User Guide

Using Telegesis Demonstration Software with ETRX3 IPD and Mock Meter Firmware

IPD firmware version r300

Mock Meter firmware version r301

Smart Energy Demo Meter Version 0.1

Smart Energy In-Premise Display Version 0.1

Table of Contents

1. Introduction

Telegesis have launched the SEP1.1 compliant ZigBee AT Command layer on the EM357 Ember platform. The ZigBee SEP AT commands allow developers to build a ZigBee Smart Energy compliant In-Premise Display without the need for any in-depth knowledge of the ZigBee PRO stack. To assist the user in practising with the IPD AT command set, a Mock Meter has been developed which can be used with the IPD for further development purposes.

Telegesis provides an example PC-based application to demonstrate the use of the In-premise Display firmware. The application allows the developer to understand the basic minimum required to create In-premise Display applications.

Note: the terms “In-Premise Display” and “In-Home Display” mean the same. We refer to the device as an In-Premise Display (IPD).

2. Installation

2.1 Requirements

The following is required for the demonstration to work:

1) Smart Energy Demo Kit containing
    a. ETRX3USB-IHD
    b. MockMeter (ETRX3USB)
2) ETRX3USB Windows Drivers
3) Mock Meter Demonstration Software Installer
4) Smart Energy Demonstration Software Installer

2.2 Instructions

2.2.1 ETRX3USB Driver

1) Download the ETRX3USB drivers from the Telegesis website using the following link

   http://telegesis.com/downloads/general/TelegesisUSB%20Driver%206.6.1.zip

2) Extract the file "TelegesisUSB Driver 6.6.1.zip" on the local hard drive
3) Run the file named "TGvcpInstaller.exe" and follow the onscreen prompts to complete the driver installation
4) Insert the ETRX3USB-IHD and the Mock Meter ETRX3USB for Windows to enumerate the devices

2.2.2 Mock Meter Demonstration Software

1) Download the Mock Meter application from the Telegesis website (*http://www.telegesis.com/telegesis_zigbee_technology_-_technical_support_/telegesis_terminal/download_page.htm*)
2) Run the file "SEMeterInstall.exe" and follow the onscreen prompts to complete the installation
3) The Mock Meter Installer will try to automatically point you install the JAVA Runtime Environment but if it fails then please install the latest version of Java on the computer manually by visiting the following link *http://java.com/en/download/*

2.2.3 Smart Energy In-Premise Demonstration Software

1) Download the Smart Energy In-Premise application from Telegesis website (*http://www.telegesis.com/telegesis_zigbee_technology_-_technical_support_/telegesis_terminal/download_page.htm*)
2) Run the file "SEIHDInstall.exe" and follow the onscreen prompts to complete the installation

3) The Smart Energy In-Premise Installer will try to automatically point you to install the JAVA Runtime Environment but if it fails then please install the latest version of Java on the computer manually by visiting the following link:

   http://java.com/en/download/

2.2.4 Manual Installation of JAVA RxTx Library

Both the Mock Meter and the In-Premise Display applications connect to an ETRX3USB using a serial port and make use of the serial libraries made available under the project RxTx hosted at website http://rxtx.qbang.org. The Installer for the demo applications will install the library but it is known that the libraries are often removed when Java is updated hence making the demo application fail to detect or use any of the serial devices (ETRX3USBs).

Following the steps given below to install the Java RxTx library manually,

1) Download the latest pre-built binary from http://rxtx.qbang.org
2) Extract the "rxtxSerial.dll" to the "\bin" directory of the Java install which is usually at "C:\Program Files\Java\jre7\bin" location
3) Extract the file "RxTxComm.jar" to the "\lib\ext" directory of the Java install usually located at "C:\Program Files\Java\jre7\lib\ext"

3. Usage

3.1 Mock Meter

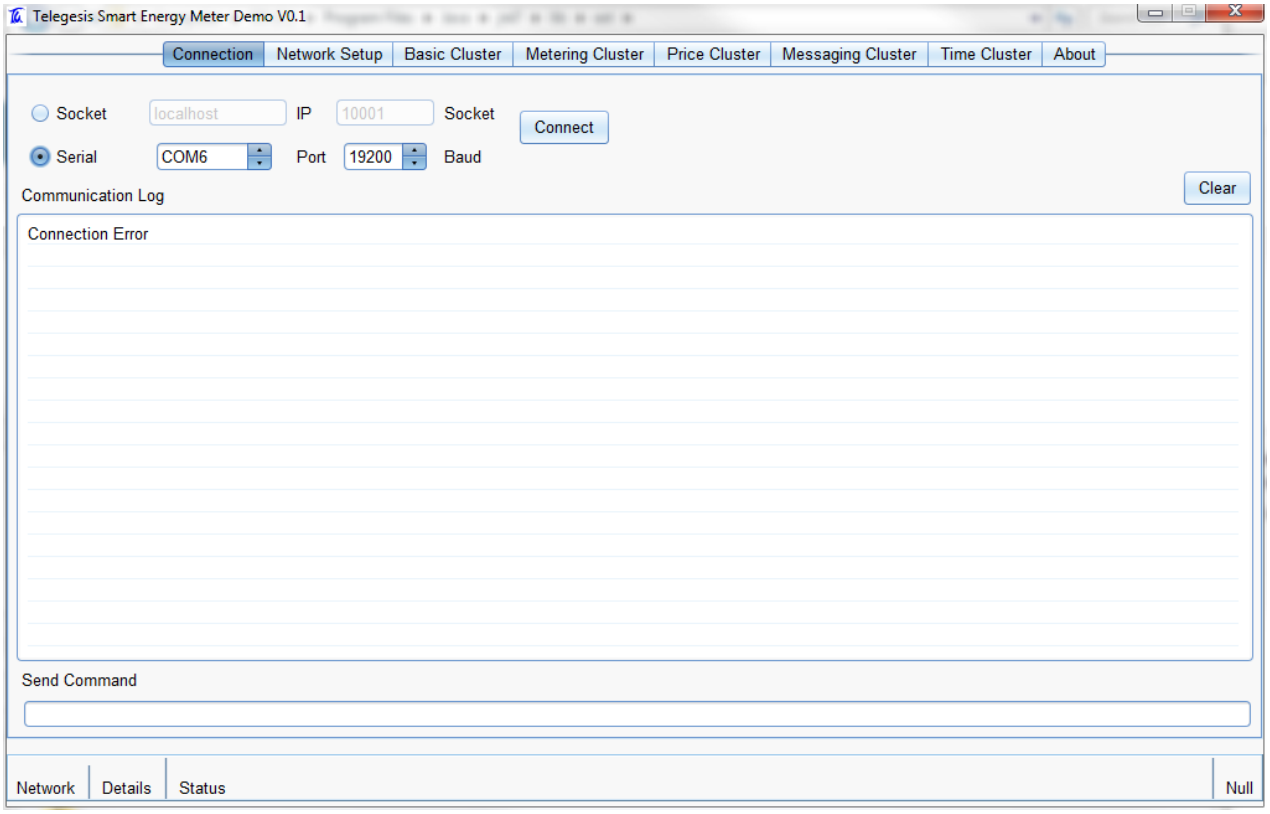
3.1.1 Connection

Insert the Mock Meter ETRX3USB into a USB slot on the PC.

If necessary, use the Windows Device Manager to find the COM port number of the Mock Meter.

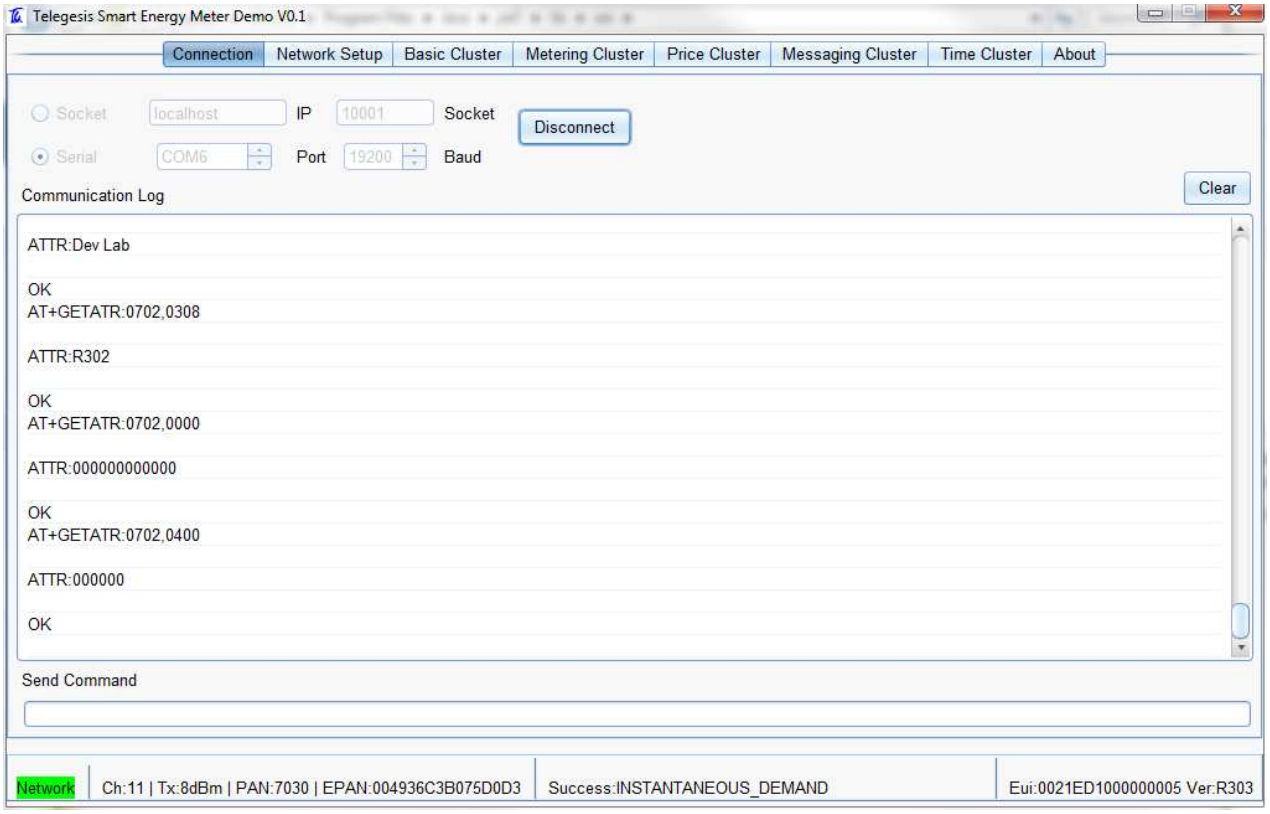
Start the SEMeter application from the Windows Start Menu.

