temperature option. Set the decade box to 3890 Ω and the text box to 845°C. Press the Calibrate button

The unit is now calibrated for all different types of RTD inputs. You can always go back to Factory calibration by pressing the Restore Defaults button.

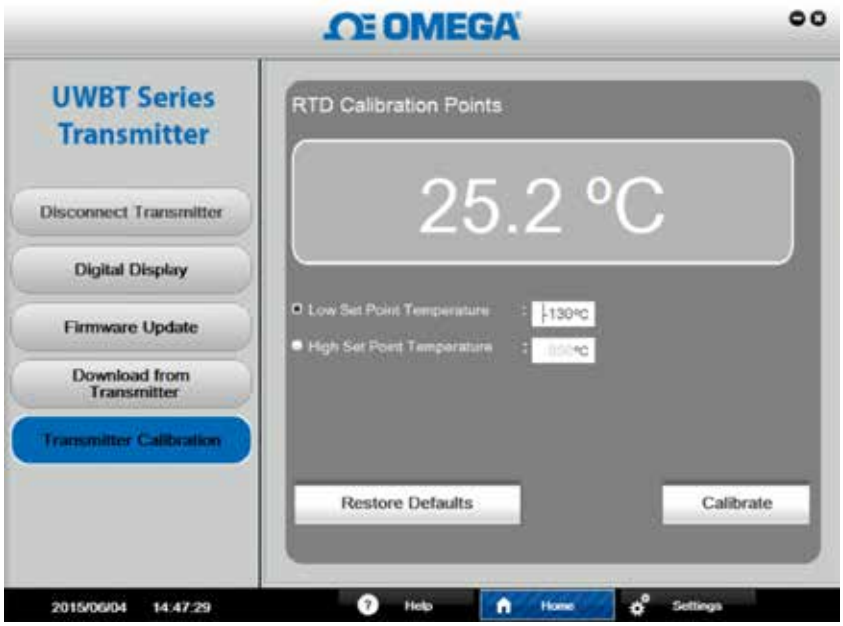


Figure 6-8. RTD Model Calibration

pH/ Temperature Model – UWBT-PH

You need to calibrate for pH and the RTD temperature input. You can calibrate the device using 4 different temperature engineering units: Fahrenheit, Kelvin, Celsius and Rankine. Below example uses degrees Celsius as an Engineering unit. In order to change the engineering units go to the settings screen, select the engineering unit and click save all settings button. If there is no RTD sensor connected to the device, please change the solution temperature in the settings menu and save all changes to the device before you start calibration (default solution temperature is 22.2 °C). The pH input is a two point calibration using a pH electrode and two buffer solutions (4 and 10 pH) or DC mV source (177mV and -177mV):

- Select the pH Low Set Point option. Place the pH electrode in the 4 pH solution (or set the DC source to 177mV), wait for, at least, 1-minute for the measurement to stabilize and enter 4 pH in the low pH set point text box. Press the Calibrate button.
- Select the pH High Set Point option. Place the pH electrode in the 10 pH solution (or set the DC source to -177mV), wait for, at least, 1-minute for the measurement to stabilize and enter10 pH in the high pH point text box. Press the Calibrate button.

You can calibrate the pH input for any other buffer solutions like 7 and 10 pH. The calibration is not limited to only 4 & 10 pH values. For RTD temperature calibration, use a precision decade box:

- Select the Low Set Point Temperature option. Set the decade box to 101Ω and enter 3 °C in the low set point temperature text box. Press the Calibrate button.
- Select the High Set Point Temperature option. Set the decade box to 127Ω and enter 70°C in the high set point temperature text box. Press the Calibrate button.

The unit is now calibrated for pH and RTD input. You can always go back to Factory calibration by pressing the Restore Defaults button.

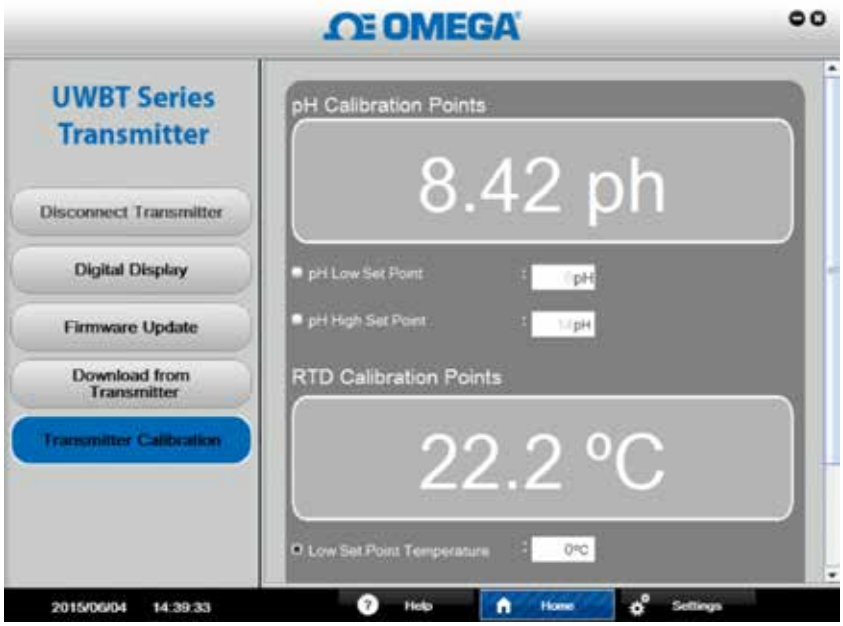


Figure 6-9A. pH/Temperature Model Calibration

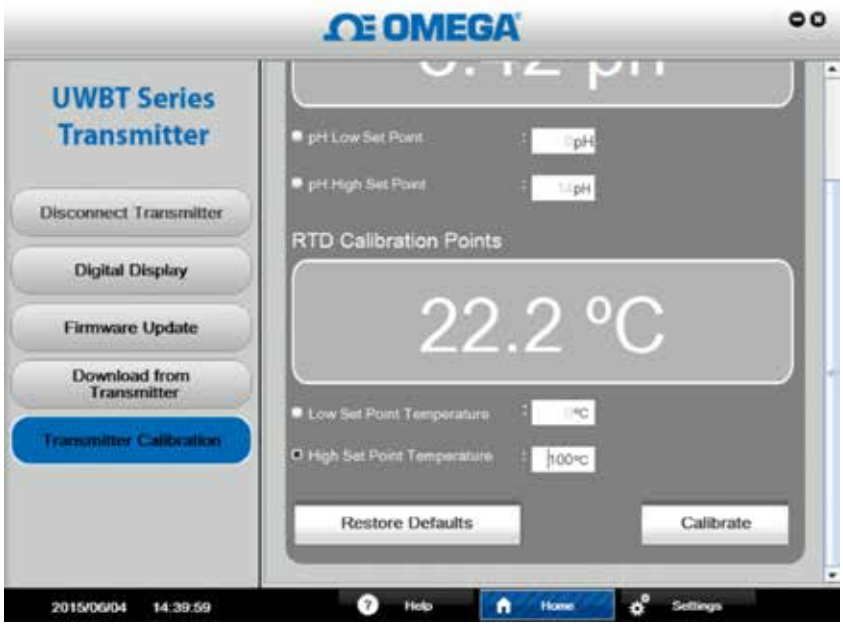


Figure 6-9B. pH/Temperature Model Calibration

6.3 Settings Description

The “Settings” screen allows you to change the UWBT transmitter settings such as sensor name, sensor sub-type, engineering units, alarm settings, start/stop internal memory logging and restore factory default settings. You can access these functions by clicking on the “Settings” button at the bottom of the PC application screen.

Sensor Settings:

The “Sensor Settings” button allows you to change the device setting depending on the type of UWBT transmitter connected. You are able to change the transmitter name and engineering units (°F, °C, °R and K), as well as set the date and time for the UWBT internal real time clock from this screen.

For thermocouple transmitters, you can set the thermocouple “Sub type” drop down menu as shown in the image below.

For RTD transmitters, you can set the RTD input type (PT100 or PT1000) and the RTD calibration curve (European or American).

For pH transmitters, you can set the “Solution Temperature” when no RTD-PT100 sensor is connected to the RTD inputs of the pH transmitter (the pH electrode not having a built-in RTD sensor).

Figure 6-10. Thermocouple Sensor Settings Screen

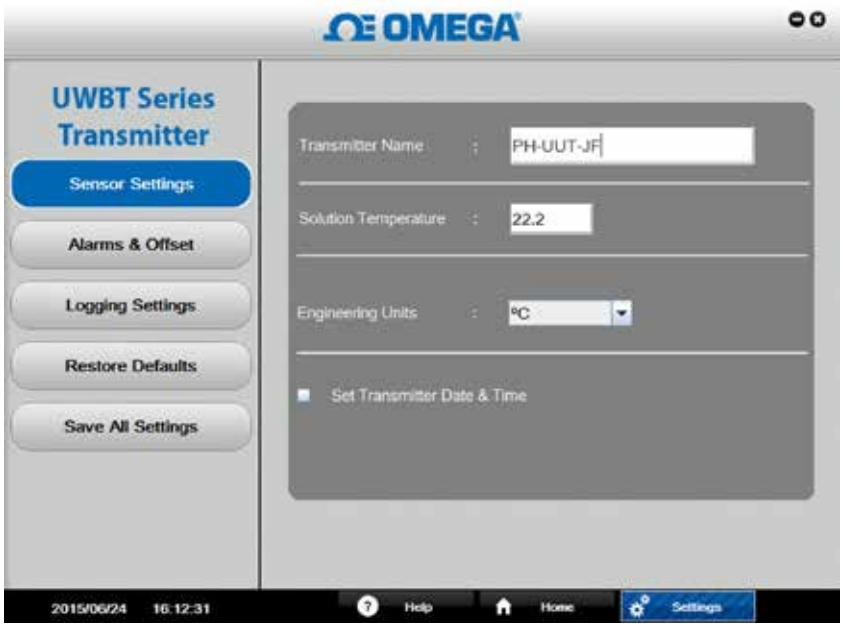


Figure 6-11. pH Sensor Settings Screen

NOTE:

After all the changes to the sensor input, alarm and logging settings, the "Save All Settings" button must be clicked for the new changes to get saved/updated in the transmitter's internal memory.

Alarms & Offset:

The "Alarms & Offset" screen allows you to set the low/high alarm set point values, deadband and sensor offset corrections. The images below show the "Alarms & Offset" screen after the button is clicked for the thermocouple and pH transmitters. The screen for RTD transmitters is similar to that of thermocouple transmitters. The screen for pH transmitters is similar to that of RH transmitters, the only difference is that the RH values are replaced by pH values.

Figure 6-12. Thermocouple Alarms And Offset Screen

- **High Alarm set point:**

You can set the high alarm value to the highest measurable input of the particular UWBT sensor sub-type. For example, you can set up to 2300°F for K-type thermocouple.

- **Low Alarm set point:**

You can set the low alarm value to the lowest measurable input of the particular sensor sub-type. For example, you can set the alarm as low as -148°F for K-type thermocouple.

- **Alarm Deadband:**

Once the sensor reaches a high/low alarm state, the alarm stays active until the reading goes below "high alarm value – deadband value" or above "low alarm value + deadband value". Alarm deadband is always a positive number. Below are examples of deadband settings for the transmitter.

