Wireless Temperature Maintenance Service-WTMS

User Guide

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1. WTMS: An Introduction

Wireless Temperature Maintenance Service (WTMS) includes a number of Sensors (Transmitters), a Receiver Module and Application software running in a PC connected to the Receiver . Application software receives the data transferred to the PC through Ethernet port by the WTMS Receiver Module, analyses and records the data in MS Access Database that can be viewed by the Graphical User Interface (GUI) of the WTMS Application Software.

CAUTION

USE ONLY NON-RECHARGEABLE LITHIUM BATTERY FOR SENSOR

This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

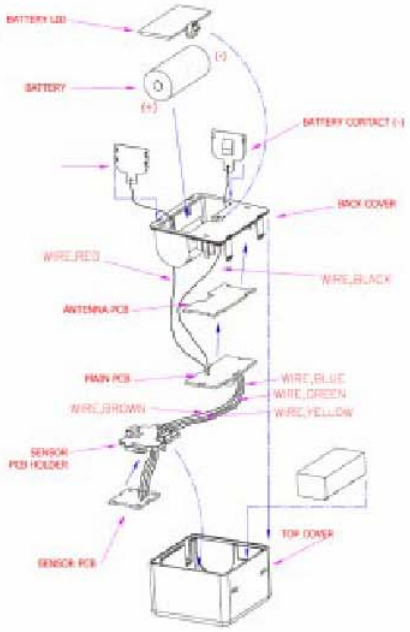
(1) this device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

Changes of modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

2. WTMS Sensors (Transmitters)

WTMS sensor can transmit data once in two minutes at 910MHz. Shown below are the main parts of a Sensor.



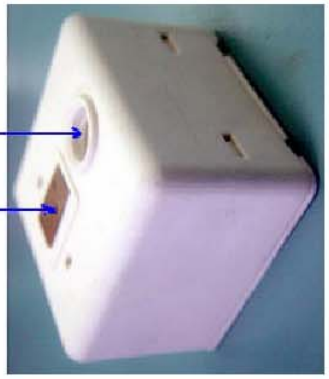
2.1. Inserting Battery

WTMS sensor works from a 3.6V Lithium Battery (2/3AA size). A lid is provided on the rear side of the sensor to insert the battery. Make sure that the battery polar ity is correct as per the sticker attached inside the battery compartment.
WTMS sensor will transmit one data immediately after power up and will continue to transmit data once in an interval of two minutes (maximum).

Caution:
- » The battery is not a rechargeable type. Attempts to recharge the battery may lead to explosion, heating up or electrolyte leakage.
- » Verify battery polarity before inserting it to the battery compartment.

2.2 Sensor Mounting

To accurately measure the temperature of a hot surface, the metal plate of the sensor should have a firm contact with the surface. Apply a layer of thermal joint compound on the metal plate of the sensor for better thermal conductivity. For fastening the sensor to the surface, a mounting hole is provided through which an M8 bolt can be inserted.



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3. WTMS Receivers

WTMS receiver works from a 4.5 V DC adaptor . It consists of an Ethernet port , RS-485 interface and an SMA connector to connect antenna.

Connect the Adapter to the DC input Socket. The Power LED will light when the DC Adapter is connected to the mains and is switched ON.

4. WTMS application Software

The WTMS software is to run on a dedicated machine. Otherwise the user can expect a slight performance degradation depending upon the resources used by the other software.

4.1 System Requirements

4.1.1 HARDWARE REQUIREMENTS

- P-IV
- 256MB RAM
- Min. 5GB free disk space.

4.1.2 SOFTWARE REQUIREMENTS

- Windows 2000/XP
- .NET 1.1 Framework
- Microsoft Access

4.2 Software Installation

1. Insert CD into the CD drive.
2. Open the main WTMS directory.
3. Open Setup folder.
4. Run Application wtms.exe.

4.3 Configuration

After the WTMS software is installed, Receiver Settings, Sensor Registration and Default settings should be configured.

