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Smart Electrical Meter Development Platform (SMB 3.0) Test Results

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Design Resources

www.ti.com/tool/TIDM-SMARTMETERBOARD3	Tools Folder with Design Files
www.ti.com/product/trf7970a	RFID
www.ti.com/product/cc3000	CC3000
www.ti.com/tool/cc2530emk	CC2530

ASK Our E2E Experts
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Kit Contents and Requirements

- Smart Meter Board + AC Power Coord
- SimpleLink™ CC3000 Wi-Fi Evaluation Module
- TRF7970A RFID Target Board
- PLC Daughter Boards and Module
- 2 CC2530 RF Transceiver Daughter Boards
- IHD430, Low-Cost Segment Based In-Home Display
- 1-Phase Metrology Module (MSP430AFE253)
- Application Microcontroller Module (Stellaris® LM3S1B21)
- Data Concentrator Board (Not Included)
- Wi-Fi GUI SW is Provided in the Zip File Accompanying this Document.

Design Features

- Modular and Scalable Smart Meter Development Platform Helps Developers Design Low-End to Advanced Smart Meters for AMR and AMI Systems.
- Open Platform Lets Developers Customize their Designs for Further Development or Differentiation.
- ARM® Cortex™-M Application Microcontrollers
- Wi-Fi Capability Allows Smart Meters to Connect to an IP Network so Customers can Communicate with the Smart Meter through a Wi-Fi-Connected Computer, Smartphone or Tablet, without the Additional Cost and Complexity of a Gateway.
- Support for Low-Power RF (Sub-1GHz and 2.4-GHz ZigBee) Implementations Connects a Meter to a Home Area Network (HAN) for Short-Range Communication.
- Easy Software Integration with Support for TI Smart Grid Software Libraries, including ZigBee SEP 1.x and 2.0, WMBUS, 802.15.4g, One-Phase/Two-phase metrology, THD, DLMS, Pre-Payment, MIFARE™ and Encryption.
- Supports PLC for PRIME/G1/G3/P1901.2 for Low-Frequency Narrowband Communication.
- NFC Capabilities Introduce Options for Pre-Payment of Energy.

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1 Overview

The Smart Meter Board (SMB) from Texas Instruments is a comprehensive modular and scalable tool to demonstrate the capabilities of a Smart Meter along with the smart grid's most prolific communications protocols. The SMB is a unique modular and scalable environment that lets developers include multiple wired and wireless communication protocols including power line communication (PLC), near field communication (NFC), Wi-Fi, sub-1GHz and 2.4GHz ZigBee ® Smart Energy Profile (SEP) on e-metering applications. The SMB performs energy or electricity metering and has the capability of transferring key meter data via wired and wireless sensors to showcase Automatic Meter Reading (AMR) and Automatic Metering Infrastructure (AMI) systems.

To test the Smart meter board capabilities a desk lamp with a 40 watt bulb is connected to the power outlets on the side of the SMB. The steps in the SMB user manual are followed to power up the board. The communication and proper operation of each of the modules are being tested. This test document will illustrate the results of the wi-fi, zigBee, NFC, and metering modules. For more information regarding each of the modules, please refer to their own TI design webpages or user manuals on ti.com

2 Smart Meter Board (SMB)

Once the smart meter board starts up and connects to the wi-fi access point, the metrology engine can calculate power usage. The consumption wattage can then be displayed on the LCD screen as shown below.