1. High alarm state - If you set the temperature deadband to 10°F and the high alarm value to 250°F, the transmitter will be in alarm state (red LED blinks 2 times every 2 seconds) when the temperature measurement reaches 250°F or above. The transmitter will stay in alarm state until the

temperature measurement reaches 240°F or below ("high alarm value – deadband value").

2. Low alarm state - If you set the temperature deadband to 10°F and the low alarm value to 50°F, the transmitter will be in alarm state when the temperature measurement reaches 50°F or below. The transmitter will stay in alarm state until the temperature measurement reaches 60°F or above ("low alarm value + deadband value").

• **RH High Alarm Set Point:**

You can set the high alarm value to the highest measurable value for RH/Temp transmitters which is 98% RH.

• **RH Low Alarm Set Point:**

You can set the low alarm value to the lowest measurable value for RH/Temp transmitters which is 2% RH.

• **RH Alarm Deadband:**

The following are examples of deadband settings for RH/Temp transmitters:

5. High alarm state - If you set the RH deadband to 5% and the high alarm value to 90%, the transmitter will be in alarm state when the RH measurement reaches 90% or above. The transmitter will stay in the alarm state until the measurement reaches 85% or below ("high alarm value – deadband value").

6. Low alarm state - If you set the RH deadband to 5% and the low alarm value to 20%, the transmitter will be in alarm state when the RH measurement reaches 20% or below. The transmitter will stay in alarm state until the measurement reaches 25% or above ("low alarm value + deadband value").

• **pH High Alarm Set Point:**

You can set alarm value to the highest measurable value for pH transmitters which is 14pH.

• **pH Low Alarm Set Point:**

You can set alarm value to the lowest measurable value for pH transmitters which is 0pH

• **pH Alarm Deadband:**

Examples of deadband setting for pH transmitters:

5. High alarm state - If you set pH deadband to 2 and the high alarm value to 10pH, the transmitter will be in alarm state when measurement reaches 10pH or above. The transmitter will stay in alarm state until the measurement reaches 8pH or below ("high alarm value – deadband value").

6. Low alarm state - If you set pH deadband to 2 and the low alarm value to 7pH, the transmitter will be on alarm state when pH measurement reaches 7pH or below. The transmitter will stay in alarm state until the measurement reaches 9pH or above ("low alarm value + deadband value").

• **Offset Correction:**

You can set a value for an offset correction for reading your sensor input data. This offset can be a positive or a negative number.

Figure 6-13. pH Alarms And Offset Screen

Logging Settings:

The "Logging Settings" screen allows you to start/stop logging on the transmitter internal memory, set the logging rate, and enable/disable the circular buffer. There are five internal logging rates you can choose from:

- 10 samples/seconds
- 1 sample/seconds
- 1 sample/10 seconds
- 1 sample/30 seconds
- 1 sample/minute

Figure 6-14. Logging Settings Screen

To start an internal logging session:

1. Select "Transmitter Internal Logging" to On.
2. Set the "Internal Logging Sampling Rate" from the dropdown menu
3. Select "Circular Buffer" to ON/OFF.

- If the circular buffer is ON, after the transmitter internal memory is full, new measurements will be overwritten over previously saved measurements starting with the oldest saved data point. This will continue until you turn the logging off.
- If the circular buffer is OFF, the transmitter will stop logging when its memory becomes full. Full memory is indicate by the yellow and red LEDs on the transmitter blinking alternatively.

4. Click on "Save All Settings". When the transmitter starts logging internally, the green LED on the transmitter will blink twice every 3-seconds.

Restore Defaults:

The "Restore Defaults" button allows you to restore the factory default settings on the UWBT transmitter. The settings that will be restored are: sensor sub-type, engineering units, alarms and offset, and logging settings. For example, the default settings for thermocouple transmitters are:

- Sub type: K calibration
- Engineering units: °F
- Temperature high alarm: 2300°F
- Temperature low alarm: -148°F
- Temperature deadband: 1°F

- Temperature offset correction: 0°F
- Device Internal logging: OFF
- Internal logging sampling rate: 1 sample/10 seconds
- Circular buffer: OFF

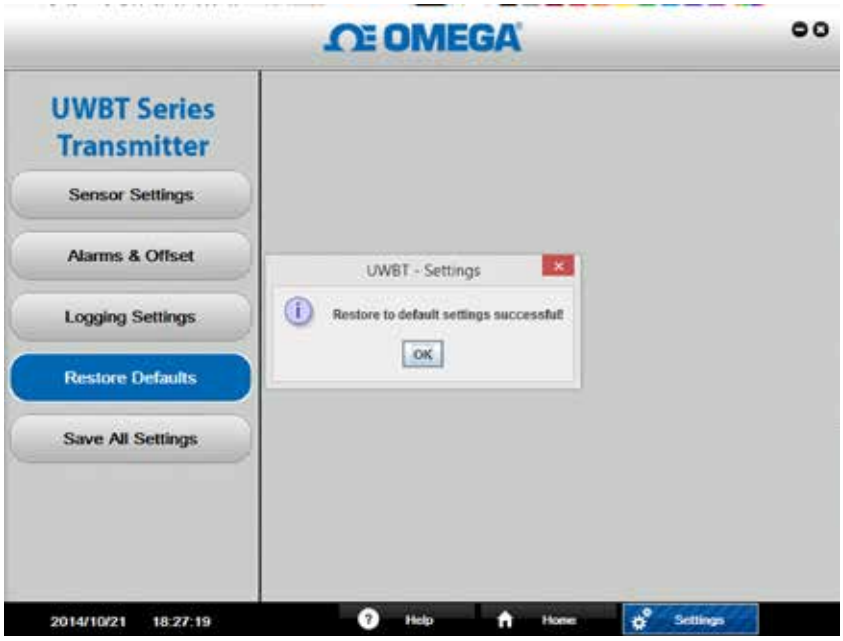


Figure 6-15. Restore Defaults Screen

Save All Settings:

The "Save All Settings" button allows you to save all updated settings in the transmitter's internal memory. New settings will be shown next time you connect your transmitter to the PC app.

Figure 6-16. Save All Settings Screen

Section 7 - Troubleshooting/Help

The information provided in this section should solve most of the common problems you may experience when operating your UWBT transmitter. If the problems and solutions outlined here do not solve your problem, please contact Omega's customer service department. Contact information can be found on the last page of this manual or by visiting omega.com

7.1 App Display Issues

1. Q: I am paired to a transmitter, but the measurement field on my display is blank.
   A: This may mean that the transmitter is not well-synchronized with your smart device. Switch the UWBT transmitter off and back on; then try to pair the transmitter again in the app, as outlined in the chapter titled "Connecting to the UWBT Transmitter".
2. Q: The display says "Open Sensor". What does this mean?
   A: "Open Sensor" means that either there is no probe connected to your UWBT transmitter handle, or the probe has not made a full connection in order to take measurements. Check the transmitter handle to make sure the connection is tight.
3. Q: Is there anywhere on the app that I can see the maximum range for my specific sensor?
   A: Yes. If you go to the Display → Gauge view, the lowest and highest values on the gauge represent the full range for your sensor type/sub-type.
4. Q: Where is the crosshair on my graph?
   A: Only the playback graphs (graphs of previous logged files) allow for crosshair use. Once you've selected the playback graph you would like to view, click within the graph and the crosshair will appear.
5. Q: I do not want the alarm sound on while collecting data, but I would like to see if I am reaching my set alarm conditions. Is there a way to see this information?
   A: Yes. In the Digital display, the text would change color if you reach an alarm condition (red text = high alarm, blue text = low alarm). In the Gauge display, the blue bar portion of the gauge outline represents the low alarm area, and the red bar portion represents the high alarm. In the Graph display, there are two lines added to the graph – the blue line represents the low alarm, and the red line represents the high alarm.
6. Q: I have graph playback files saved on my smartphone/tablet, but cannot see them in the app. Where are the files?
   A: Make sure that you are not currently logging data to your transmitter or smart device. You cannot view playback files while logging. Once you stop logging, you will be able to see the files.

7.2 App Logging Issues

1. Q: Where do I find the log files that I have already saved or downloaded from the transmitter?

   A: The files can be found in the Display → Graph → View Playback Graph. A list of all of your available log files will appear, and you can select to view them from that screen.

2. Q: How do I change the timestamps on my graph from elapsed time (starts with 0:00:00) to real time (starts with the actual clock time when logging began)?

   A: You can change the way you view timestamps on your graph by going to Sensor Settings → Time Axis, and selecting the timestamps you prefer. Selecting elapsed time means that your first timestamp will be 0:00:00; selecting real time means that your timestamps will be the actual clock times. Please note that you cannot change the time axis for a playback graph.

3. Q: I want to clear all of the logged data from my tablet/smartphone. How do I do it?

   A: For Android devices:

   1. Go to the Settings menu of your device
   2. Click on Storage → Miscellaneous Files
   3. In this folder, you can select and delete the UWBT files.

Figure 7-1. UWBT Files On An Android Tablet

A: For an Amazon Kindle Fire device:

1. Go to the Settings menu of your device
2. Click on Device Options → Storage
3. Click on Miscellaneous
4. In this folder, you can select and remove the UWBT files.

A: For iOS devices:

1. Connect your smart device to your PC, and open iTunes.
2. Click on your device in the menu bar, and click on the "Apps" section
3. Near the bottom of the Apps screen, there is a "File Sharing" section. When you select the UWBT app, the box on the right will display "UWBT Documents" – these are your stored log files
4. Select the files, and press your keyboard's "Backspace" button to delete.

Figure 7-2. UWBT Files In iTunes

5. Q: I internally logged data to my transmitter in one language; when I downloaded the log files to my tablet/smart phone, they were not in the same language. How did this happen?

   A: If you have internally logged data to the transmitter, the log file will always load in the language you are using on the UWBT app at the time of download. For example, you may internally log data on the UWBT transmitter in English. However, if you changed the app's language to French, and then proceed to download the log file, it will download in French.

6. Q: If my internal memory is full, but I choose to use a circular buffer, what happens to my existing data?

   A: As you start logging new data, the UWBT app will delete and overwrite the existing memory as time passes. You will not lose all of your data at once.

To activate the Circular Buffer when the Transmitter's memory is full, follow these steps:

1. Turn on the circular buffer in the 'Logging Settings' menu.
2. Select 'Save all Settings'.
3. From the display screen, select 'Start Logging'.

NOTE:

If you choose to download the same log file in a different language, it will overwrite the current file you have saved (because it uses the same file name).

6. Q. I downloaded data that I logged at 1 sample/second in CSV format. When I opened my CSV file, the timestamps are only showing me the minutes (as opposed to the seconds). How do I fix this issue?

   A: In the case that your samples were faster than 1 sample/minute, make sure that the format of the time column on your CSV file shows MM/DD/YY hh:mm:ss.0000 (month/day/year hour:minute:millisecond). Your data will then display correctly.

7.3 App Settings Issues

1. Q: The transmitter has lost connection with the UWBT app, and it is not being discovered.

   A: Switch the transmitter off, and back on. Try to repair with your UWBT app after the restart and it should work

2. Q: I changed the name of my transmitter in the app, but do not see the new name when I look in the "Settings" section. What happened?

   A: In order to see your changed name in the app, you need to unpair the transmitter and re-pair.