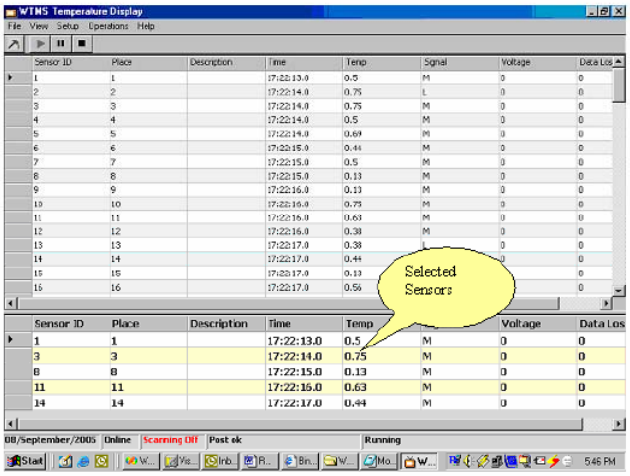
Refer section 5 for details of receiver settings

4. 4 How to run WTMS Application Software

1. Click on Start.
2. Choose WTMS from the Programs Menu.
3. Click on 'Launch WTMS' sub menu item for running the WTMS application.

4.5 How to use WTMS Application Software

4.5.1 Main WTMS Screen



In this screen the real time display of sensor data is displayed.

This screen will also have a provision to select the preferred sensors and watch the data of these sensors in a separate area. To do this, double click on the preferred sensors and the data of the selected sensors appears at the bottom in a separate area. When there are more sensors selected, the selected area can be dragged up and down for better visibility.

The main screen also contains menu, toolbar, and status bar.

Status Bar: (Panels from the Left)

1. Date panel: Displays the current system date.
2. Status panel:
   a. Online: Represents the running state.
   b. Offline: Represents the stopped state
3. Scanning panel: Shows whether the scanning is on or off.
4. Post panel:
   a. Post ok: No error
   b. Post error: [Error description1], [Error description2]

If there is more than one post failure, user can view the detailed description of the errors at its ToolTip text.

2. Application Status panel: This panel describes the current process and even the application errors (Scanning sensor values, Running, Paused, Error while starting Display, etc)

Various menus and their sub menus are given below. A brief description about each sub menu is given in the brackets.

File menu

Exit (Exits from the WTMS Application)

View menu

Toolbar (Show/Hide the Toolbar)

Status Bar (Show/Hide the Status bar)

Sensor Detail (Show/Hide the Sensor Description)

Sensor History (View the history of a particular sensor)

Setup menu

WTMS Receiver Settings (Setup the WTMS Receiver Settings)

Sensor Registration (Add/Delete/Edit Sensor Registration details)

Default Settings (Setup the default settings of WTMS)

Delete Old Data (Delete old data till the specified date)

Operations menu

Start WTMS (Starts online sensor data update)

Pause (Pauses the online sensor data update)

Resume (Resumes the online sensor data update)

Stop (Stops the online sensor data update)

Restart (Restarts the online sensor data update, when settings change)

Help menu

Help Topics... (Online HTML Help)
About WTMS... (About Box)

The GUI will show the latest data of each sensor received from the Ethernet/ Modbus protocol.

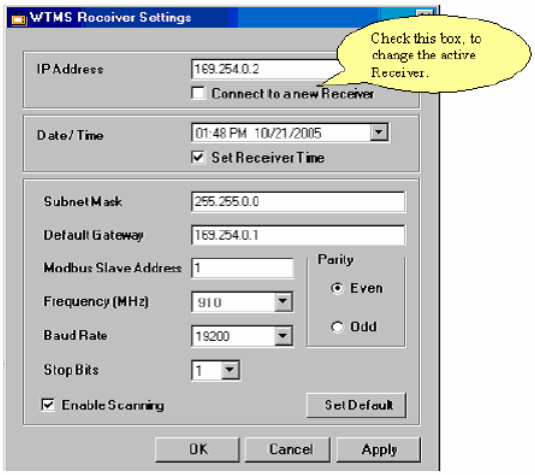
Data that may be displayed:

- Sensor ID
- Place (1 to 100)
- Time (HH:MM:SS MS) -24 hrs clock
- Temperature in °C (accuracy 1 °C)
- Receive signal strength
- Battery Voltage
- Number of data loss (incremented)

4.5.2 SETUP MENU

4.5.2.1 RECEIVER SETTINGS

1. Click on Setup in the main screen.
2. Choose Receiver Settings from the drop down menu, and the screen shown below appears.



This screen allows the user to connect to a new receiver, configure IP address, Mask address, Gateway address, Receiver frequency, Baud Rate, Stop Bits, Parity and the Enable scanning option.

