AD-CELLPACKBM-SL Quick Start Guide

DESCRIPTION

The **AD-CELLPACKBM-SL** is a complete BMS kit consisting of the EVAL-ADBMS6830BMSW 16-channel cell monitor, the EVAL-ADBMS2950-BASIC pack monitor, EVAL-ADBMS6822 dual isoSPI adapter, and the SDP-K1 microcontroller board. This solution is based on high-performance BMS devices that are specifically designed for broad market applications and is suitable for determining the battery's state of charge (SoC) and state of health (SoH), as well as performing important BMS diagnostics.

The AD-CELLPACKBM-SL can operate either in embedded mode or through a PC-based graphical user interface. Complete with working software and hardware, as well as software examples, this kit makes it easier for customers to prototype and create connected systems for BMS applications.

EQUIPMENT NEEDED

For easy identification of the components included in the kit, refer to Figure 1.

Boards

- 2x EVAL-ADBMS6830BMSW 16-Channel Battery Cell Monitor
- 1x EVAL-ADBMS2950-BASIC Battery Pack Monitor
- 1x EVAL-ADBMS6822 Dual isoSPI Adapter
- 1x EVAL-SDP-CK1Z (SDP-K1) Controller Board
- 2x DC2472A Battery Cell Emulator
- 1x MAX32625PICO Programming Adapter with 10-pin SWD cable (loaded with firmware image)

Cables and Other Accessories

- 2x Cell Connector Block (18-cell connector)
- 3x DuraClik isoSPI Twisted Pair Cables
- 3x USB Type A to Micro-B Cable
- 2x 12.0“ Alligator Clip / Test Lead, Black
- 1x 12.0” Alligator Clip / Test Lead, Red
- 1x 24.0“ Alligator Clip / Test Lead, Red

The following list of equipment are **not provided as part of the kit** but are required for running the setup described in this guide.

- Laptop or PC running Windows 10
- Digital power supply (such as the Keysight e3631A 0V to 6V power supply)
- 2x wall plugs (to plug USB cable from DC2472A to provide power)

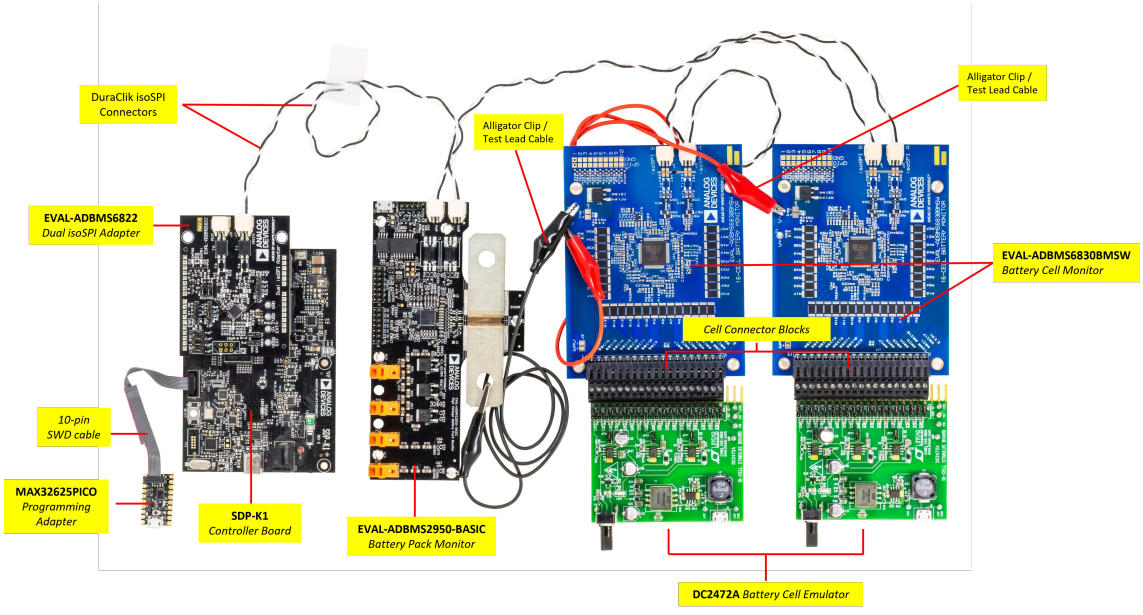

Figure 1. AD-CELLPACKBM-SL Kit Contents / Complete Daisy Chain Setup

SYSTEM SETUP

SOFTWARE

The **BMS Browser GUI Broadmarket** is a PC browser based Graphical User Interface (GUI) tool designed to work in conjunction with the hardware in the AD-CELLPACKBM-SL BMS kit.

MyAnalog.com account is required when downloading the software. When updates or new versions are available an email notification will be sent to the email address associated with the MyAnalog account used to download the original software package.

MCU Configuration

By default (upon purchase), the AD-CELLPACKBM-SL kit comes with a MAX32625PICO programming adapter that is loaded with firmware image.