3. Q: Why isn't the app letting me pair with 3 transmitters at the same time?

   A: The UWBT app allows for pairing with viewing data from multiple transmitters simultaneously (3 for iOS apps, 4 for Android apps). However, you need to go through the pairing process with the transmitters individually. After you have paired with the first transmitter, you can then discover and pair with the next, one at a time until you've paired all of the transmitters you need.

4. Q: Why isn't the app accepting my text inputs for values/transmitter name?

   A: Make sure you are pressing the "Done" button after entering your text, to confirm the change.

   - Click "Next" to update the drivers. After this step, your UWBT transmitter should be detected by the computer.

5. Q: When I try to pair with my transmitter, my iOS device gives me an 'Incompatible Accessory' message. How do I resolve this problem?

   A: After receiving an 'Incompatible Accessory' message, take the following steps in order to pair with your iOS device properly.

1. Turn off the UWBT transmitter.
2. In the iOS device's settings menu, 'forget' the UWBT transmitter:
   a. Go to 'Settings' → '*Bluetooth*'→ select the 'Information' icon for your transmitter → click 'Forget this device'.
3. Restart the iOS device's *Bluetooth* functionality
   a. While still in the *Bluetooth* settings, move the slider to the 'Off' position, and then back 'On'.
4. Turn on your UWBT transmitter, and restart the pairing process.

7.4 PC Application Issues

NOTE:

After installation of the UWBT PC Application, you may have to install some additional software (e.g., MAC Port). If necessary, follow the instructions on the MAC PC for installing the software needed.

1. Q: When I connect my transmitter to the PC via its USB port, a Windows pop-up message says that 'the USB device cannot be detected. How do I resolve this issue?

   A: This problem is common to USB 3.0 ports on Windows 7 operating systems. To resolve the issue, follow these steps:

   - Disconnect the transmitter from your PC.
   - Turn the slide Power switch to the 'OFF' position.
   - Reconnect the transmitter to the PC via the USB port (with the power switch still in the OFF position).

2. Q: Why isn't the UWBT-PC application detecting my transmitter, even though it is connected to the USB port of my computer?

   A: There may have been an interference while installing the drivers for the UWBT transmitters. These drivers are installed in the "UWBT Libusb" folder that is created in the C:\ drive of your computer upon installation. To install these drivers manually, follow these steps:

   - With your UWBT transmitter connected to an USB port of your computer, right click on "My Computer"
   - Click on "Manage" and from the "Computer Management" window, click on "Device Manager"
   - Find the UWBT device in the list of connected devices.
   - Right click on the UWBT device name, select "Update Driver Software"
   - Manually browse to the location of the "UWBT Libusb" folder, C:\UWBT Libusb by default and select the "driver" folder inside.

Section 8 - Specifications

Please visit the Omega website for complete UWBT specifications.

http://www.omega.com/uwbt

Section 9 - Approvals And Regulatory Compliance

FCC Notice: This device complies with Part 15 of the FCC rules. Operation is subject to the following conditions:

1. This device may not cause harmfuL interference;
2. This device must accept any interference received, including interference that may cause undesired operation

CE Marking: It is the policy of OMEGA® to comply with all worldwide safety and EMI/EMC regulations that apply. OMEGA is constantly pursuing certification of its products to the

European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.CE Marking: It is the policy of OMEGA® to comply with all worldwide safety and EMI/EMC regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives.

OMEGA will add the CE mark to every appropriate device upon certification.

9.1 EMC Anomalies

Standard: 61326-1, 300 489-1

Model UWBT-PH:

Conducted RF Immunity over the AC Power adapter Lines

Operating in *Bluetooth* Mode, AC Power adapter: Tested at 220V/60Hz at 3 Vrms, from 900 KHz to 50 MHz, the pH reading changes from 4.23 to 10.48 pH. From 50 MHz to 80 MHz, you may experience open pH sensor condition.

9.2 Power Adapter

The power adapter provided with the UWBT transmitter is certified for use in the following countries/regions: North America, Europe, Australia, Brazil, China, Japan, Korea, Mexico, and Singapore.

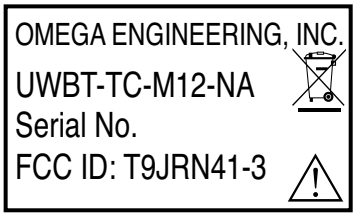
WARNING:

The UWBT is provided with a USB 2.0 A to Mini-B 5pin USB cable. Make sure to use this provided cable with your UWBT unit; using a different USB cable may result in reading noise from your sensors, leading to inaccurate data.

9.3 Wireless Certification

The UWBT is certified as a wireless device in the following countries by their respective governing agencies: North America, the European Union, Mexico, Brazil, South Korea, Japan, China, Singapore, and Australia.

The rear label of the UWBT indicates the country that your transmitter is certified for use in



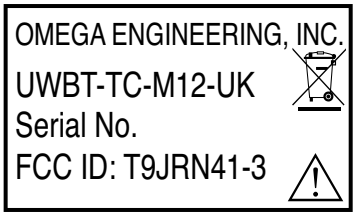


Figure 9-1. Rear Label for UWBT-*-NA, certified for use in North America

Figure 9-2. Rear Label for UWBT-*-UK, certified for use in the United Kingdom

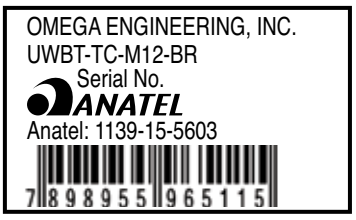


Figure 9-3. Rear Label for UWBT--BR, certified for use in Brazil**

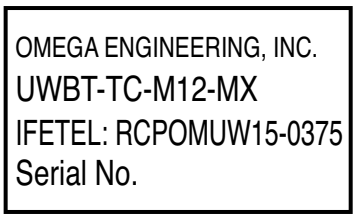


Figure 9-4. Rear Label for UWBT--MX, certified for use in Mexico**

Figure 9-5. Rear Label for UWBT--SEA, certified for use in Singapore and Australia**

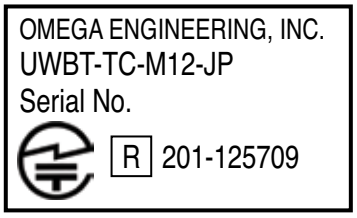


Figure 9-6. Rear Label for UWBT--JP, certified for use in Japan**

Figure 9-7. Rear Label for UWBT--CN, certified for use in China**

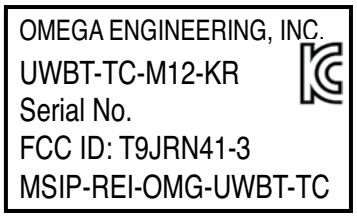


Figure 9-8. Rear Label for UWBT--KR, certified for use in South Korea**

Section 10 - Communication Protocol

10.1 Introduction

10.1.1 Purpose

The scope of this document is to provide the detailed design on the communication of UWBT Device with Smartphone and PC application.

10.2 Acronyms & Abbreviations

UWBT	- Universal Bluetooth Wireless Transmitter
EOF	- End of Frame
CR	- Carriage return
NACK	- Negative Acknowledgement
SA	- Source Address
DA	- Destination Address

10.3 Communication Interface

The UWBT Device uses Bluetooth 2.1 Class1 type for Smartphone communication and it is backwards-compatible with Bluetooth version 2.0, 1.2 and 1.1.

PC communication interface uses generic USB stack for communication with UWBT Device. The PC communication follows the USB2.0 communication, checksum and EOF frame will be taken care in the transport layer of the USB protocol. So in the Data layer no checksum and EOF is available.

The Master to slave communication is a single string of up to 256 characters in length. String arguments are separated by SPACE character and the last (and only) character is the CR (Carriage return) character.

Here, Master - PC / Smartphone
Slave - UWBT Device

The various commands used by master and slave for the communication is tabulated below.

Sl No	Master Request Commands	Slave Response Commands	Description	Usage
1	501	0x01F5	Read Device Settings	PC & Smartphone
2	502	0x03E8	Write Device Settings	PC & Smartphone
3	503	0x01F7	Read Live Data	Smartphone Only
4	504	0x01F8	Download Records – 5 Blocks	Smartphone Only
5	505	0x01F9	Download Records	PC & Smartphone
6	506	0x01FA	Restore Factory Default	PC & Smartphone

Table 10-1. List of Master/Slave Commands

Sl No	Master Request Commands	Slave Response Commands	Description	Usage
8	508	0x01FC	Get MAC Address and Alias Name	PC Only
10	512	0x0200	Erase Log Memory	PC & Smartphone
11	513	0x03E8	Set Device Name	PC & Smartphone
12	514	0x0202	End Of Memory Status	PC Only
13	515	0x0203	PC Application Disconnect	PC Only
17	5001	0x1389	Get Device Health	Smartphone Only
19	-	0x03E8	Acknowledgement	Slave to PC & Smartphone

Table 10-1. List of Master/Slave Commands Cont.

General Master To Slave Communication

Master sends a single string of up to 256 characters in length. String arguments are separated by either Space or Semicolon character depending on the body of the data. The data is ASCII encoded. If the communication is point to point then the SA & DA addresses are both zero.

Packet Entry	Description	Notes
Start	Packet Header ("%")	Start of Frame Identifier
SA	Source Address (Master)	Optional – 0...255
DA	Destination Address (Slave)	Optional – 0...255
Command	Type of command (0.... 65535)	
Arg1	Argument 1	Optional
Arg2	Argument 2	Optional
Arg3	Argument 3	Optional
Arg n-1	Argument n	Optional
Arg n	Check sum or CRC	Optional
End	CR	Carriage Return

Table 10-2. Master/Slave Communications

General Slave To Master Communication Frame Format Is Described Below.

Slave sends a response back to the Master. The data are separated by either a Space or Semicolon. The data is ASCII encoded.

Packet Entry	Description	Notes
Start	Packet Header (0xA5)	Start of frame Identifier (Mandatory for streaming data)
SA	Source Address (Master)	Optional
DA	Destination Address (PC or another device)	Optional
Command	Type of command (0.... 65535)	Same Command as sent from the Master (if applicable) - Optional
Length	Data Packet Length (1...255)	# of bytes in the packet
Data 0		
Data 1		
Data 2		
Data n	Checksum or CRC	Optional
End	CR	Carriage Return

Table 10-3. Master/Slave Communications Frame Format

The command field is the HEX equivalent of the command string sent by Master.

Checksum = Checksum of the complete frame. Checksum will be calculated by adding the frame bytes from Packet header to Data N and truncated into 16 bit values.