Connect to a new Receiver: Used to connect to another receiver in the network.

If the user wants to read the sensor readings of another receiver, check this option, Give the IP address of receiver to connect and click Apply.

The system will give appropriate confirmation / error message when the task is done.

Warnings
(when Connect to new receiver is checked and applied)

Sensor History Info Deleted: All the sensor history readings of the previous receiver are deleted and the table will be ready for the data from the newly connected receiver.

Sensor Registration info Deleted: All the sensor registrations of the previous receiver are deleted and the table will be ready for next set of sensors in the newly connected receiver.

Caution ! It is highly recommended that you take the back up of database (WTMS.mdb file) before you perform the "connect to new receiver" operation. Else all the data related to the previous receiver will be lost.

Configure IP (Connect to a new receiver unchecked): Used for configuring the IP of the current receiver. Enter the new IP and click apply. The IP of the Current Receiver is changed to the one entered.

Warnings (while changing the IP)

IP Conflict: If there exist a receiver with the same IP as newly entered one. This creates conflict in the network.

Caution ! It is highly recommended that you make sure, no other receiver in the network has the same IP as that of the one, which you want to set.

Set Default button: Used for restoring the Receiver settings to the default value.

Enable Scanning: Used for setting up the Receiver operation mode.

Scanning mode (Enable Scanning checked): In this modethe receiver stores data from every active sensor.

No scanning mode (Enable Scanning unchecked): In this mode the receiver stores data for the only sensors, which are defined in Modbus table.

Set Receiver Time: Used for setting up the Receiver date and time. When the settings screen opens it show the current receiver time and will be disabled. "Set Receiver Time" option is provided to set the time of the receiver to current system time.

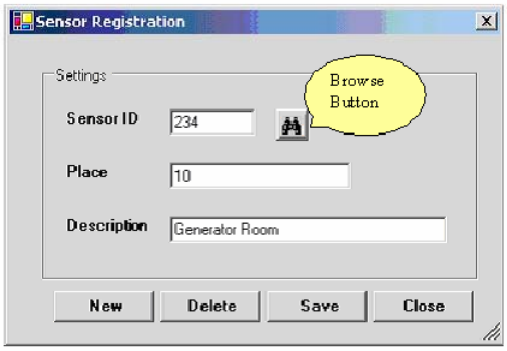
Set receiver time checked: Current date and time of the system is ready to set. When apply is clicked the current time is set at the receiver end.

Set receiver time unchecked: Receiver Date Time remains the same.

Note: If any changes have been made to the settings while the communication channel is in use it is advisable to restart the WTMS Receiver.

4.5.2.2 SENSOR REGISTRATION

1. Click on Setup in the main screen.
2. Choose Sensor Registration from the drop down menu, and the screen shown below appears.



The software has a provision to register the details of all the sensors including the place information and a short description. In this screen the user can add a new sensor, delete a sensor and edit sensor details. A maximum of 100 sensors can be registered.

To add a new sensor to the database:

1. Click on New.
2. Provide all required details (If a new sensor having either same Sensor ID or place ID is entered the system will show appropriate error/warning message.).
3. Click on Save.

To delete a sensor from the database:

1. Click on the Browse icon.
2. Select the sensor to be deleted.
3. Click on Delete.

OR

1. Enter the Sensor ID in the specified box.
2. Click on delete.

To edit sensor details:

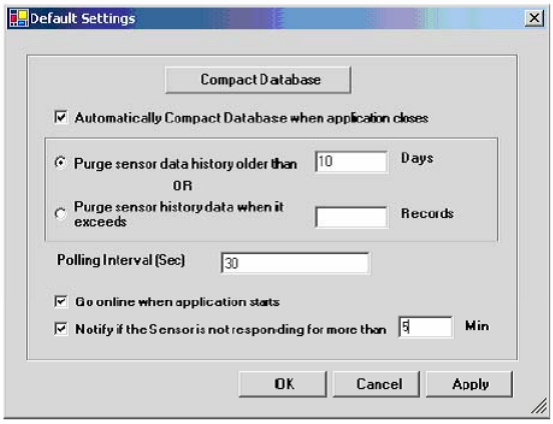
1. Click on the Browse icon.
2. Select the sensor to be edited.
3. Make necessary changes in details.
4. Click on Save.