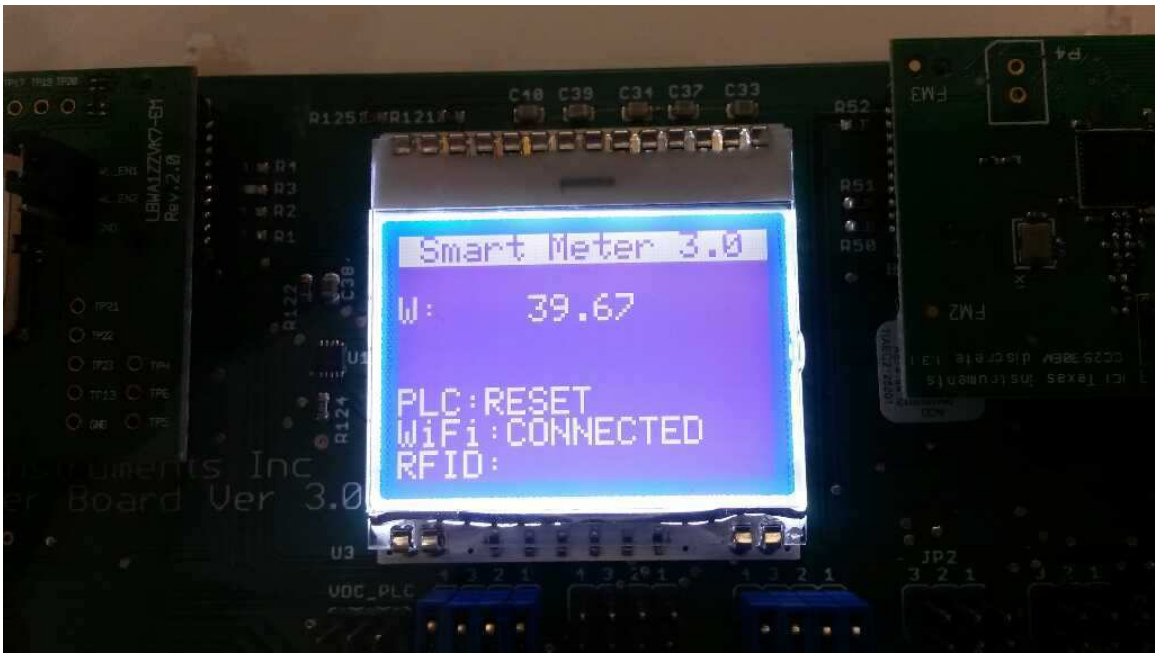

Figure 1. Smart Meter Board

The data is also transmitted out via the wireless and ZigBee modules. The host processor of the smart meter board handles the messages to each module. Theoretically, when the LCD screen is correctly displaying data, then the other modules will also transmit the correct data. The test results for the Wi-fi module are next.

3 Wi-fi Graphical Results Applet

A graphical user interface was designed to take the information from each packet of information transmitted via the wi-fi module and create a graph of past metering data including a read out of the current wattage. As seen below, the current reading is about 40 watts, which is correct because a 40 watt bulb is being measured by SMB.