On receiving the request from the master the slave sends any one of the response as listed below

1. Slave Requested Data

Normal Slave response

2. Slave Response No Data With Acknowledgement

0xA5	0x00	0x00	0x03	0xE8	0x01	0x01	Checksum

3. Slave Response With Busy

0xA5	0x00	0x00	0x03	0xE8	0x01	0x02	Checksum

4. Slave Response With Negative Acknowledgement

0xA5	0x00	0x00	0x03	0xE8	0x01	0x03	Checksum

5. Slave Response Representing Internal Logging ON

0xA5	0x00	0x00	0x03	0xE8	0x01	0x04	Checksum

6. Slave Response Representing End Of Log Memory

0xA5	0x00	0x00	0x03	0xE8	0x01	0x05	Checksum

7. Slave Response Representing Non Availability Of Log Data (Log Erased)

0xA5	0x00	0x00	0x03	0xE8	0x01	0x06	Checksum

8. Slave Response Representing Connection Of Another Master

0xA5	0x00	0x00	0x03	0xE8	0x01	0x07	Checksum

This acknowledgement will be send if both the masters are connected (PC and Smartphone) to UWBT device and one of the masters sends any of the following requests

a. Write user settings

b. Restore default settings

c. Erase log memory

d. Set serial number

e. Set device name

f. Firmware update

Checksum Calculation: Checksum is calculated for the entire frame by adding the bytes from packet header to Byte N. If the checksum value exceeds 16 bits (greater than 0xFFFF), then the MSB 16 bits are added to the LSB 16 bits, until the MSB 16 bits become zero.

E.g.

1. If Calculated checksum = 0x0000A1B2, then the final checksum = 0xA1B2

2. If calculated checksum = 0x0F1FFEEC, then the final checksum is calculated as follows

Add 16 bits MSB to 16 bits LSB -

```
0xFEEC +
0x0F1F
------------
0x10E0B (Intermediate result 1)
------------
```

As the intermediate result 1 is greater than 0xFFFF, MSB 16 bits is added again to LSB 16 bits

```
0x0E0B +
0x0001
------------
0x0E0C (Intermediate result 2)
------------
```

As the intermediate result 2 is lesser than 0xFFFF, the Final checksum would be 0x0E0C

10.3.1 Communication Between Smartphone And UWBT Probe

The master initiates the data transfers by sending request as string. On receiving the request, the slave will respond with appropriate frame. In case the slave does not respond for the request, the master waits for 100ms and resends the same string. The master will send the same request 5 times and if it does not receive any reply from slave, it displays message indicating “communication failed”.

In case, if slave sends Negative or Busy Acknowledgement, the master sends the same request 5 times. If the master does not get positive response from device, it indicates the user “Communication failed”.

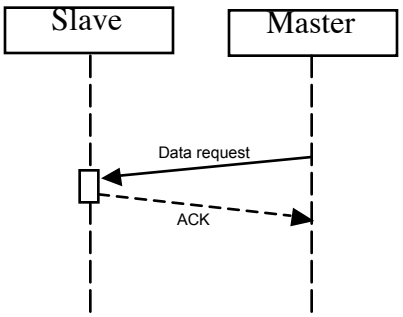


Figure 10-1 - Slave responding with Acknowledgement

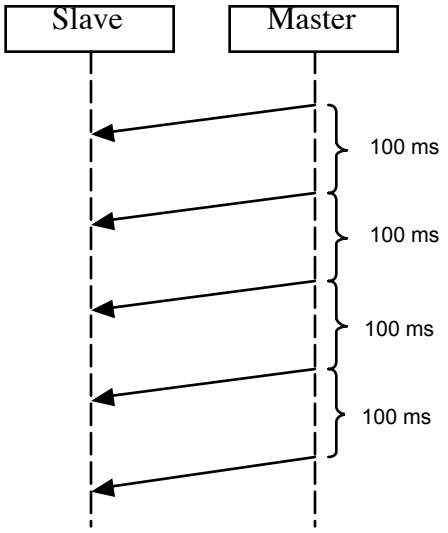


Figure 10-2 - Slave With No Response

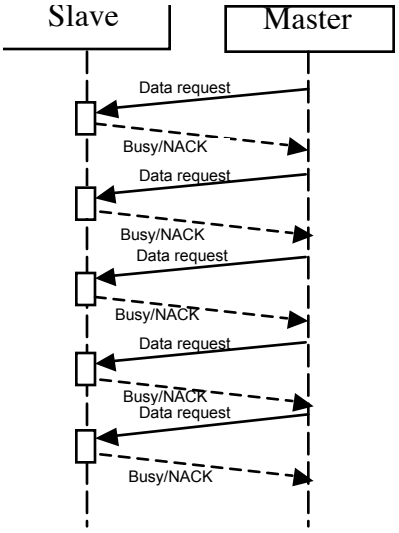


Figure 10-3 - Slave With Busy/NACK

10.3.2 Read Device Settings

This frame is used to Read the device settings and the Smartphone/PC will send this under following conditions.

1. Smartphone will send this once the application completes the connection process with the UWBT device.
2. PC will send this request once it is connected to UWBT device.

Read Device Settings String Format (PC/Smartphone)

%0 0 501<CR>

UWBT Device Response To Read Device Settings String

On receiving this string from Smartphone the UWBT device sends Device settings frame

Packet Header	SA	DA	Command		Length	Byte 1 – Byte 2	Byte 3	Byte 4	Byte 5	Byte 6 - Byte 7	Byte 8 - Byte 9
0xA5	0x00	0x00			0x2F	Firmware version	UWBT Device model	Sensor Type	Sensor Subtype	Temperature Zero Offset correction	pH/RH Zero Offset Correc-tion Value

Byte 10 -Byte 11	Byte12 - Byte 13	Byte 14 - Byte 15	Byte 16 - Byte 17	Byte 18 -Byte 19	Byte 20 - Byte 21	Byte 22	Byte 23	Byte 24
Temperature Low alarm value	RH or pH low alarm value	Temperature High alarm value	RH or pH High alarm value	Temperature dead band value	RH or pH dead band value	Engineering unit & RTC set status	Sampling Rate	Temperature coefficient type for RTD/ Temp Model

Table 10-4. Frame Format Of Read Device Settings

Byte 25	Byte 26 - Byte 27	Byte 28	Byte 29	Byte 30	Byte 31	Byte 32 – Byte 47	Checksum
RTD sensor present status for pH/Temp model	RTD temperature value for pH/ Temp Model	Reserved	UWBT-L Device internal logging interval value	UWBT-L Device internal logging Status	UWBT-L Device (Log) Circular buffer Enable/ Disable	Device Serial number	-

Table 10-4. Frame Format Of Read Device Settings Cont.

Field Descriptions:

Field	Values And Description
Byte 1 – Byte 2	These two bytes represents the Firmware Version of UWBT device. E.g. Consider the Firmware version as 1.01 Now multiply 1.01 by 100 to convert into integer and then calculate the hex value. In this case the hex value is 0x0065
Byte 3	1 -UWBT Device
Byte 4	1 -Thermocouple 2 -RTD 3 -pH 4 -RH
Byte 5	For Thermocouple Model, the value ranges from 1 to 9 for the sensor subtypes J, K, T, E, R, S, B, C and N accordingly. For RTD Model, the value ranges from 1 to 2 for the sensor subtypes PT100 and PT1000. For pH/Temp Model and RH/Temp Model the value is 0.
Byte 6 – Byte 7	Temperature Zero Offset correction Value. This offset correction is common for Thermocouple, RTD and pH/Temp Model (If RTD is present). E.g. Consider user set the zero offset temperature as -1.6° F. Now multiply -1.6 by 10 to convert into integer and then calculate the hex value. In this case hex value is 0xFFF0.

Table 10-5. Read Device Settings Frame Field Description

Field	Values And Description
Byte 8 – Byte 9	Data bytes for pH/RH Model is calculated as shown in the example. (Refer Note: 1) E.g. for pH Model Consider user set the pH value as 12.01 Now multiply 12.01 by 100 to convert into integer and then calculate the hex value. In this case the hex value is 0x4B1. E.g. for RH Model Consider user set the RH value as 25.2 Now multiply 25.2 by 10 to convert into integer and then calculate the hex value. In this case the hex value is 0x00FC. For Temp Model these bytes are always Zero.
Byte 10 – Byte11	These bytes are common for Thermocouple Model, RTD Model, RH/ Temp Model and pH/Temp Model temperature low alarm value. Note: RH/Temp Model and pH/Temp Model have temperature measurement for temperature related compensation. E.g. Consider user set the low alarm temperature as 100.0°F. Now multiply 100.0 by 10 to convert into integer and then calculate the hex value. In this case hex value is 0x03E8.
Byte 12 – Byte 13	Low Alarm (Refer Note: 1) E.g. for pH Model Consider user set the low alarm ph value as 10.50 Now multiply 10.50 by 100 to convert into integer and then calculate the hex value. In this case hex value is 0x041A. E.g. for RH Model Consider user set the low alarm ph value as 30.5 Now multiply 30.5 by 10 to convert into integer and then calculate the hex value. In this case hex value is 0x0131.
Byte 14 – Byte 15	These bytes are common for Thermocouple Model, RTD Model, RH/ Temp Model and pH/Temp Model temperature High alarm value. Note: RH/Temp Model and pH/Temp Model have temperature measurement for temperature related compensation. E.g. Consider user set the High alarm temperature as 100.0° F. Now multiply 100.0 by 10 to convert into integer and then calculate the hex value. In this case hex value is 0x03E8.

Table 10-5. Read Device Settings Frame Field Description Cont.

Field	Values And Description
Byte 16 – Byte 17	High Alarm (Refer Note: 1) E.g. for pH Model Consider user set the low alarm ph value as 12.50 Now multiply 12.50 by 100 to convert into integer and then calculate the hex value. In this case hex value is 0x04E2. E.g. for RH Model Consider user set the low alarm ph value as 80.4 Now multiply 80.4 by 10 to convert into integer and then calculate the hex value. In this case hex value is 0x0324.
Byte 18 - Byte 19	These bytes are common for Thermocouple Model, RTD Model, RH/ Temp Model and pH/Temp Model sensor temperature Dead band value. E.g. Consider user set the temperature dead band value as 10.0° F. Now multiply 10.0 by 10 to convert into integer and then calculate the hex value. In this case hex value is 0x0064.
Byte 20 – Byte 21	Dead band value for pH/RH Dead band for pH/RH Model has two byte values as described below E.g. for pH Model Consider user set the dead band value as 10 Now multiply 10 by 100 to convert into integer and then calculate the hex value. In this case hex value is 0x03E8. E.g. for RH Model Consider user set the dead band value as 13 Now multiply 13 by 10 to convert into integer and then calculate the hex value. In this case hex value is 0x0082
Byte 22	Bit 2 to Bit 0 001 – Engineering unit 'F' 010 – Engineering unit 'C' 011 – Engineering unit 'R' 100 – Engineering unit 'K' Bit 3 0 – RTC NOT updated 1 – RTC updated

Table 10-5. Read Device Settings Frame Field Description Cont.

Field	Values And Description
Byte 23	Sampling interval, 1 - for 10samples/1sec 2 - for 1sample/1sec 3 - for 1sample/10sec 4 - for 1sample/30sec 5 - for 1sample/60sec
Byte 24	For Thermocouple Model, RH/Temp Model and for pH/Temp Model will have value 0. For RTD Model has following values possible 1- American Curve 2- European Curve
Byte 25	For Thermocouple Model, RTD Model and for RH/Temp Model has value 0. And for pH/Temp Model the following value is possible 0 - RTD sensor not present 1 - RTD sensor present
Byte 26 – Byte 27	For Thermocouple Model, RTD Model and for RH/Temp Model will have value 0. And for pH/Temp Model if RTD sensor is not present then these bytes will have the user set temperature value
Byte 28	Reserved
Byte 29	UWBT internal logging interval, 1 - for 10samples/1sec 2 - for 1sample/1sec 3 - for 1sample/10sec 4 - for 1sample/30sec 5 for 1sample/60sec
Byte 30	Gives the information about the UWBT-L Device internal logging status. 0 – Internal logging OFF 1 - Internal logging ON For UWBT Device (Basic model), the byte is 0 and this byte will not be considered in Smartphone.
Byte 31	Log Circular buffer Enable/Disable 0 – Circular buffer Disable 1 – Circular buffer Enable (Default condition
Byte 32 – Byte 47	Device serial number These fields contain Alphanumeric values.