The following screen will be shown,



Click on the “Serial” radio button and select the serial port from the adjacent field. Click “Connect” to attempt to connect.

If the connection is successful the status bus is updated with Mock Meter information and ZigBee setup stored in the Mock Meter ETRX3USB is retrieved as shown in the screenshot below,

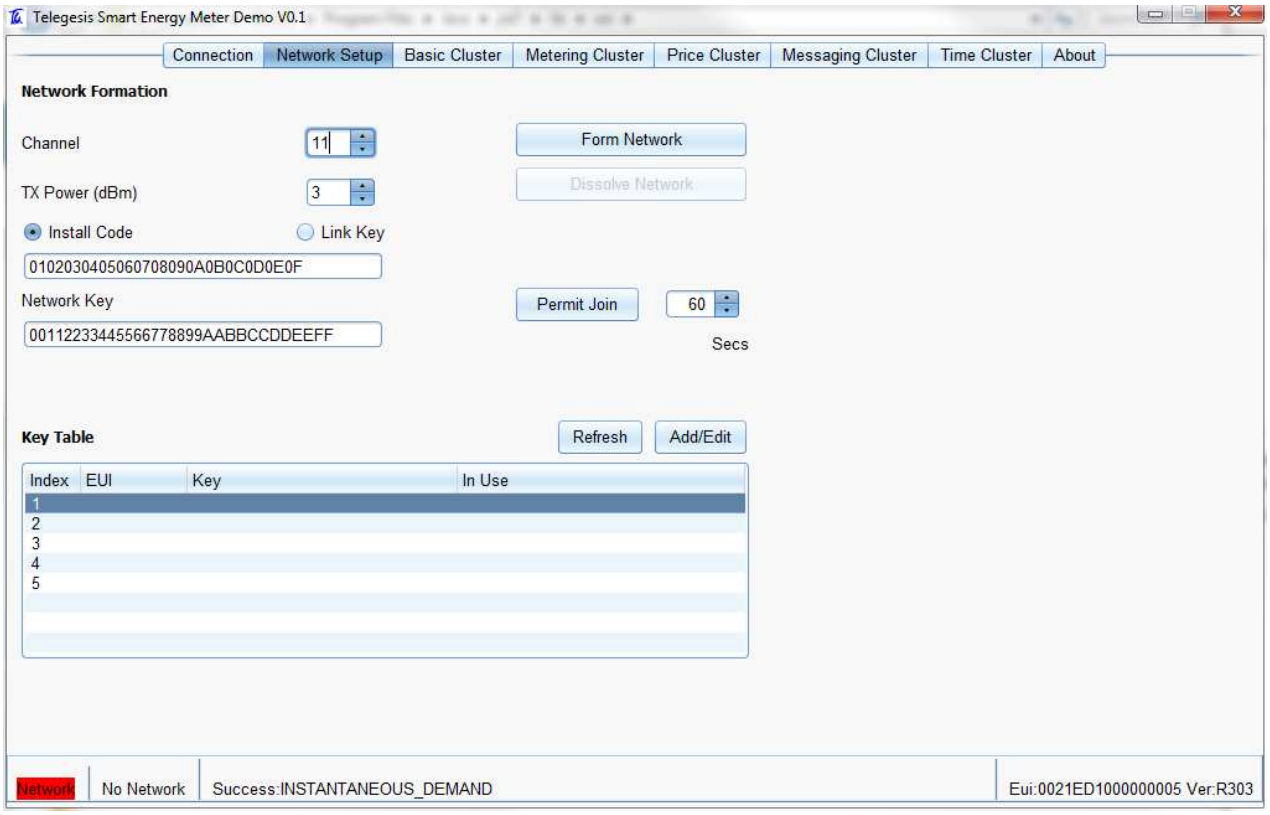


If the selected Serial Port does not connect to a Mock Meter ETRX3USB then an error is shown in the status bar.

All the messages exchanged between the Mock Meter ETRX3USB and the demonstration application are listed in the “Communication Log” window for reference and debugging. AT Commands can also be sent to the Mock Meter ETRX3USB by typing them into the “Send Command” field and pressing the “Enter” key.

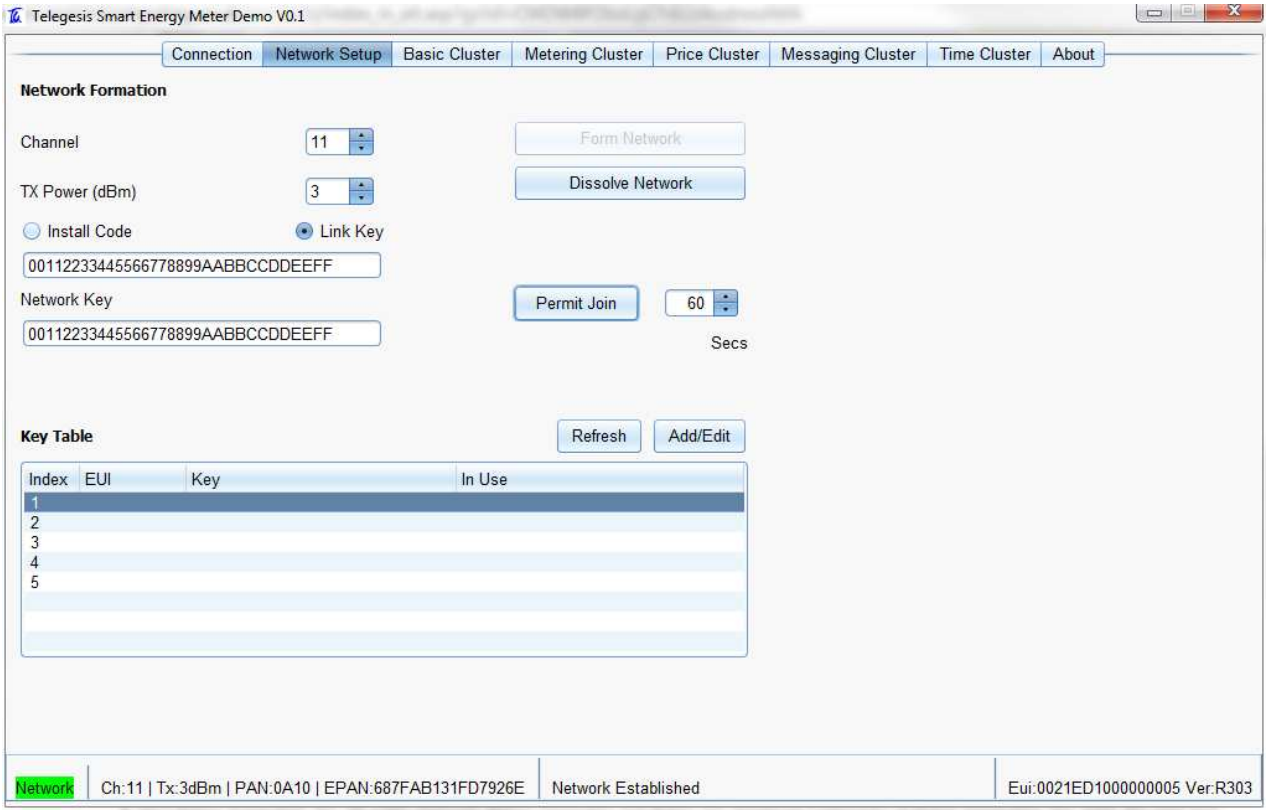
3.1.2 Network Setup

Navigate to the “Network Setup” tab in the application; the following screen is presented:



To form a network,

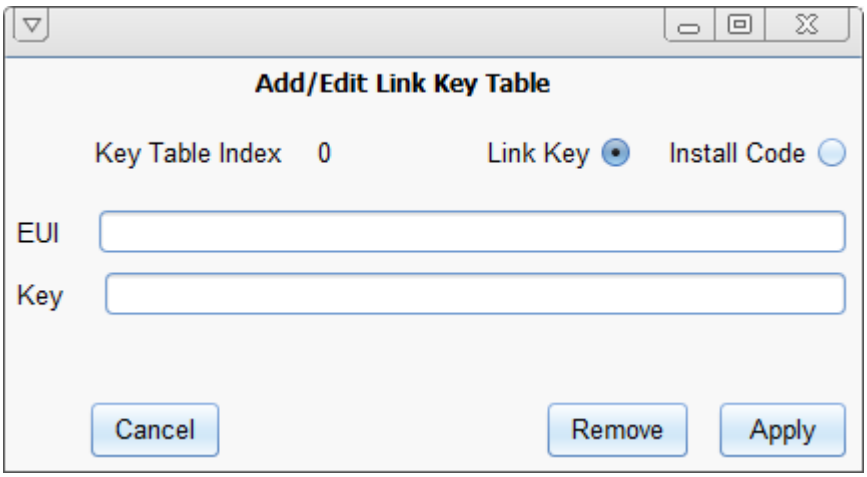
- Select an appropriate ZigBee channel number and transmit power level for the device or use the default settings
- Using the options button select whether the Trust Centre Link Key will be derived from an Install Code or whether the string given in the text below the radio button should be used as the Link Key.
- If Install Code is selected then give a string of 12,16,20 or 28 characters plus 4 character install code. Please node the two character make on hexadecimal number
- If “Link Key” is selected then enter a 32 character Link Key in ascii hexadecimal format.
- Enter a 32-character long Network key in the text box labelled “Network Key”
- Click the “Form Network” button to create the network with the above setting.
- If successful the following screen will be shown. Notice the status bar loaded with network information:



3.1.3 Adding a Smart Energy Device to the Key Table

The security credentials of any device wishing to join the Smart Energy network must be entered in the Mock Meter which is the Trust Centre of the network.

In the picture shown above click on an empty row in the “Key Table” and click the “Add/Edit” button. The following screen is shown:

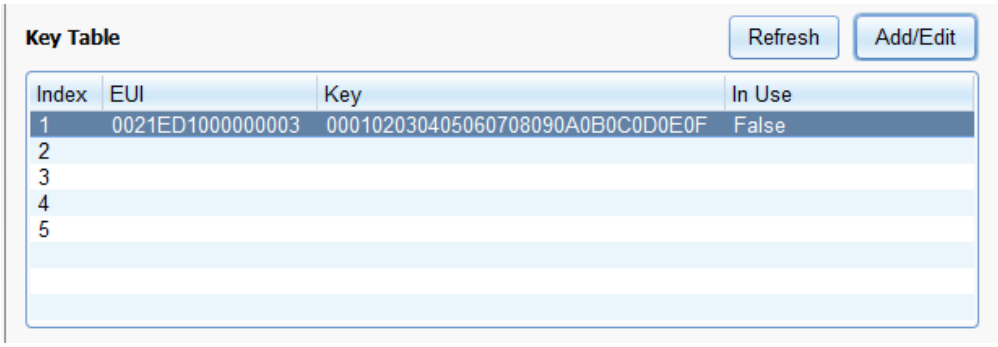


Select the appropriate type as “Link Key” or the Install Code.

Fill in the EUI field with the hexadecimal IEEE64 address of the device wishing to join

Fill in the “Key” field with the “Link Key” or “Install Code” of the device wishing to join; the data entered must match with what is programmed in the joining device for the process to be succesfull.

Press “Apply” to write the entry into the “Key Table”.

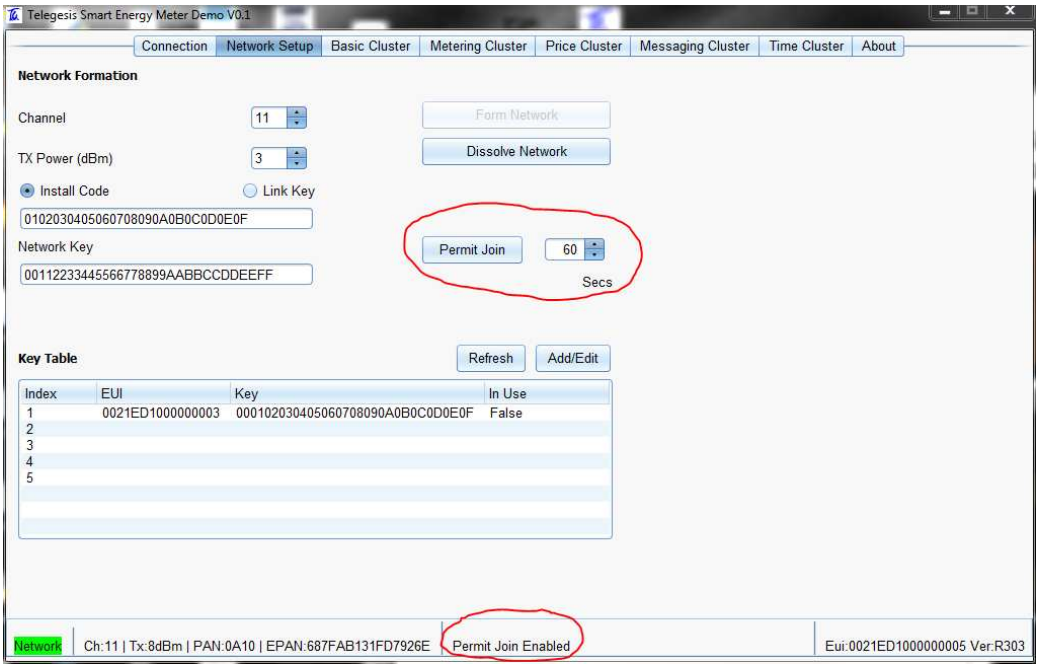


The field “In Use” changes to “True” once the device has joined and has successfully completed the CBKE process.

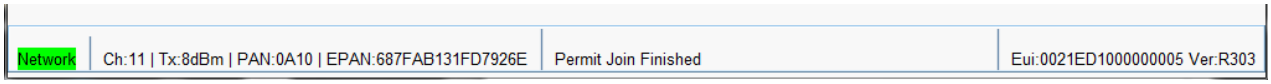
3.1.4 Permit Join

The ZigBee Smart Energy network will normally have the ZigBee joining turned off at the Trust Centre. When it is desired to allow a new device to join the network the network joining is allowed for a certain period of time only.

After adding the credentials of the joining device in the “Key Table” the network must be configured to allow joining to incoming devices. To do so select the number of seconds for which to allow joining and click “Permit Join”; the success of the operation will be indicated in the Status bar.