OR

1. Enter the Sensor ID in the specified box.
2. Make necessary changes in details.
3. Click on Save.

4.5.2.3 DEFAULT SETTINGS

1. Click Setup in the main screen.
2. Choose Default Settings from the drop down menu, the screen shown below appears.



The System has provision for automatically compacting database, over writing of records when the log exceeds a certain limit specified by the exceed limit, polling interval for querying WTMS Receiver.

To Compact Database:

Click on Compact Database button to immediately compact the database.

OR

Check the "Automatically Compact Database when application closes" parameter.

To purge sensor history:

1. Choose either the "Purge data history older than" or "Purge sensor history data when it exceeds".
2. Specify either the number of days or number of records depending on choice.

Microsoft Access 2000 Specification

Maximum size of Table in database = 1GB

Limits of database

Purge data history older than:

If all the 100 sensors are working for 24 hours a day with a polling interval of 30 seconds, then the maximum no of days, which can be set for Purge data history older than, can be 41 days (It's the Maximum).*Purge sensor history data when it exceeds:* Maximum no of Records allowed in History table is 11787761. So the "purge when exceeds" value should be less than 11787761.

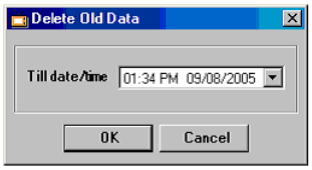
To Specify Polling Interval:

1. Enter the time in seconds after which polling is to be done.
2. Check the "Go online when application starts" parameter to automatically start polling each time the application is run.

Check the "Notify if the sensor is not responding" parameter if the user is to be notified when a sensor does not respond for more than the specified time in minutes.user is to be notified when a sensor does not respond for more than the specified time in minutes.user is to be notified when a sensor does not respond for more than the specified time in minutes.

4.5.2.4. DELETE OLD DATA

1. Click on the Setup button in the main screen.
2. Choose Delete Old Data from the drop down menu, the screen shown below appears.



The system will delete old data till the specified date/time and compact the database after deletion. The system will give appropriate confirmation / error message when the task is done.

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4.5.3 VIEW MENU

To show/hide the toolbar:

1. Click on View.
2. Click on Toolbar from the drop down menu that appears.

Configure Button (First Button): A short cut button to the setup menu.
Play Button: To start the online sensor data update.
Pause/Resume Button: To pause/resume the online sensor data update.
Stop Button: To stop the online sensor data update.

To show/hide the Status Bar:

1. Click View.
2. Click on Status Bar from the drop down menu that appears.

To show/hide Sensor Details:

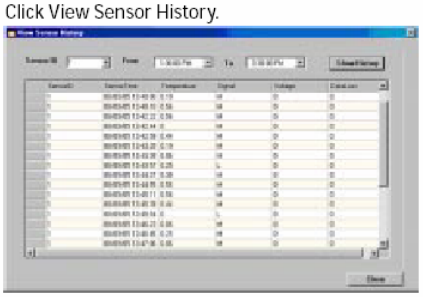
1. Click View.
2. Click on Sensor Details from the drop down menu that appears.

To view Sensor History:

1. Click View.
2. Click on Sensor History from the drop down menu that appears.

Sensor History can also be view by

1. Right Click on a Sensor row in the main screen.
2. Click View Sensor History.



Above figure shows the Sensor history details screen. In this screen Sensor history data is displayed based on a particular sensor ID and time.

4.5.4 OPERATIONS MENU

Upon clicking Operations, a drop down menu containing the following options appears:

Start WTMS: Starts online sensor data update.

Pause/Resume: Pauses/Resumes the online sensor data update.

Stop: Stops the online sensor data update.

Restart: Restarts the online sensor data update, when settings change.

4.5.5 HELP MENU

Upon clicking Help, a drop down menu containing the following options appears:

Help Topics: Opens a Help Window from where the user can navigate through the Help Topics available.

About WTMS: Opens an About Box containing details about the application.