Note 1: In pH Model, for example if the user sets the dead band / Low alarm / High alarm values as 12, the application should send the value as 12.00

Table 10-5. Read Device Settings Frame Field Description Cont.

10.3.3 Write Device Settings

This frame is used by the Smartphone/PC to write user settings to the UWBT Device.

Write Device Settings String format (PC/Smartphone)

%0 0 502 <18 elements><CR>

E.g.

Element 1	- Sensor subtype	(1 Byte)
Element 2	- Temperature Zero Offset correction Value	(2 Bytes)
Element 3	- pH/Temp Model Zero Offset correction Value	(2 Bytes)
Element 4	- Temperature Low alarm value	(2 Bytes)
Element 5	- RH or pH low alarm value	(2 Bytes)
Element 6	- Temperature High alarm value	(2 Bytes)
Element 7	- RH or pH High alarm value	(2 Bytes)
Element 8	- Temperature dead band value	(2 Bytes)
Element 9	- RH or pH dead band value	(2 Bytes)
Element 10	- Engineering unit & RTC set status	(1 Byte)
Element 11	- Sampling Rate	(1 Byte)
Element 12	- Temperature coefficient type for RTD	(1 Byte)
Element 13	- RTD sensor present status for pH/Temp model	(1 Byte)
Element 14	- RTD temperature value for pH/Temp Model	(2 Bytes)
Element 15	- Reserved	(1 Byte)
Element 16	- UWBT-L Device internal logging interval value	(1 Byte)
Element 17	- UWBT-L Device internal logging ON/OFF	(1 Byte)
Element 18	- UWBT-L Circular buffer Enable/Disable	(1 Byte)
Element 19	- Date	(1 Byte)
Element 20	- Month	(1 Byte)
Element 21	- Year	(1 Byte)
Element 22	- Hour	(1 Byte)
Element 23	- Minute	(1 Byte)
Element 24	- Seconds	(1 Byte)

Note: For Element values, Pl. Refer Field description of the Read Device Settings frame.

UWBT Device Response To Write Device Settings String

On receiving this string, the UWBT device sends Acknowledgement.

10.3.4 Read Live Data

This frame is used to initiate the device to send the Live data. On sending this frame consecutively the UWBT device sends the Live data to Smartphone.

Read Live Data String Format (Smartphone)
%0 0 503<CR>

UWBT Device Response To Read Live Data String

Packet Header	SA	DA	Command	Length	Byte 1	Byte 2	Byte 3 - Byte 4	Byte 5 - Byte 6	Byte 7 - Byte 8	Byte 9	Check-sum
0xA5	0x00	0x00									

Table 10-6. Frame Format Of Read Live Data

The length field varies as per the device type and are mentioned below

Thermocouple board - 0x05
RTD board - 0x05
pH with RTD - 0x07
RH board - 0x09

Field Descriptions:

Field	Values And Description
Byte 1	Bit 0 – Indicates low alarm for Temperature value(for all sensor models) Bit 1 - Indicates High alarm for Temperature value (for all sensor models) Bit 2 - Indicates low alarm for pH or RH value (Thermocouple Model and RTD Model will have the value 0) Bit 3 - Indicates high alarm for pH or RH value (Thermocouple Model and RTD Model will have the value 0) Bit4 – Indicates Temperature Sensor out of range. Possible values are 0 – No alarm detected 1 – Alarm detected Bit 5 – Indicates Temperature Sensor Open status. Possible values are 0 – Sensor NOT open 1 – Sensor Open Bit 6 – Indicates pH/RH Sensor Open status Possible values are 0 – pH/RH Sensor NOT Open 1 – pH/RH Sensor Open Bit 7 – Indicates pH/RH Sensor out of range. Possible values are 0 – pH/RH Sensor not in out of Range 1 – pH/RH Sensor Out of Range

Table 10-7. Field Description Of Live Data Frame

Field	Values And Description
Byte 2	Bit 6 – Bit 0 This byte indicates the Battery charge level in %. Bit 7 – indicates Battery Charger Status Possible value 0 – Charger not connected 1 – Charger connected
Byte 3 – Byte 4	These bytes will have the measured temperature data for Thermocouple Model, RTD Model or Compensation temperature for RH/Temp Model and pH/Temp Model.
Byte 5 – Byte 6	**TC & RTD Board** Byte 6 does not exist Byte 5 - Indicates End of Memory status Possible values 0x80 - End Of Memory 0x00 - Memory available for Record storage **pH Board** It holds the 16 bit pH value for pH/Temp Model **RH Board** It Holds 8 bit RH values for RH/Temp Model. MSB byte(Byte 5) is always 0
Byte 7 – Byte 8	**TC & RTD Board** These bytes do not exist **pH Board** Byte 8 does not exist Byte 7 - Indicates End Of Memory status Possible values 0x80 - End Of Memory 0x00 - Memory available for Record storage **RH Board** It holds Dew point for RH board
Byte 9	**TC, RTD & pH Boards** These bytes do not exist **RH Board** Byte 9 - Indicates End Of Memory status Possible values 0x80 - End Of Memory 0x00 - Memory available for Record storage

Table 10-7. Field Description Of Live Data Frame Cont.

If sensor out of range indication is sent to the Smartphone, it has to request the Device health frame to identify whether the sensor value has really gone out range or due to sensor open/short condition.

10.3.5 Download Records – 5 Blocks

Download Records string format (PC/Smartphone)

%0 0 504 <Block No><CR>

UWBT device response to Download Records string

Packet Header	SA	DA	Command		Length	Byte 1	Byte 2	Byte 1280	Checksum
0xA5	0x00	0x00			-	-	-	-	

Table 10-8. Frame Format Of Download Records – 5 Blocks

In this frame, the length represents 5 pages. Length field 0x05 indicates 5 pages of data, i.e. 1280 bytes.

10.3.6 Download Records

UWBT Device supports internal logging up to 128 Kbytes. Smartphone/PC can download the UWBT Device internal logged data using this frame.

Download Records String format (PC/Smartphone)

%0 0 505<Block No><CR>

UWBT device response to Download Records string

Packet Header	SA	DA	Command		Length	Byte 1	Byte 2	Byte 256	Checksum
0xA5	0x00	0x00			-	-	-	-	

Table 10-9. Frame Format Of Download Records

In this frame, the length represents page. Length field 0x01 indicates 1 page data, i.e. 256 bytes.

10.3.7 Restore Factory Default

The Smartphone sends this frame, if the factory settings need to be restored.

Restore Factory Default String Format (PC/Smartphone)

%0 0 506<CR>

UWBT Device Response To Restore Factory Default String

The response to this request is similar to UWBT device response to Read Device Settings string.

10.3.8 Get MAC Address And Alias Name

This frame is used to read the UWBT device alias name and MAC address.

Get MAC Address And Alias Name String Format (PC)

%0 0 508<CR>

UWBT Response To Device Name And MAC Address String

Packet Header	SA	DA	Command		Length	Byte 1 - Byte 12	Byte 13 - Byte 33	Checksum
0xA5	0x00	0x00			0x20	MAC address	Device alias name	

Table 10-10. Frame Format Of Get MAC Address And Alias Name

Field Descriptions:

Field	Values And Description
Byte 1 – Byte 12	MAC address holds the 12 alphanumeric value
Byte 13 – Byte 33	Device alias name can be set up to 20 alphanumeric value

Table 10-11. Field Description Of Get MAC Address And Alias Name

10.3.9 Erase Log Memory

This frame is used to Erase the Log memory of UWBT device.

Erase Log memory string format (PC)

%0 0 512<CR>

UWBT response to Erase Log memory

Packet Header	SA	DA	Command		Length	Byte 1	Checksum
0xA5	0x00	0x00			0x01	–	

Table 10-12. Frame Format Of Erase Log Memory

On receiving this string, the UWBT device sends Acknowledgement.

10.3.10 Set Device Name

This frame is used by Smartphone/PC to enter the device name to the UWBT device.

Set Device Name String Format (PC/Smartphone)

%0 0 513 <20 Elements><CR>

Elements 1 – 20 can be alphanumeric values.

E.g., %0 0 513 T h e r m o c o u p l e <CR>

UWBT Response Set Device Name String

On receiving this string, UWBT device sends Acknowledgement.

10.3.11 Get Device Health

The Master will send this request every 30sec to get the Battery status and the Bluetooth signal strength.

Get Device Health String Format (Smartphone)

%0 0 5001 2<CR> - Device health request in which the UWBT device will send valid RSSI value

UWBT Response To Get Device Health String

Packet Header	SA	DA	Command		Length	Byte 1	Byte 2	Byte 3
0xA5	0x00	0x00			0x07	Battery voltage	Battery charge in %	Battery charge status

Byte 4	Byte 5 - Byte 6	Byte 7	Checksum
Device settings modified by PC	–	Bluetooth signal strength	

Table 10-13. Frame Format Of Get Device Health

Field Descriptions:

Field	Values And Description
Byte 1	This field indicates the Battery voltage. E.g. Consider the Battery voltage as 3.3V Now multiply 3.3 by 10 to convert into integer and then calculate the hex value. In this case the hex value is 0x21
Byte 2	This byte represents the Battery charge level in %.
Byte 3	This byte indicates the Battery status. Bits 3 to Bits 0 holds the Charging indication 0xX1 – Charging in progress 0xX2 – Fully Charged 0xX3 – Discharging Bit7 0 - Memory available for Logging 1 - End of Log memory
Byte 4	0x00 – Device settings NOT modified by PC 0x01 – Device settings modified by PC

Table 10-14. Field Descriptions

Field	Values And Description
Byte 5 – Byte 6	0x00, 0x00 – No Error 0x00, 0x01 – Battery Fault 0x00, 0x02 – Temperature sensor open (for all sensor models, even for pH/Temp Model and RH/Temp Model has temperature sensor for compensation) 0x00, 0x04 – Temperature sensor short (for all sensor models, even for pH/Temp Model and RH/Temp Model has temperature sensor for compensation) 0x00, 0x08 – pH or RH sensor open (pH/Temp Model and RH/Temp Model only) 0x00, 0x10 – pH or RH sensor short (pH/Temp Model and RH/Temp Model only) 0x00, 0x20 – Bluetooth module fault (Health status can be logged, but cannot send to any Info to Smartphone) 0x00, 0x40 – EEPROM failure 0x00, 0x80 – Real time clock failure 0x01, 0x00 – Key malfunction 0x02, 0x00 – Charger failure
Byte 7	This field gives the Bluetooth signal strength in %

Table 10-14. Field Descriptions Cont.

10.3.12 End Of Memory Status

PC application sends this string when enabling internal logging to get the status of End of memory

End Of Memory Status Frame Format (PC)

%0 0 514<CR>

UWBT Response To End Of Memory Status String

On receiving this string, the UWBT device sends Acknowledgement

10.3.13 PC Application Disconnect

When the PC application is disconnected, the PC application Disconnect string will be sent to the UWBT device.