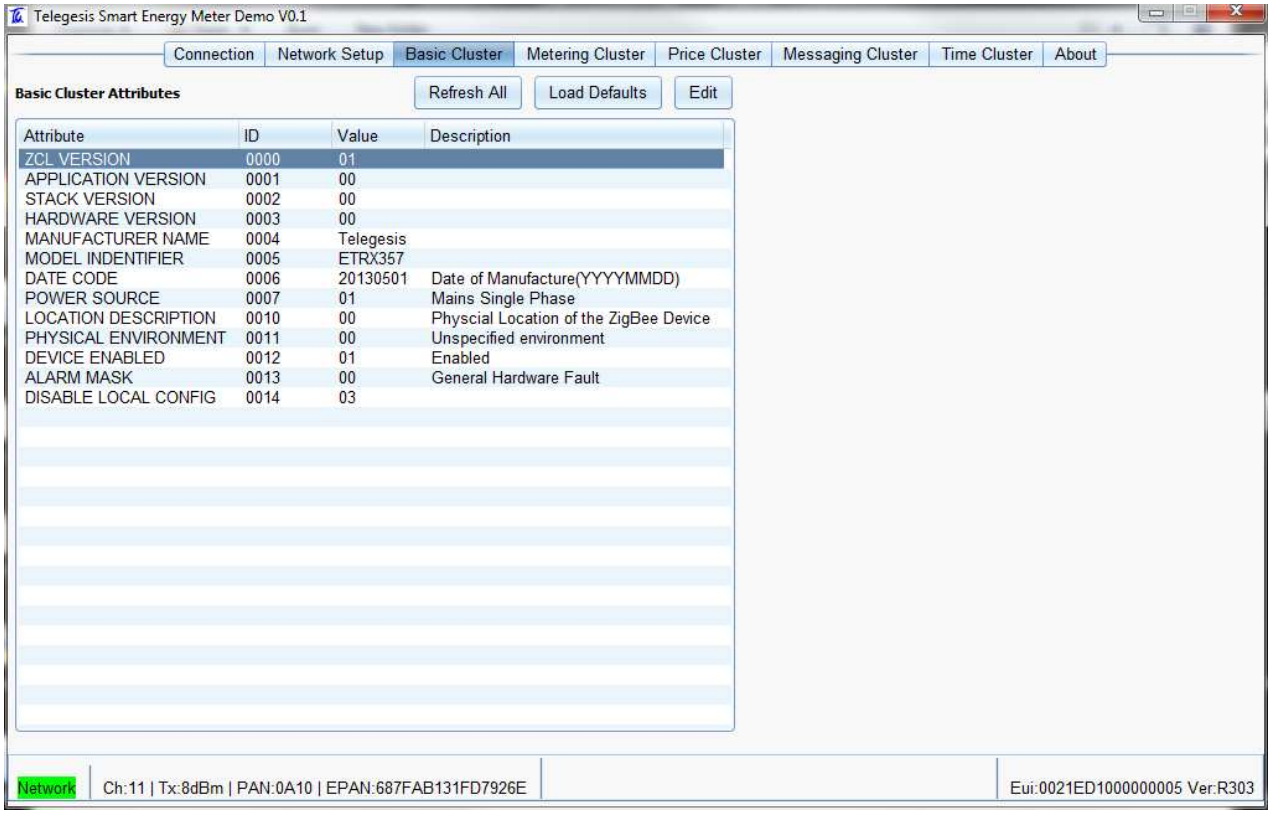


Once the Permit Join period has finished the status bar is updated accordingly



3.1.5 Basic Cluster

The Basic Cluster is mandatory for all devices in ZigBee Smart Energy Network. The attributes of the Basic Cluster hosted by the Mock Meter ETRX3USB can be seen by navigating to the “Basic Cluster” tab in the application. The following screen illustrates the Basic Cluster default settings in the Mock Meter ETRX3USB

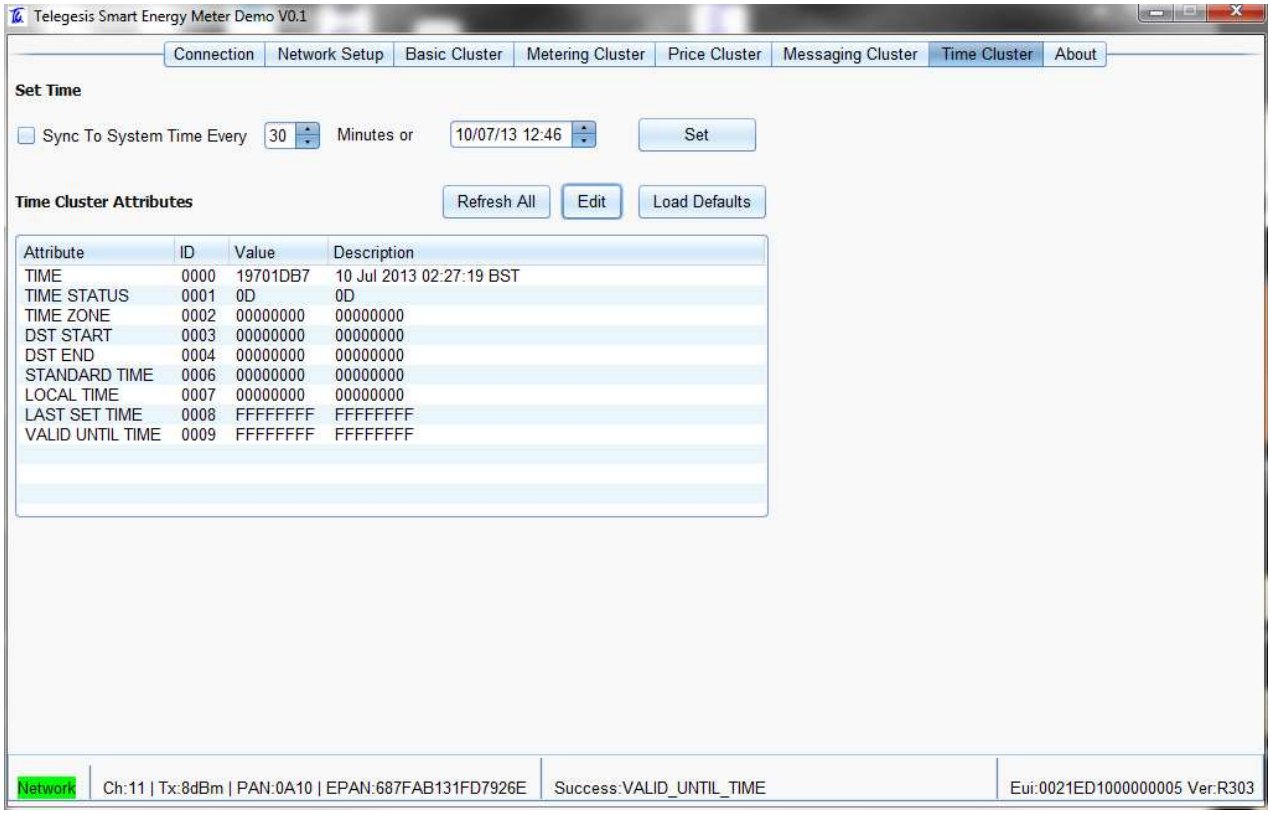


All the attributes listed in the table above can be changed by double clicking on the attribute row or by clicking on the “Edit” button.

Please ensure that when updating the attributes the data must conform to the specifications to ensure proper application behaviour.

3.1.6 Time Cluster

The Mock Meter ETRX3USB need to be set up with the current time as well as being declared as the master time source of the network in the Time Status attribute. The “Time Cluster” tab gives access to the Time Cluster attributes of the Mock Meter.

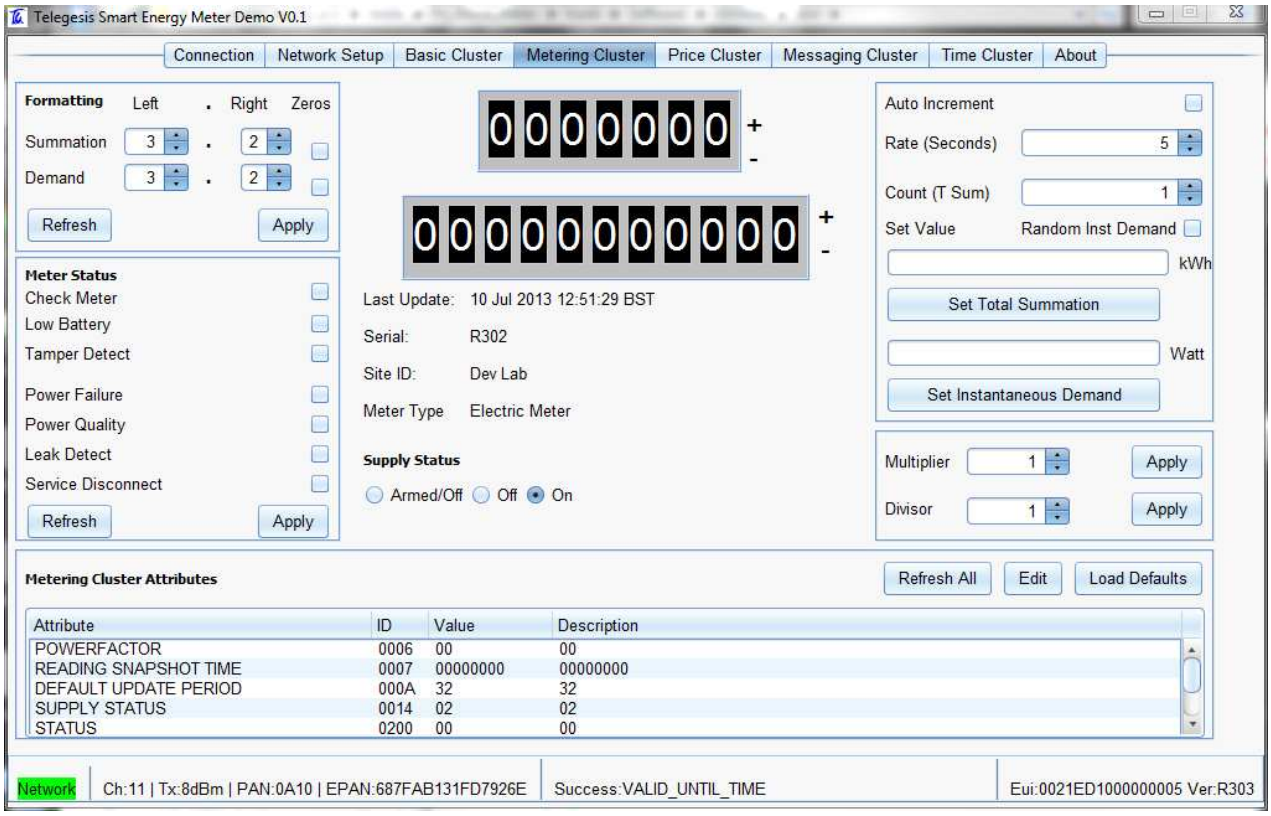


Check the checkbox “Sync Time to System Time” to enable syncing the time of the Mock Meter with the computer. The time in the Mock Meter may drift over time so the application allows for syncing the time with the PC periodically.