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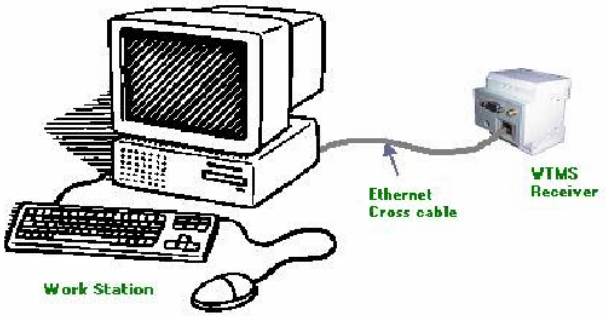
5. Receiver settings

1. Power on WTMS receiver and press RESET button to load the default settings
2. POST LED will glow during default settings loading. Once the default parameters are loaded, POST LED goes off and now the receiver is set to the following default parameters.

IP Address	:169.254.0.2
Mask Address	:255.255.0.0
Gateway Address	:169.254.0.1
Modbus slave Address	:1
Baud rate	:19200
Stop bit	:1
Parity	:even

3. To change the IP address of Receiver as per field requirement, connect the receiver to the work station using an Ethernet Cross cable as shown below.



4. Set the IP address of the PC statically to 169.254.0.3.
5. Open the WTMS receiver settings window from the SETUP MENU of the WTMS Application Software.
6. Set the IP address, Net mask, and default gateway as per the network in which the Receiver to be installed

7. Set the frequency 910 MHz and slave address as per the field requirement.
8. Power down and power up the receiver to apply the new settings.

Caution ! It is highly recommended that you make sure, no other receiver in the network has the same IP as that of the one, which you want to set.

Now the Receiver is ready to connect to the field network

9. Disconnect the receiver from Work station & connect to the field network using Ethernet straight cable.
10. Connect antenna to the receiver and power on Reciver.
11. The Ethernet link LED will glow once the Ethernet link is established. The Ethernet Data LED starts blinking during data communication.
12. Connect the receiver to the GUI by selecting PLAY button from Tool bar of WTMS Application software.
13. Set Scanning enabled in Receiver Set-up menu to get data from all active sensors(maximum 100 Sensors).
14. If scanning mode is disabled sensor ID must be manually registered using "Sensor Registration" in Set-up menu.
15. When the receiver starts receiving sensor data the RF Data LED starts blinking.
16. Sensor Data will be updated in the Application software main Screen.
17. Sensor History can be viewed by selecting "Sensor History " from VIEW menu.

Refer Section 4.5 "How to Use WTMS Application Software" for more details.

Note: When the IP parameters ,Slave address or Frequency are changed , the receiver must be power down and up to apply changes.

Data loss is calculated by taking the last recorded time of a particular Sensor as reference. In order to avoid unrealistic value by taking wrong refernce time , Appication software must be restarted using PLAY button in toolbar after receiving first data following a time setting from Receiver Settings Menu.

6. WTMS Specifications

6.1 WTMS Sensor Specifications

Operating Frequency	:	910MHz
Time between two consecutive transmissions	:	120 seconds maximum
Measurement Temperature Range	:	-20°C to +150°C
Operating Temperature Range	:	-20°C to +85°C (ambient)
Storage Temperature Range	:	-20°C to +85°C (ambient)
Humidity	:	20 to 95%
Transmission Range	:	20m in Enclosed Area, 50m in Open Space.
Battery Specification	:	3.6V Lithium Battery, 2/3AA
Expected Battery Life	:	3 years
Ideal bolt for mounting	:	M8 Bolt
Thermal Joint Compound	:	Thermal Grease ,Silicon Based Temperature- -40°C to +200°C

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6.2 WTMS Receiver Specifications

AC-DC Adapter Specification		
AC input	:	110-240 V
DC out put	:	+4.5V
Maximum Current	:	450mA
Operating Frequency	:	910MHz
Operating Temperature Range	:	-20°C to +55°C (ambient)
Signal Quality	:	High - greater than -60dBm Medium - between -60dBm and -80dBm Low - less than -80dBm
Interfaces	:	DC Socket, SMA Connector for Antenna, DB9 Female socket for RS-485 communication, RJ-45- 10/100 base Ethernet
Diagnostic Display	:	POWER - Green LED (Steady) RF Data - Yellow LED (Flashing) POST- Yellow LED (Steady) Ethernet Link - Green LED (Steady) Ethernet Data- Yellow LED (Flashing)