PC Application Disconnect Frame Format (PC)

%0 0 515<CR>

UWBT Response To PC Application Disconnect String

On receiving this string, the UWBT device sends Acknowledgement.

Section 11 - Data Logging

11.1. Data Logging (LOG)

Data logging module is responsible for data recording into the EEPROM of the UWBT device, the logged data is further made available for retrieving through the USP (User Smart Phone) or PC for the End-User processing. This module interacts directly with RTC & EADC drivers to obtain Date/Time stamp and processed sensor data respectively. Thus stored data shall be retrieved by SIA (Smart Phone Interface Application) or PIA (PC Interface Application) modules based on necessity for transmitting to USP or PC.

The UWBT is classified into four types based on the type of sensor interfaced to it. The sensor inputs are handled by the DAL (Data Acquisition & Logging) application. Possible sensor interfaces for which the device is design are

- Thermocouple
- RTD
- pH
- RH

The available Sensor Sampling Rate ranges from 10 samples/sec max to 1 sample/minute min.

11.1.1. EEPROM Memory Allocation and Record Format

The UWBT Device utilizes 128KB of serial EEPROM for recording the sensor specific data and device configuration parameters. The EEPROM data will be grouped as blocks of records for storing long hours of data. A record block (256 bytes) format at 128K EEPROM is represented in the table below.

	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07
0x00	Number of Records	Record Interval	Day	Month	Year	Hour	Min	Sec
0x01	Block Stamp High	Block Stamp Low	Record Size	R	R	R	R	R
0x02	R	R	R	R	R	R	R	R
0x03	R	R	R	R	R	R	R	R
0x04	R	R	R	R	R	R	R	R
...	R	R	R	R	R	R	R	R
0x1F	R	R	R	R	R	R	CRC	CRC

Table 11-1: Allotment of Location for Each Record Block

- Each record block as size of 256 bytes, contains the headers for Date & Time stamp, Number of Records, Record interval, Block Stamp and Record Size for reconstructing the records at later stage
- The calculated CRC is placed in the last two bytes

The 'Record Interval' stores sensor subtype of Thermocouple or RTD based on the configuration of the device. The record Interval byte details are given in the table below.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Description
X	X	X	X	X	0	0	1	10 samples/1 second
X	X	X	X	X	0	1	0	1 sample/1 second
X	X	X	X	X	0	1	1	1sample/10 seconds
X	X	X	X	X	1	0	0	1 sample/30 seconds
X	X	X	X	X	1	0	1	1 sample/60 seconds
X	X	X	X	1	X	X	X	Indication for start of fresh logging
For TC Board Only								
0	0	0	1	X	X	X	X	J Type thermocouple
0	0	1	0	X	X	X	X	K Type thermocouple
0	0	1	1	X	X	X	X	T Type thermocouple
0	1	0	0	X	X	X	X	E Type thermocouple
0	1	0	1	X	X	X	X	R Type thermocouple
0	1	1	0	X	X	X	X	S Type thermocouple
0	1	1	1	X	X	X	X	B Type thermocouple
1	0	0	0	X	X	X	X	C Type thermocouple
1	0	0	1	X	X	X	X	N Type thermocouple
For RTD Board Only								
0	1	X	X	X	X	X	X	PT100 type RTD
1	0	X	X	X	X	X	X	PT1000 type RTD
X	X	0	1	X	X	X	X	American curve
X	X	1	0	X	X	X	X	European curve

Table 11-2: Allotment Bits of Fields at Record Interval

The number of record blocks in the 128K EEPROM is projected in the table below.

	256	256	256	256	256	256	256	256
0x00	System Variables	System Variables	Reserved					
0x01	R_Block1	R_Block2	R_Block3	R_Block4	R_Block5	R_Block6	R_Block7	R_Block8
0x02	R_Block9	R_Block10	R_Block11	R_Block12	R_Block13	R_Block14	R_Block15	R_Block16
0x03	R_Block17	R_Block18	R_Block19	R_Block20	R_Block21	R_Block22	R_Block23	R_Block24
…	R_Block..	R_Block..	R_Block..	R_Block..	R_Block..	R_Block..	R_Block..	R_Block..
0x3F	R_Block 497	R_Block498	R_Block499	R_Block500	Reserved	Circular Buffer End Point	Reserved	Reserved

Table 11-3: Allotment of Blocks at 128K EEPROM

- The blocks 1 and 2 (512 Bytes) are allotted for UWBT system variables.
- The block 510 (256 Bytes) is used to store the Circular buffer end point of last stored log data
- The block 3 to 8 and 509, 511 and 512 (2.25 KB) are reserved for future expansion.
- The thermocouple uses two bytes for storing the temperature data (RecordSize = 2).
- The RTD sensor uses two bytes for storing the temperature (RecordSize = 2).
- The RH sensor uses six bytes for storing the RH, dew point and temperature data (RecordSize = 6).
- The pH sensor uses four bytes for storing the pH and temperature data (RecordSize = 4).
- For example @RecordInterval_10Sec and @RecordSize_2, each R_Block may store around 20 minutes of records. The 500 of R_Block may store around (500x20=10000min=166.6Hours=)6.94Days of data.
- For example @RecordInterval_1Min and @RecordSize_2, each R_Block may store around 120 minutes of record.500 of R_Block may store around (500x120=60000min=1000Hours)41.66Days of data
- The records will be collected and stored at user set time interval (Min=10Sample\Sec. Max=1Sample \ Min).
- The Record block must be in circular buffer format, and the END circular buffer pointers must be stored in the EEPROM.
- A separate field is allotted in “Write Device Settings” communication frame, which provides option for enabling / disabling circular buffer. When circular buffer is disabled, the firmware will not over write the data at EPPROM blocks.
- The device memory will have a circular buffer. If memory space runs out on the device, it will overwrite the earliest data points in order to have most current data available to the user.
- Logging will be active until the stop request from Smartphone or PC. When the EEPROM memory exceeds the level, data will be overwriting from the starting location by using the circular buffer concept. Therefore, we have the latest sensor data to be stored in the EEPROM.
- If UWBT device circular buffer is off then the data logging stops after writing into 500th block of EEPROM memory.

11.1.2. Records Storage Space and Time Calculation

Records storage space and time calculations are illustrated in table below.

TC/RTD Sensor							
Samples	Record Size	Per Block Records	500 Block Records	Time in Seconds	Time in Minutes	Time in Hours	Day
100mS	2	120	60000	6000	100	1.67	0.069
1Sec	2	120	60000	60000	1000	16.67	0.694
10Sec	2	120	60000	600000	10000	166.67	6.944
30Sec	2	120	60000	1800000	30000	500.00	20.833
1min	2	120	60000	3600000	60000	1000.00	41.667
RH Sensor							
Samples	Record Size	Per Block Records	500 Block Records	Time in Seconds	Time in Minutes	Time in Hours	Day
100mS	6	40	20000	2000	33	0.56	0.023
1Sec	6	40	20000	20000	333	5.56	0.231
10Sec	6	40	20000	200000	3333	55.56	2.315
30Sec	6	40	20000	600000	10000	166.67	6.944
1min	6	40	20000	1200000	20000	333.33	13.889
PH Sensor							
Samples	Record Size	Per Block Records	500 Block Records	Time in Seconds	Time in Minutes	Time in Hours	Day
100mS	4	60	30000	3000	50	0.83	0.035
1Sec	4	60	30000	30000	500	8.33	0.347
10Sec	4	60	30000	300000	5000	83.33	3.472
30Sec	4	60	30000	900000	15000	250.00	10.417
1min	4	60	30000	1800000	30000	500.00	20.833

Table 11-4: Records Storage Space and Time

11.1.3. Data Logging DFD

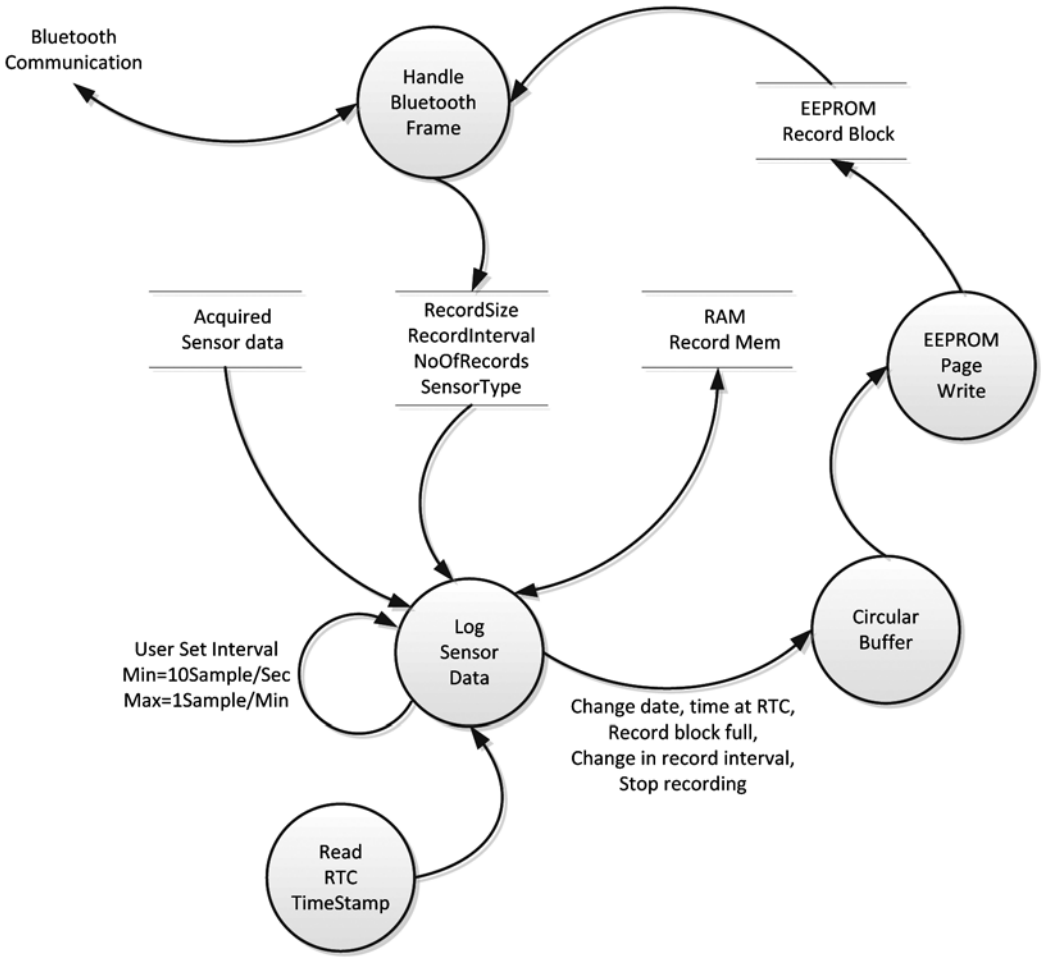


Figure 11-1: Data Logging Data Flow Diagram

- Whenever the record block is full or Power down event has occurred or stop recording has happened, then the firmware will write the current record block into the EEPROM.
- Also, whenever start recording event is initiated the application will start with fresh record block.
- After UWBT device Power up, the device starts with “internal log off” state.