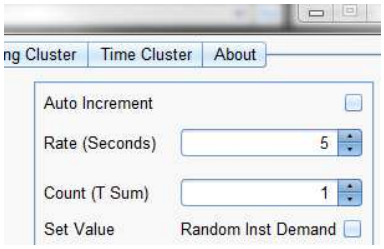
The Mock Meter can be made the Master Time source of the network by editing the “TIME STATUS” attribute or by loading the defaults using the “Load Defaults” button.

3.1.7 Metering Cluster

The “Metering Cluster” tab gives access to the attributes hosted by the metering cluster as shown below:



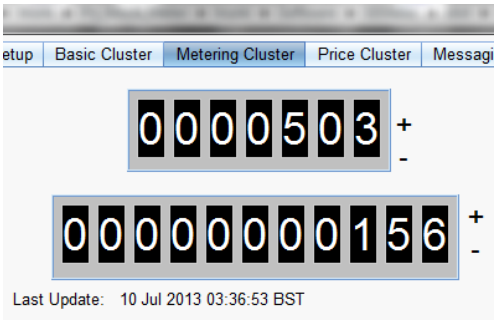
To set the meter to auto-increment its current summation attribute the “Auto Increment” check box can be checked which will make the application update the Current Summation attribute as specified in the field “Count (T Sum)” and at the rate specified by “Rate (Seconds)” field. If the “Random Inst Demand” button is checked a random value between 0 and 1000 watts will be set in the Instantaneous Demand attribute at each interval as specified by the “Rate (Seconds)” field.



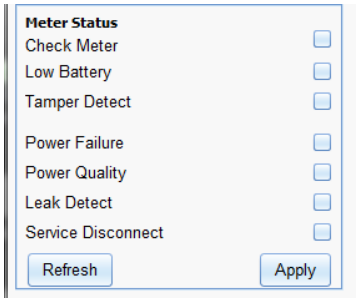
The values for Total Summation and Instantaneous Demand can also be updated via the “Set Total Summation” and “Set Instantaneous Demand” buttons.

The values shown on the meter dial for Total Summation such as given below are calculated as,

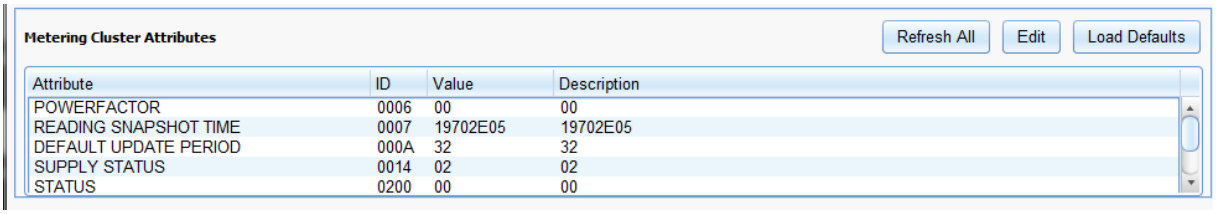
*Dial Value = Total Summation Attribute Value * Multiplier / Divisor*



Meter Status can be updated by clicking on the required check boxes and clicking the "Apply" button in the following section of the "Metering Cluster" tab:

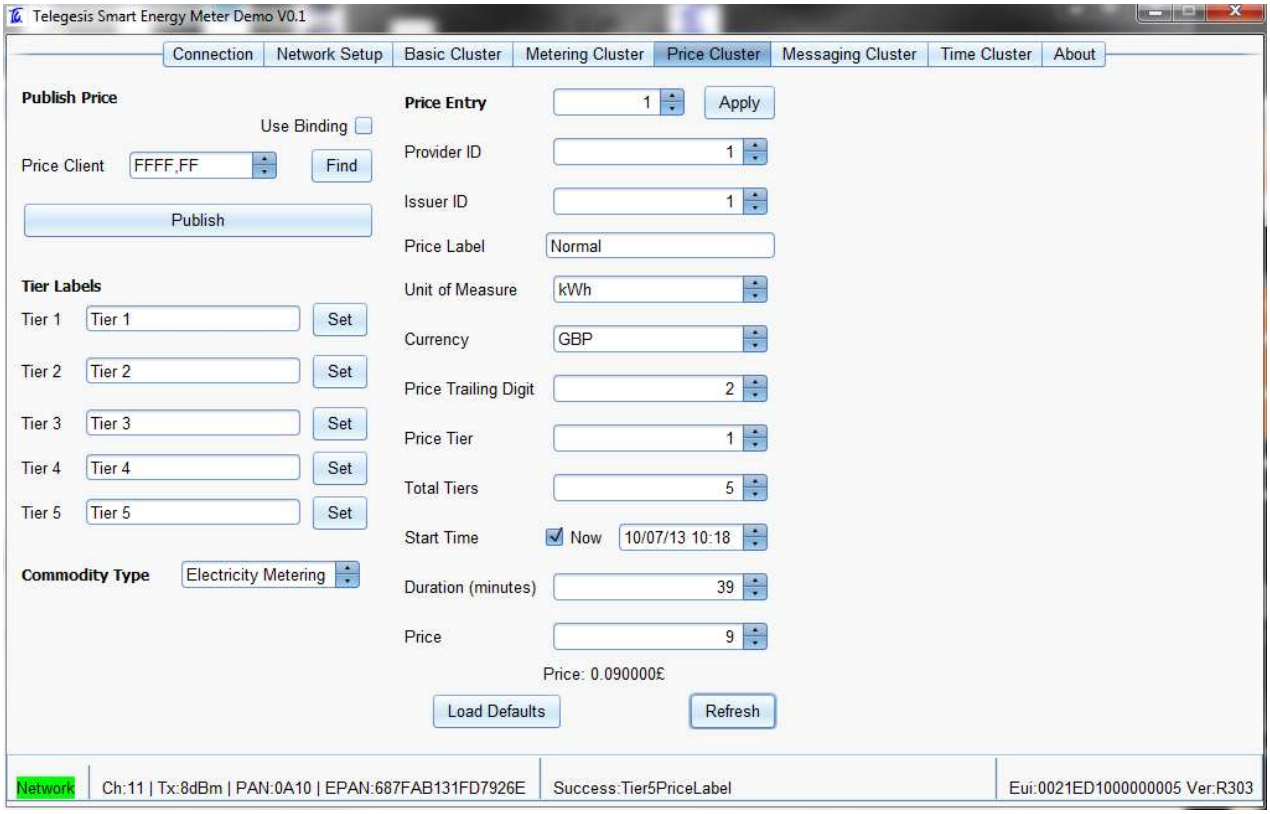


Most of the attributes can be updated by editing the rows in the "Metering Cluster Attributes" table by either double clicking the relevant row or clicking on the "Edit" button.



3.1.8 Price Cluster

The price set in the "Price Cluster" can then be published to or retrieved by an IHD. The Mock Meter ETRX3USB can store up to 5 prices, one of the 5 stored (usually at index 1) is the current price and the remainder should be scheduled prices and should not overlap each other in time.



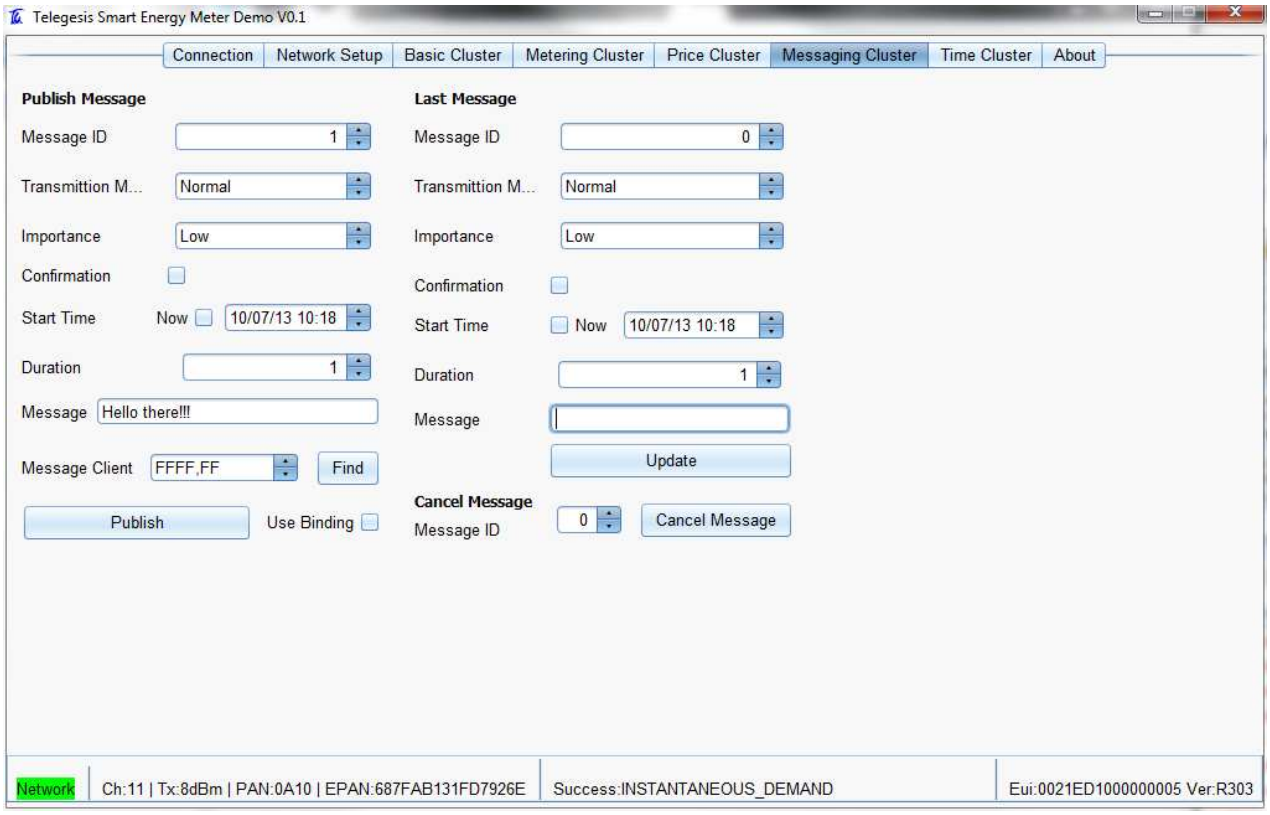
Change the "Price Entry" spinner to see the prices contained in the respective entries in the price table of the Mock Meter ETRX3USB.