6.3 Application Software Specifications

HARDWARE REQUIREMENTS	:	P-IV, 256MB RAM, Min. 5GB free disk space.
SOFTWARE REQUIREMENTS	:	Windows 2000/XP .NET 1.1 Framework, Microsoft Access

7. Troubleshooting Tips for WTMS

7.1 Sensor Data is not appearing in GUI.

A. Checks at Sensor Side:

» Check whether the battery is inserted in the WTMS Sensor
» Check for correct battery polarity by comparing with the sticker inside the battery compartment
» If possible, check the battery voltage or insert a new battery

B. Checks at Receiver Side:

» Check whether the AC-DC adapter is connected to the receiver and is switched ON.
» Check whether the Power LED is glowing
» Check whether the Ethernet link is good.
» Check whether the antenna is properly connected to the receiver

C. Checks at WTMS Application Software:

» Check whether the frequency setting is correct.
» Check whether the IP address of the receiver is correct.
» Check whether the sensor is registered .If scanning mode is disabled sensor must be registered manually using Sensor Registration menu.

7.2 Temperature reading in GUI is not correct

Checks at Sensor side:

» Check whether there is a proper contact between the metal plate of the sensor and the surface whose temperature is being measured
If needed, re-apply the thermal joint compound on the metal plate
» If needed, tight the M8 bolt properly so as to get good thermal conductivity

7.3 No data from one or a more sensors while others are functional

See the section "7.1 A. Checks at Sensor Side"

8. Maintenance Tips for WTMS

WTMS Sensors

- Replace sensor battery when a battery voltage reading is < 2.8V
- Periodically inspect the contact between the sensor metal plate and the surface whose temperature is being measured
- Remove the batteries when the sensors are not in use

WTMS Receivers

- Periodically inspect the antenna connections and Ethernet connections.
- Disconnect power when not in use.

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9. List of Error Messages

Sl. No	Error Number	Error Messages/ Description	Possible Corrections.
1.	E001	Could not open database.	See that the mdb file exists in the Application Folder and all the 5 tables exist.
2.	E002	Connection to the receiver cannot be established.	Check Connection. Check receiver IP in the Receiver Settings. There is no receiver with the IP set in settings. So change the IP in Settings
3.	E003	Failed to read from the receiver.	Check the Receiver IP and Connection.
4.	E004	Could not save sensor.	Check the Receiver. Check the DatBase
5.	E005	Could not save receiver settings; receiver write error.	Check that IP of receiver is correct.
6.	E006	Connection to the database cannot be established.	See that the mdb file exist and all the 5 tables exist.
7.	E007	Error while trying to compact database.	Check whether the Data Base is open. If so close it and then check.
8.	E008	Could not delete history data.	See that WTMS_SENSOR_HISTORY_INFO table exist in Database
9.	E009	Sensor not registered.	See that the Senor is registered at the Receiver end.
10.	E010	Error while overwriting the sensor Place.	While Trying to register a sensor. If any sensor exist at the same place then whether to replace the old sensor with new one. If yes the sensor is replaced
11.	E011	Failed to Write to DataBase.	Check the Database and Tables exist.
12.	E012	Could not save history data into database.	See that WTMS_SENSOR_HISTORY_INFO table exist in Database
13.	E013	Could not scroll Datagrid.	Close the application and reload.
14.	E014	-- No Connection -- a) Failed to retrieve Register values. b) Failed to set values. c) Failed to set Register value.	Check Connection. Check receiver IP.
15.	E015	-- Invalid Function -- a) Failed to retrieve Register values. b) Failed to set values. c) Failed to set Register value.	Check Connection. Check receiver IP.
16.	E016	Socket not connected.	Check Connection. Check receiver IP in the Receiver Settings. There is no receiver with the IP set in settings. So change the IP in Settings.
17.	E017	-- Invalid data address -- a) Failed to retrieve Register values. b) Failed to set values. c) Failed to set Register value.	Check the Receiver settings

10. List of POST Messages

POST Message Number	POST Message
0001	RF Chip Failure
0002	Ethernet Chip Failure
0004	Flash Database Corrupt
0008	Flash Database rewriting
0010	RAM Failure
0020	Flash Failure

11. Sensor Location Chart

No	Sensor ID	Location	Remarks

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No	Sensor ID	Location	Remarks

- -

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No	Sensor ID	Location	Remarks

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Receiver -UBGGTCI0106R

botl050606SU Ver 2.0

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