11.1.4. Logged Data Recovery Communication Frames

Two command frames are defined for recovering data from EEPROM. They are Download Record Blocks (504) and Download Records (505).

11.1.4.1. Download Record

The UWBT Device supports internal logging up to 125 Kbytes. The PC application can download internally logged data from the UWBT Device using this frame.

Download Records string format (from Smartphone)

%0 0 505 <Block_Number><CR>

UWBT device response to Download Records

0xA5	0x00	0x00	0x01	0xF9	0x01	B1	B2	….	B256	Checksum

- In this frame, the length represents page. Length field 0x01 indicates 1 page data, i.e. 256 bytes.

Note: For Download Record & Download Record Blocks (5 Blocks or 3 Blocks) the below condition & response are common.

- The UWBT will respond only once for Smartphone command request. Any request from the host device, will be acknowledged and responded
- Based on time stamp, Number Of Records, Block Stamp and Record Size the Smart phone will reconstruct the sensor logged records

11.1.4.2. Download Record Blocks (5 Blocks)

The Smartphone (Android application) can download internal logged data from the UWBT Device in terms of 5 blocks, with the help of this frame.

Download Record Blocks string format (from Smartphone)

%0 0 504 <Number><CR>

UWBT device response to Download Records

0xA5	0x00	0x00	0x01	0xF8	0x05	B1	B2	…	B1280	Checksum

- In this frame, the Length is represented in multiples of five pages. Length field 0x05 indicates 5 page records, i.e. 1280 bytes.

11.1.4.3. Download Record Blocks (3 Blocks)

The Smartphone (iOS application) can download internal logged data from the UWBT Device in terms of 3 blocks, with the help of this frame.

Download Record Blocks string format (from Smartphone)

%0 0 509 <Number><CR>

0xA5	0x00	0x00	0x01	0xFD	0x03	B1	B2	…	B768	Checksum

UWBT device response to Download Records

In this frame, the Length is represented in multiples of three pages. Length field 0x03 indicates 3 page records, i.e. 768 bytes.

11.1.5. Approximate Download Time Calculation.

- The data will be downloaded at a baud-rate of 115200 bps, at 8N1
- Communication time per Byte is (9 bits), = 78.125uS
- Communication time per Block is (256+8 = 264Bytes) = 20625 uS = 20.625 mS
- Communication time per 500 blocks is = 10312.5 mS = 10.3125 Sec
- Estimated processing time at the Smartphone end and in the UWBT device is approximately 150% of the time taken for data communication
- Approximate data download time = 10.3125+15.46875= 25.78125 sec

11.1.6. Circular Buffer

- Circular buffer has 500 blocks of data.
- If internal log memory is not erased, then "download request" from USP /PC application, will always downloads/receives 500 blocks of UWBT logged data.
- Else the UWBT device replies "Device Memory Empty" acknowledgement.
- The USP / PC application will decode UWBT logged data and then splits into files, in accordance with log sessions.

11.1.6.1. Circular Buffer Off – Single Session

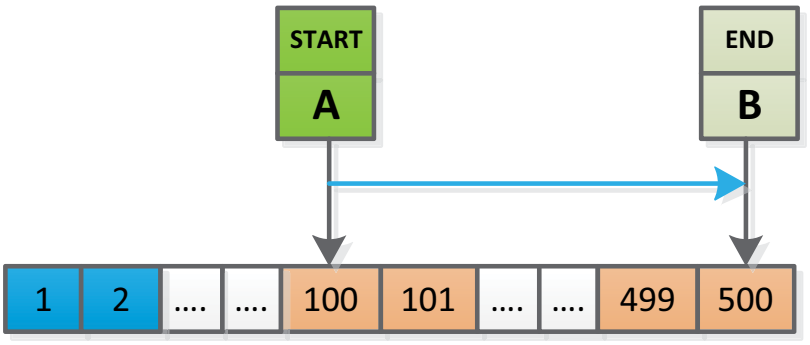


Figure 11-2: Circular Buffer Off – Single Session

- The session starts at point A (100th block), and ends at point B (500th block).
- While downloading, the USP receives, 1st Block (oldest data) first and 500th Block (newest data) at the end. The receiving block order should be (1 to 500).
- Since circular buffer is off, the log will end at Point B, and "End of Memory" indication will be shown at Point B.

11.1.6.2. Circular Buffer Off – Multi Session

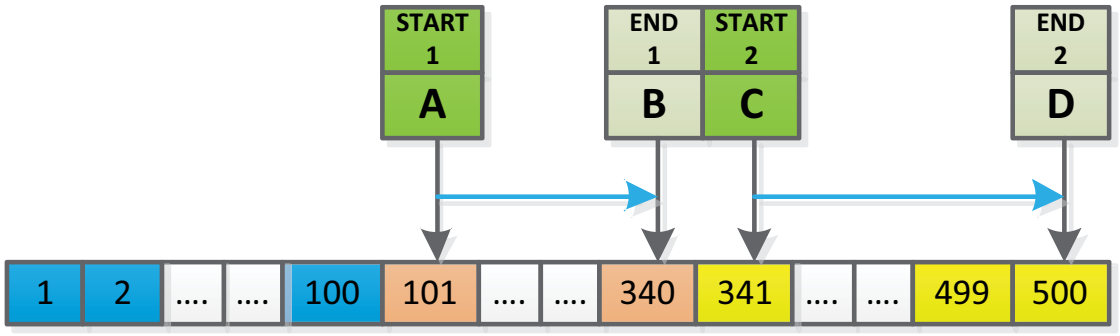


Figure 11-3: Circular Buffer Off – Multi Session

- For multi session example, the session starts at point A and C, and ends at point B and D.
- While downloading, the smart phone receives, 1st Block (oldest data) first and 500th Block (newest data) at the end. The receiving block order should be (1 to 500).
- Since circular buffer is off, the log will end at Point D, and "End of Memory" indication will be shown at Point D.

11.1.6.3. Circular Buffer ON – Single Session – Memory Not Overlapped

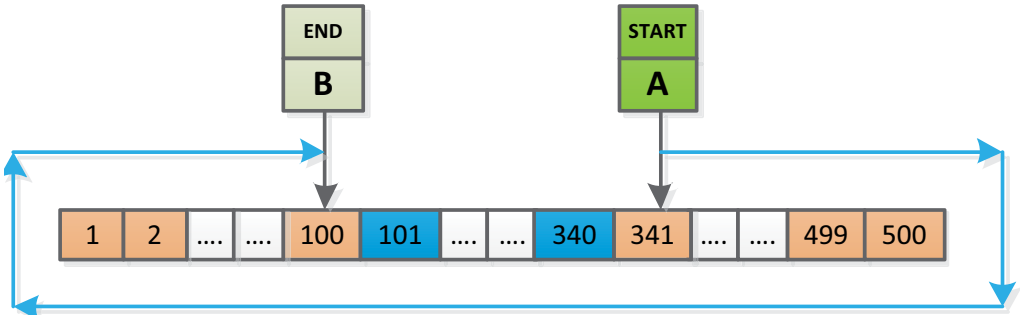


Figure 11-4: Circular Buffer ON – Single Session – Memory Not Overlapped

- The session starts at point A (341st block), and ends at point B (100th block).
- While downloading, the smart phone receives, 101st Block (oldest data) first and 100th Block (newest data) at the end. The receiving block order should be (101 to 500 and 1 to 100).
- The blocks 101 to 340 contain old data.
- Since circular buffer is on, the log will not end at 500th block.

11.1.6.4. Circular Buffer ON – Single Session – Memory Overlapped

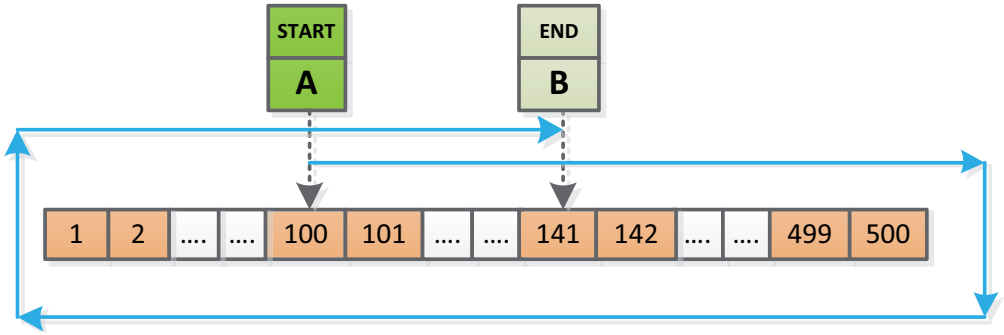


Figure 11-5: Circular Buffer ON – Single Session – Memory Overlapped

- The session starts at point A (100th block), and ends at point B (141st block).
- While downloading, the smart phone receives, 142nd Block (oldest data) first and 141st Block (newest data) at the end. The receiving block order should be (142 to 500 and 1 to 141).
- Since circular buffer is on, the log will not end at 500th block.
- The Blocks 100 to 140 will be over written by new data.

11.1.6.5 Circular Buffer ON – Multi Session – Memory Not Overlapped

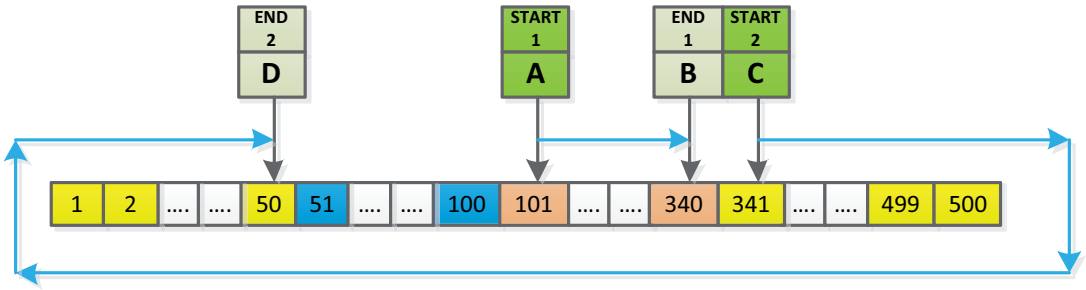


Figure 11-6: Circular Buffer ON – Multi Session – Memory Not Overlapped

- The session starts at point A, C and ends at point B,D.
- While downloading, the smart phone receives, 51st Block (oldest data) first and 50th Block (newest data) at the end. The receiving block order should be (51 to 500 and 1 to 50).
- Since circular buffer is on, the log will not end at 500th block.
- The first session will be placed at blocks 101 to 340.
- The Second session will be placed at blocks 341 to 500 and 1 to 50.
- The blocks 51 to 100 contain old data.