Make the necessary changes to the price table entry and then click "Apply" to make that entry active. Only entries made active can be sent to or retrieved by the IHD. See ZSE1.1 specification for description of various fields of the price table entry.

The price can be published to a client by use of ZigBee binding provided that the Price Client has set the binding in the Mock Meter ETRX3USB during ZSE registration process or by discovering the Price Client and then publishing the price to it. Select the appropriate option in the "Price Cluster" tab for either publishing to a "Price Client" using the address discovered using the "Find" button or by using the "Use Binding" check box and then press the "Publish" button to send the price data to the Price Client (IHD).

3.1.9 Messaging Cluster

The “Messaging Cluster” tab can be used to construct and send messages to an IHD or Messaging Client.



Fill in the required fields appropriately in compliance with the ZSE1.1 specification and publish the message using either “Use Binding” to send to all Messaging Clients listed in the binding table or to an individual Message Client by either discovering it using “Find” or by supplying its node ID and endpoint and then clicking the “Publish” button.

The published messages can be cancelled using “Cancel Message” button; the message ID must match the message to be cancelled.

Once a message is published it is copied to the “Last Message” storage of the Mock Meter ETRX3USB and can be retrieved by a Messaging Client if that Message Client missed the message when sent by the Mock Meter.

3.2 In-Premise Display (IHD)

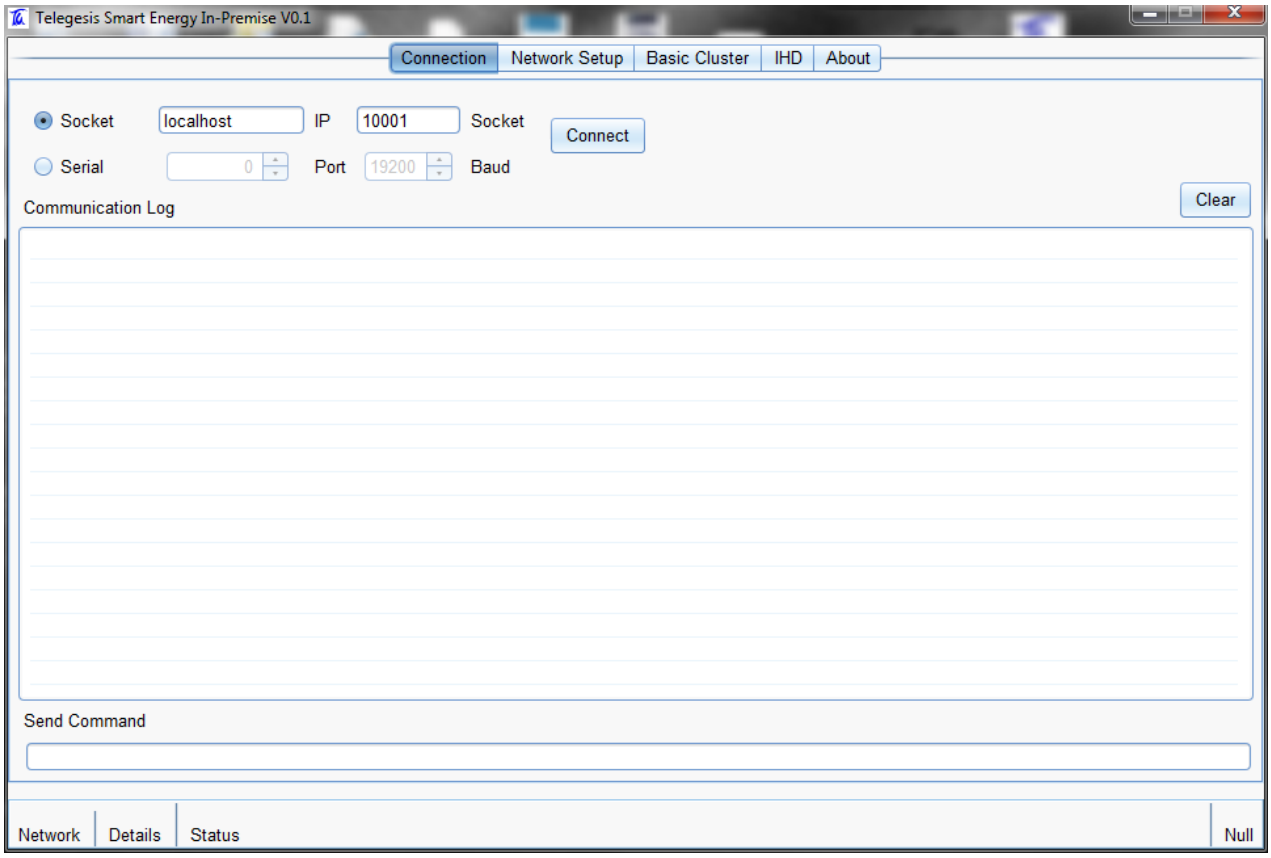
3.2.1 Connection

Insert the Mock Meter ETRX3USB into a USB slot on the PC

If necessary, use the Windows Device Manager to find the COM port number of the Mock Meter.

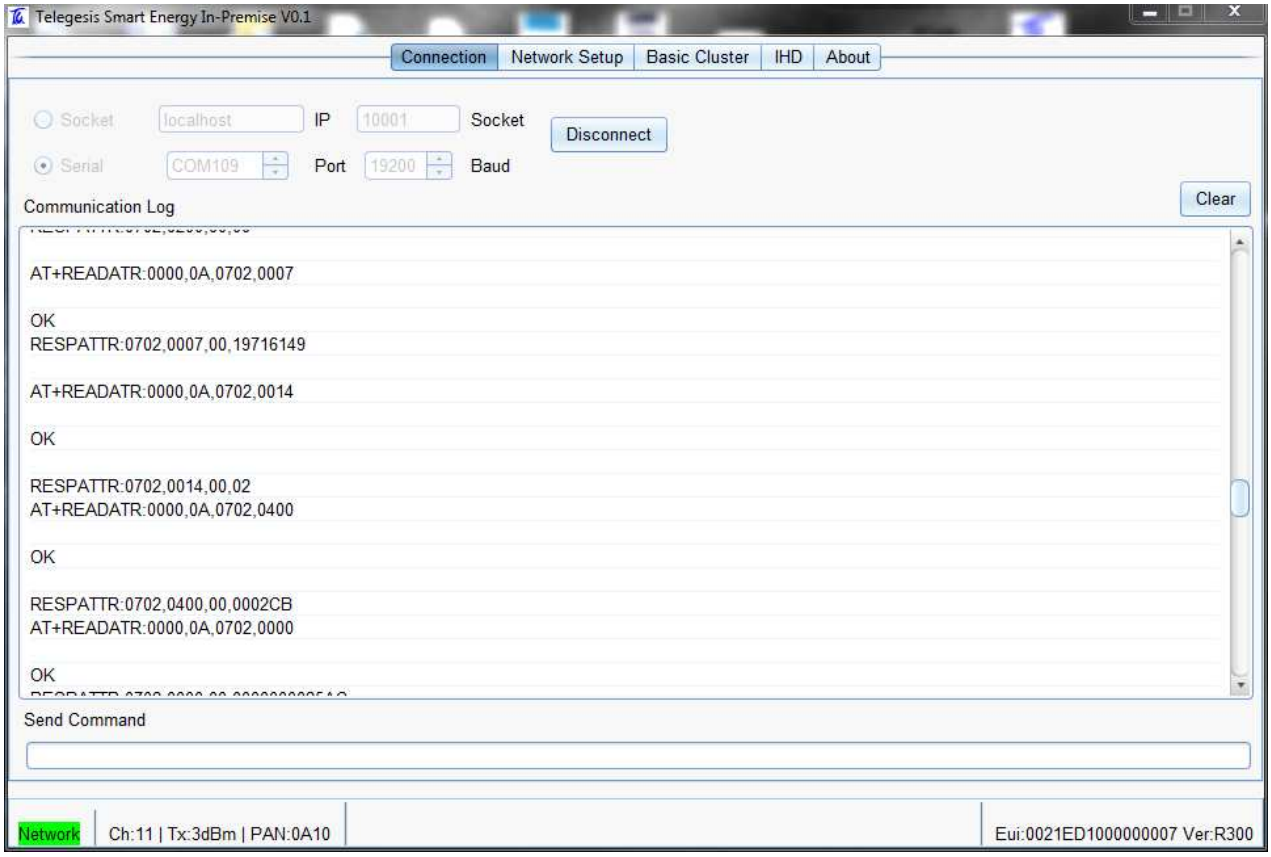
Start the SEMeter application from the Windows Start Menu

The following screen will be shown:



Click on the “Serial” radio button and select the serial port from the adjacent field. Click “Connect” to attempt to connect.