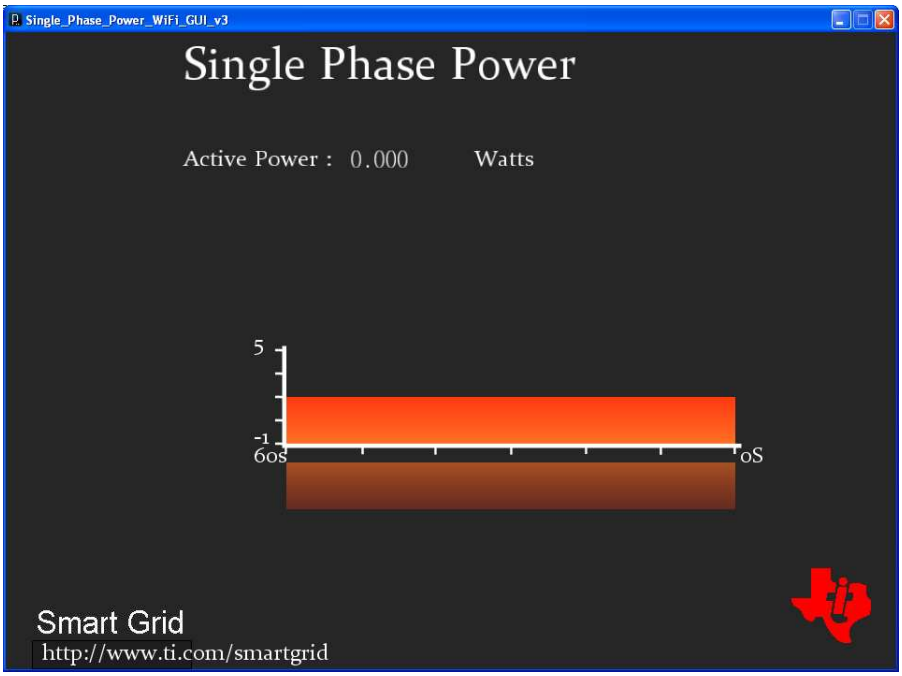

Figure 2. Wi-Fi GUI

4 ZigBee In-Home Display

Before the in-home display starts receiving data from the SMB, the LCD screen will read “lhd430”. Once the IHD is receiving data the screen will show an antenna symbol with signal strength. The center of the display will present the current metering data.

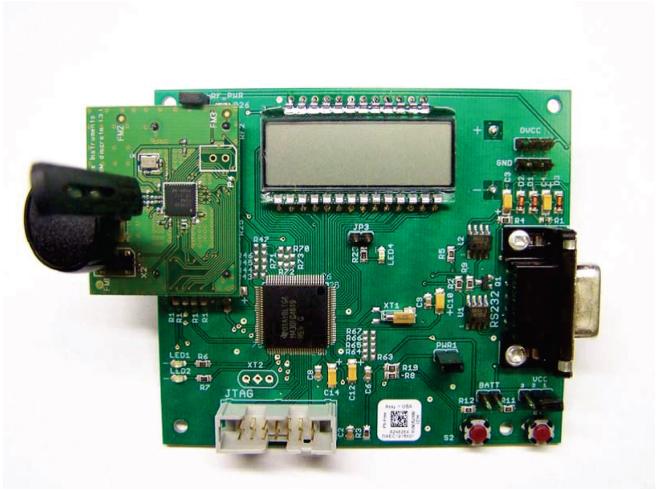

Figure 3. In-Home Display

5 NFC Card Read Test

The SMB also has support for an NFC card reader module. This test uses the TRF7970A RFID Target board. More information regarding the RFID board can be found in the SMB user guide.

Figure 4. RFID Module

When an NFC card is in range of the reader module the id of the card will be displayed on the SMB's LCD screen. The id appears on the last line of the display as shown below.

Figure 5. NFC Card ID

6 Test Results

The test is successful. Both the SMB, wi-fi GUI and the in-home display present similar data. The IHD lags one second behind the Smart meter board's LCD because the IHD screen updates every second. In conclusion, the SMB 3.0 and the in-home display both show about 40 watts when a 40 watt load is connected to the power outlets of the SMB 3.0.

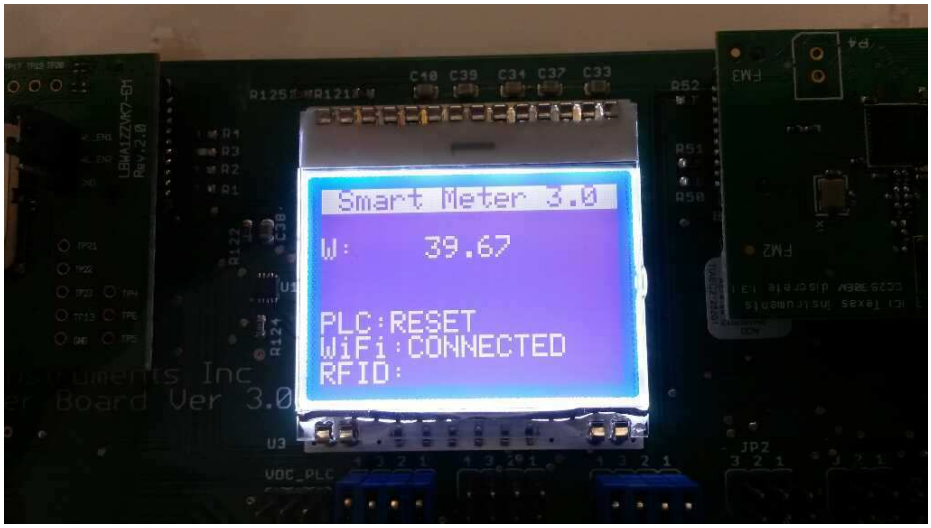

Figure 6. Test Results

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Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265