11.1.6.6. Circular Buffer ON – Multi Session – Memory Overlapped

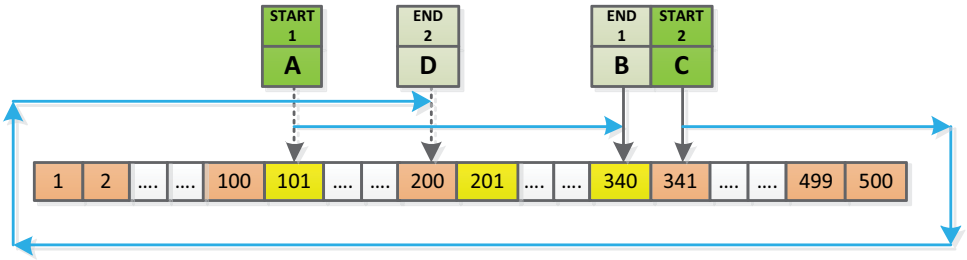


Figure 11-7: Circular Buffer ON – Multi Session – Memory Overlapped

- The session starts at point A, C and ends at point B, D.
- While downloading, the smart phone receives, 201st Block (oldest data) first and 200th Block (newest data) at the end. The receiving block order should be (201 to 500 and 1 to 200).
- Since circular buffer is on, the log will not end at 500th block.
- The first session will be placed at blocks 101 to 340.
- The first session blocks 101 to 200 are over written by second session.
- The Second session will be placed at blocks 341 to 500 and 1 to 200.

11.1.6.7. Erase EEPROM and End of Memory Indication

- Whenever the USP / PC application writes “Internal logging - On” and “Circular buffer – Off”, then the UWBT device will start the device internal logging. If internal memory is full then “End of Memory” indication will be shown. This situation the UWBT device will set the “Internal logging - Off”.
- Whenever the USP / PC application requests for erasing UWBT EEPROM log memory, then the UWBT device will erase, only when “Internal logging is Off”. And then it will clear the “End of Memory” indication.
- Whenever the USP / PC application selects “Circular buffer – On” option, then the UWBT device will clear the “End of Memory” indication.

Whenever the USP / PC application writes “Internal logging - On” and “Circular buffer – On”, then the UWBT device will clear the “End of Memory” indication and will starts the device logging.

Appendix A: UWBT-RH Sensor Information

A.1 Accuracy

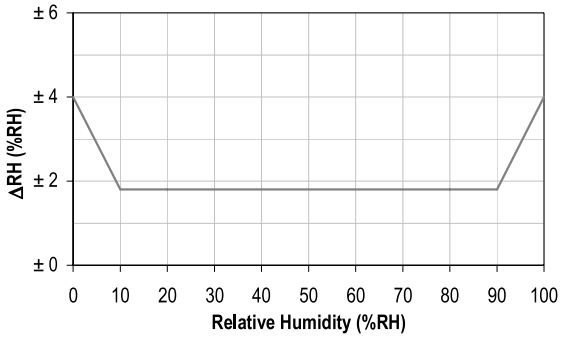


Figure A-1. RH Accuracy Chart

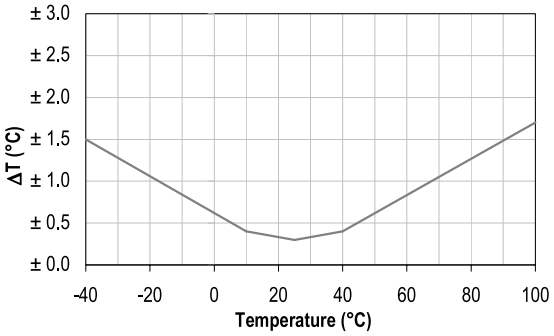


Figure A-2. Temperature Accuracy Chart

Accuracies are tested at Manufacturer's Outgoing Quality Control at 25°C (77°F) and 3.3V. Values exclude hysteresis and non-linearity, and is only applicable to noncondensing environments.

A.2 Operating Conditions

Sensor works stable within recommended normal range – see Figure. Long term exposures to conditions outside normal range, especially at humidity >80%RH, may temporarily offset the RH signal (+3 %RH after 60h). After return to normal range it will slowly return towards calibration state by itself. See Section H.4 "Reconditioning Procedure" to accelerate eliminating the offset. Prolonged exposure to extreme conditions may accelerate aging.

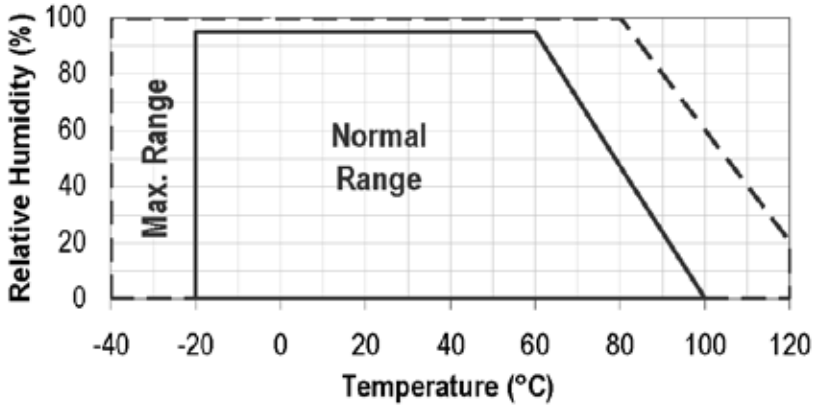


Figure A-3. Normal Range

A.3 Storage Conditions and Handling Instructions

It is of great importance to understand that a humidity sensor is not a normal electronic component and needs to be handled with care.

Chemical vapors at high concentration in combination with long exposure times may offset the sensor reading. For these reasons it is recommended to store the sensors in original packaging including the sealed ESD bag at following conditions: Temperature shall be in the range of 10°C – 50°C (0 – 80°C for limited time) and humidity at 20 – 60%RH (sensors that are not stored in ESD bags). For

sensors that have been removed from the original packaging we recommend to store them in ESD bags made of PE-HD8.

In manufacturing and transport the sensors shall be prevented of high concentration of chemical solvents and long exposure times. Out-gassing of glues, adhesive tapes and stickers or out-gassing packaging material such as bubble foils, foams, etc. shall be avoided. Manufacturing area shall be well ventilated.

A.4 Reconditioning Procedure

As stated above extreme conditions or exposure to solvent vapors may offset the sensor. The following reconditioning procedure may bring the sensor back to calibration state:

Baking: 100 – 105°C at < 5%RH for 10h

Re-Hydration: 20 – 30°C at ~ 75%RH for 12h.

(75%RH can conveniently be generated with saturated NaCl solution. 100 – 105°C correspond to 212 – 221°F, 20 – 30°C correspond to 68 – 86°F)

A.5 Temperature Effects

Relative humidity reading strongly depends on temperature. Therefore, it is essential to keep humidity sensors at the same temperature as the air of which the relative humidity is to be measured. In case of testing or qualification the reference sensor and test sensor must show equal temperature to allow for comparing humidity readings.

The packaging of sensor is designed for minimal heat transfer from the pins to the sensor. Still, if the sensor shares a PCB with electronic components that produce heat it should be mounted in a way that prevents heat transfer or keeps it as low as possible. Furthermore, there are self-heating effects in case the measurement frequency is too high.

A.6 Light

The sensor is not light sensitive. Prolonged direct exposure to sunshine or strong UV radiation may age the housing.

A.7 Materials Used for Sealing/Mounting

Many materials absorb humidity and will act as a buffer increasing response times and hysteresis. Materials in the vicinity of the sensor must therefore be carefully chosen. Recommended materials are: Any metals, LCP, POM (Delrin), PTFE (Teflon), PE, PEEK, PP, PB, PPS, PSU, PVDF, PVF. For sealing and gluing (use sparingly): Use high filled epoxy for electronic packaging (e.g. glob top, underfill), and Silicone.

Out-gassing of these materials may also contaminate the sensor (see Section H.3). Therefore try to add the sensor as a last manufacturing step to the assembly, store the assembly well ventilated after manufacturing or bake at 50°C for 24h to outgas contaminants before packing.

Appendix B: pH vs. Temperature Table For UWBT-PH

Temperature	0°C	10°C	20°C	25°C	30°C	40°C	50°C	60°C	70°C	80°C	90°C
pH	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV
0	379.4	393.3	407.1	414	421	434.9	448.8	462.7	476.6	490.5	504.4
0.5	352.3	365.2	378.1	384.4	391	403.9	416.8	429.7	442.5	455.5	468.3
1	325.2	337.1	349	354.9	360.9	372.8	384.7	396.6	408.5	420.4	432.3
1.5	298.1	309	319.9	325.3	330.8	341.7	352.6	363.6	374.5	385.4	396.3
2	271	280.9	290.8	295.8	300.7	310.7	320.6	330.5	340.4	350.3	360.3
2.5	243.9	252.8	261.7	266.2	270.7	279.6	288.5	297.5	306.4	315.3	324.2
3	216.8	224.7	232.7	236.6	240.6	248.5	256.5	264.4	272.3	280.3	288.2
3.5	189.7	196.6	203.6	207	210.5	217.5	224.4	231.4	238.3	245.2	252.2
4	162.6	168.5	174.5	177.5	180.4	186.4	192.3	198.3	204.3	210.2	216.2
4.5	135.5	140.5	145.4	147.9	150.4	155.3	160.3	165.3	170.2	175.2	180.1
5	108.4	112.4	116.3	118.3	120.3	124.3	128.2	132.2	136.2	140.1	144.1
5.5	81.3	84.3	87.2	88.7	90.2	93.2	96.2	99.2	102.1	105.1	108.1
6	54.2	56.2	58.2	59.15	60.1	62.1	64.1	66.1	68.1	70.1	72.1
6.5	27.1	28.1	29.1	29.6	30.1	31.1	32.1	33.1	34	35	36
7	0	0	0	0	0	0	0	0	0	0	0
7.5	-27.1	-28.1	-29.1	-29.6	-31.1	-31.1	-32.1	-33.1	-34	-35	-36
8	-54.2	-56.2	-58.2	-59.15	-60.1	-62.1	-64.1	-66.1	-68.1	-70.1	-72.1
8.5	-81.3	-84.3	-87.2	-88.7	-90.2	-93.2	-96.2	-99.2	-102.1	-105.1	-108.1
9	-108.4	-112.4	-116.3	-118.3	-120.3	-124.3	-128.2	-132.2	-136.2	-140.1	-144.1
9.5	-135.5	-140.5	-145.4	-147.9	-150.4	-155.3	-160.3	-165.3	-170.2	-175.2	-180.1
10	-162.6	-168.5	-174.5	-177.5	-180.4	-186.4	-192.3	-198.3	-204.3	-210.2	-216.2
10.5	-189.7	-196.6	-203.6	-207	-210.5	-217.5	-224.4	-231.4	-238.3	-245.2	-252.2
11	-216.8	-224.7	-232.7	-236.6	-240.6	-248.5	-256.5	-264.4	-272.3	-280.3	-288.2
11.5	-243.9	-252.8	-261.7	-266.2	-270.7	-279.6	-288.5	-297.5	-306.4	-315.3	-324.2
12	-271	-280.8	-290.8	-295.8	-300.7	-310.7	-320.6	-330.5	-340.4	-250.3	-360.3
12.5	-298.1	-309	-319.9	-325.3	-330.8	-341.7	-352.6	-363.6	-374.5	-385.4	-393.3
13	-325.2	-337.1	-349	-354.9	-360.9	-372.8	-384.7	-396.6	-408.5	-420.4	-432.3
13.5	-352.3	-365.2	-378.1	-384.4	-391	-403.9	-416.8	-429.7	-442.5	-455.4	-468.3
14	-379.4	-393.3	-407.1	-414	-421	-434.9	-448.8	-462.7	-276.6	-490.5	-504.4

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by the company will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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