If the connection is successful the status bar is updated with the Mock Meter information and the ZigBee setup stored in the IPD ETRX3USB is retrieved as shown in the screenshot below,

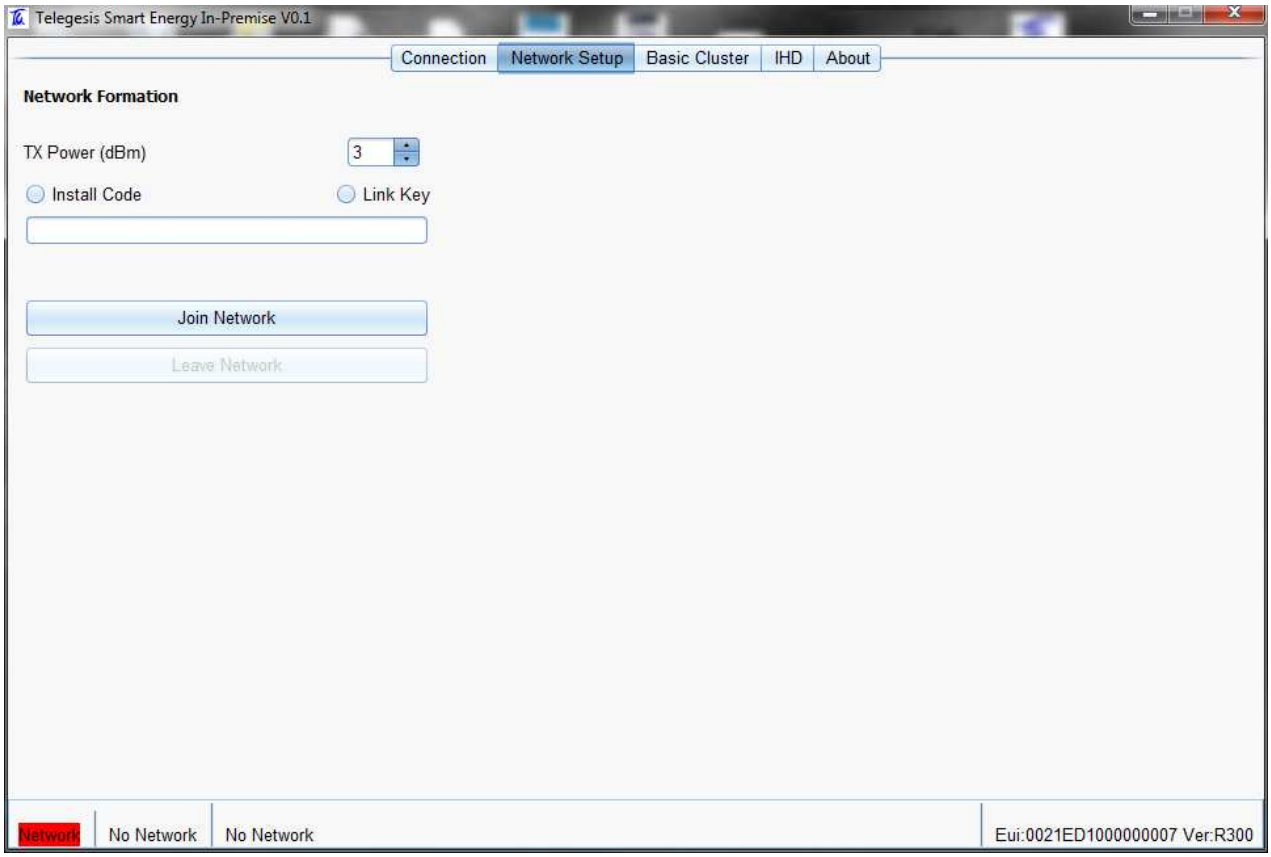


If the selected Serial Port does not connect to a IPD ETRX3USB then an error is shown in the status bar.

All the messages exchanged between an IPD ETRX3USB and the demonstration application are listed in the "Communication Log" window for reference and debugging. AT Commands can also be sent to the IPD ETRX3USB by typing them into the "Send Command" field and pressing the "Enter" key.

3.2.2 Network Joining

Navigate to the “Network Setup” tab and observe the following screen:



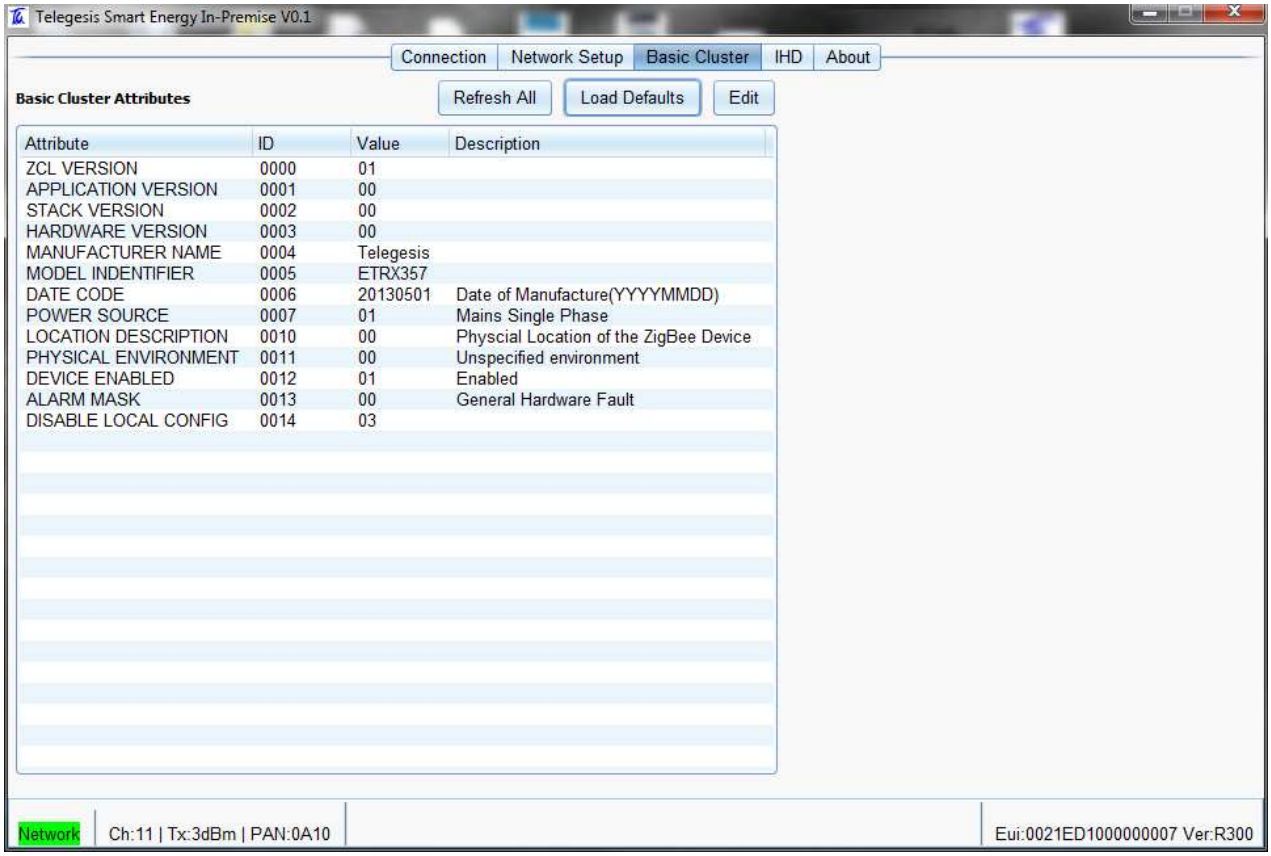
Select the radio transmit power by changing the “TX Power (dBm)” as shown above. Select “Link Key” or “Install Code” and type an appropriate value in the given field. If “Install Code” is selected the value field is automatically updated with the current value of the Install Code. The Install Code or Link Key must match to the data entered in the “Link Key Table” regarding the In-Premise Display. Press “Join Network” to attempt to join a smart energy network. Success or error will be shown in the status bar as per the outcome of the joining attempt.

The In-Premise Display upon joining the Mock Meter ETRX3USB will go through Smart Energy Registration process which may take a little time; the progress of the Registration process can be monitored in the “Communication Log” window and by the status bar messages.

To leave the ZigBee network press “Leave Network”. The status bar will change to reflect the network state of the device.

3.2.3 Basic Cluster

The Basic Cluster is mandatory for all devices in ZigBee Smart Energy Network. The attributes of the Basic Cluster hosted by the In-Premise Display ETRX3USB can be seen by navigating to the “Basic Cluster” tab in the application. The following screen illustrates the Basic Cluster default settings in the In-Premise Display ETRX3USB:

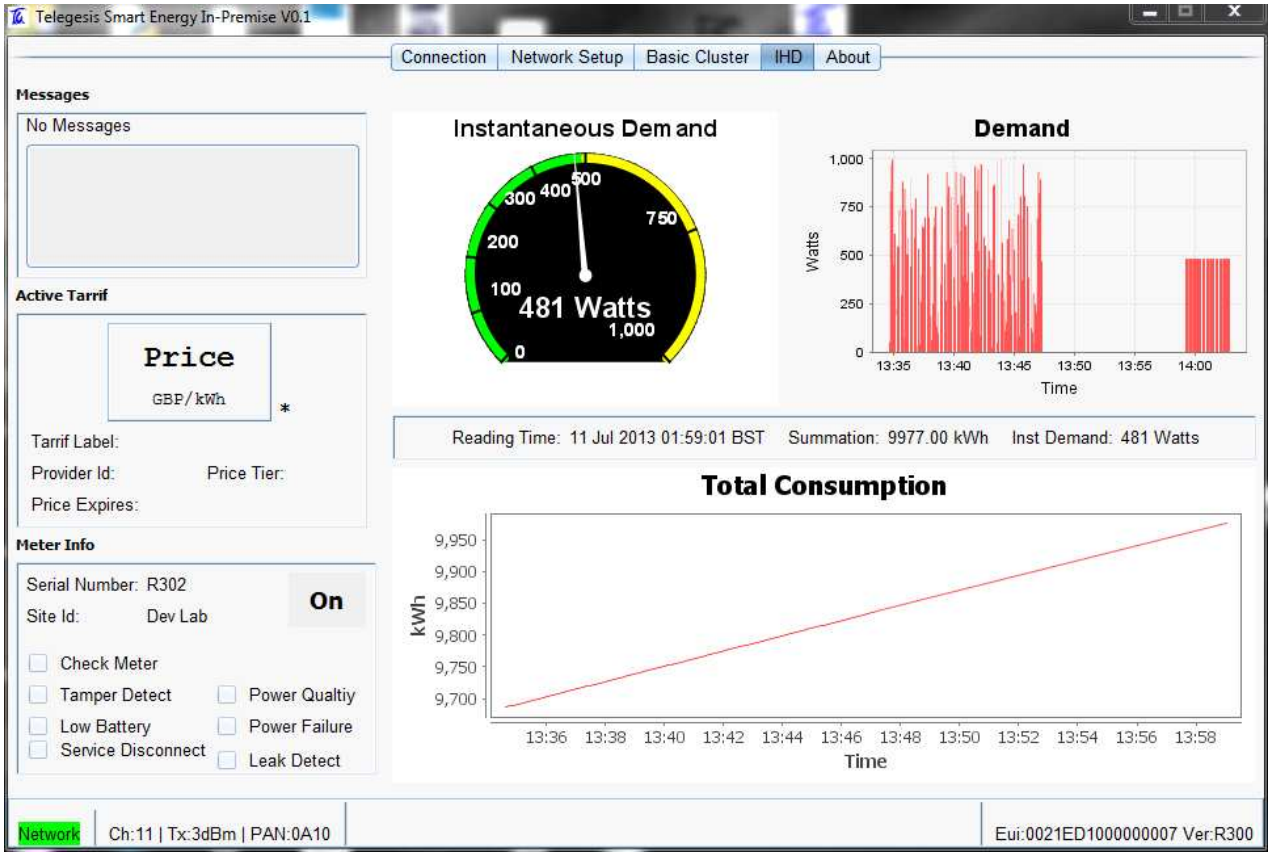


All the attributes listed in the table above can be changed by double clicking on the attribute row or by clicking on the “Edit” button.

Please ensure that when updating the attributes the data must conform to the specifications to ensure proper application behaviour.

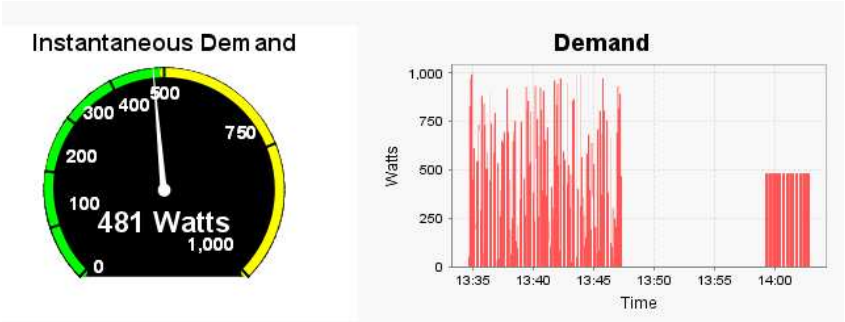
3.2.4 IHD

The IHD tab shows a representation of a basic In-Premise Display. All fields in this view are automatically updated. By default the In-Premise Display retrieves the attributes from the Mock Meter ETRX3USB every 5 seconds.



A brief description of the view shown above is as follows,

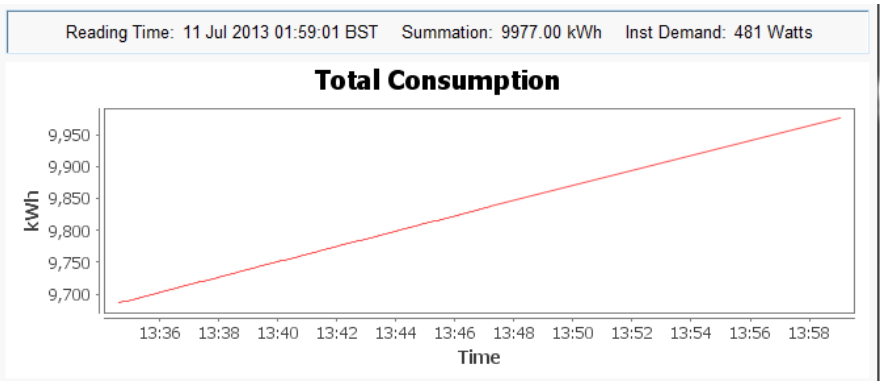
3.2.4.1 Instantaneous Demand



This part shows the Instantaneous Demand attribute as received from Mock Meter ETRX3USB as a meter dial as well as plotted in a chart against time. This visualization is updated periodically at an interval of 5 seconds.

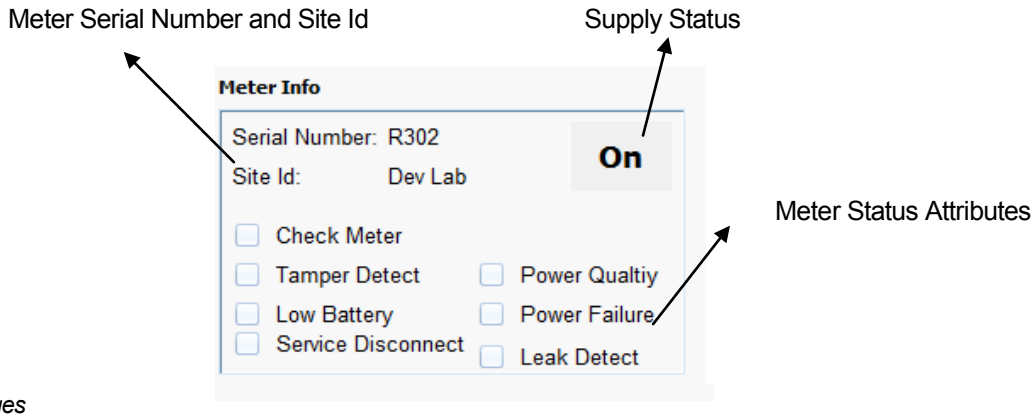
3.2.4.2 Total Summation

The Total Summation attribute is retrieved from the Mock Meter ETRX3USB every 5 seconds and is then plotted against time on the chart shown below,



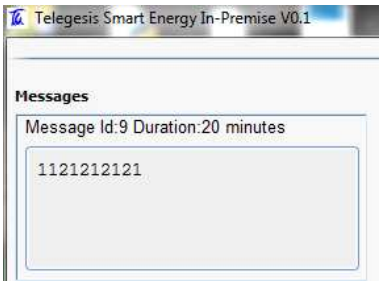
3.2.4.3 *Meter Information and Status*

The screenshot below shows the Meter information and its status.



3.2.4.4 Messages

The messages received from the Mock Meter ETRX3USB are displayed in the section shown below with Message Id and duration. Once the duration has elapsed or a Cancel Message command is received the message will be removed from the view.



3.2.4.5 Price

Price information as received from the Mock Meter ETRX3USB is shown as below,

4. Contact Information

Website: www.telegesis.com

E-mail: sales@telegesis.com

Telegesis (UK) Ltd.
Abbey Barn Business Centre
Abbey Barn Lane
High Wycombe
Bucks
HP10 9QQ
United Kingdom

Tel: +44 (0)1494 510199
Fax: +44 (0) 5603 436999