Otherwise, if you are using a new MAX32625PICO programmer (that is not part of the original kit), make sure to flash it first with the correct firmware image before using it with the AD-CELLPACKBM-SL kit. If you do not know how to flash the firmware image, follow the instructions described in this page.

GUI INSTALLATION

1. Download the BMS Browser GUI Broadmarket on the host PC.
2. Double-click on **bms_browser_gui_broadmarket-relX.Y.Z.exe** file to install the GUI.
3. Accept the license terms and then click **Next** to proceed with the installation.

   Default installation directory will be in **C:\Analog Devices**

GUI TABS AND FUNCTIONS

Below table describes the tabs available in the BMS Browser GUI with their specific functions.

Table 1. BMS Browser GUI Tabs

Tabs	Description
Quick Measure	simplifies metric measurement with a preloaded command sequence. Note that this tab only supports single device in the daisy chain, and key features enhance configuration and visualization.
Sequences	enables the creation and management of custom command sequences. Load and save sequences, divided into Init and Loop lists. The *Init* list initializes the daisy chain once, while the *Loop* list runs continuously until stopped. Toggle between lists using the corresponding buttons at the top.
Scheduler	provides insights into the execution time of sequences from the Sequences tab. It allows combining sequences for a complete execution loop. Key features enable precise timing adjustments and visualization.

Table 1. BMS Browser GUI Tabs (Continued)

Tabs	Description
Memory Map	provides a numerical output for the active command loop, organized into tables for user convenience. It offers customization and error highlighting for effective data analysis.
Plots	provides a graphical representation of data collected through the running command loop. It offers customization options for focused analysis and allows for the export of captured data for further analysis.
Data Recall	allows the retrieval and plotting of data from previous freerun sessions stored in a database file. The interface is similar to the Plots tab with added functionality for selecting the database file and test run.
Diagnostics	offers a straightforward way to execute on-device diagnostics following the device's safety manual. It displays available diagnostics, test logs, and results for a single device.

HARDWARE SETUP

The setup described in this document uses the SDP-K1 as the controller board, but users may also use the AD-APARD32690-SL as MCU and follow the same hardware setup instructions.

CELL MONITORING

This setup uses two DC2472A battery emulators for cell voltage input. Alternatively, resistors can be used to simulate battery cell voltages. 100 Ω ½ W or equivalent resistors are recommended because 100 Ω (or lower values) typically will not induce measurement errors, and the ½ W (or greater rating) will keep the resistor temperatures low, preventing power dissipation damage.

Check the EVAL-ADBMS6830BMSW User Guide for procedure on connecting resistors.

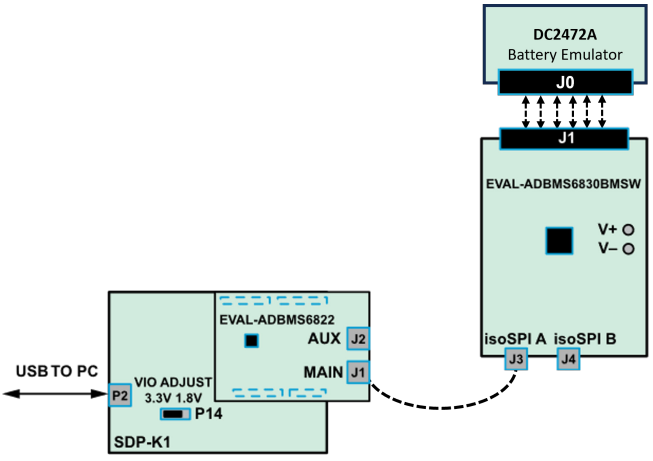

Figure 2. Cell Monitoring Setup

1. Connect the EVAL-ADBMS6822 dual isoSPI adapter to the EVAL-SDP-CK1Z (SDP-K1) controller board through the Arduino headers.

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2. Set the P14 jumper of the SDP-K1 to the 3.3 V position.
3. Connect the EVAL-ADBMS6822 (J1) to the EVAL-ADBMS6830BMSW (J3) using the 2-wire twisted-pair patch cable from the main DuraClik connector to isoSPI A DuraClik connector.
4. Plug the screw-terminal block(s) into the cell voltage connectors of the DC2472A battery emulator board. Note that the last three terminals of the DC2472A must be left hanging (see Figure 1).
5. Connect the DC2472A battery emulator board to the EVAL-ADBMS6830BMSW through the connected cell voltage connectors (J1).
6. Power the DC2472A using a 5 V external source connected to J1 using a USB cable. Alternatively, power it through PC using a USB cable to be connected via J10.
   - While some laptop USB ports may suffice for powering the emulator during evaluation, it is still recommended to use an external power supply to ensure adequate power. Note that he EVAL-ADBMS6830BMSW is powered through the DC2472A.
7. Attach the MAX32625PICO programmer to the SDP-K1 using the 10-pin ribbon SWD cable. Observe correct polarity when connecting the SWD cable, refer to below figure.

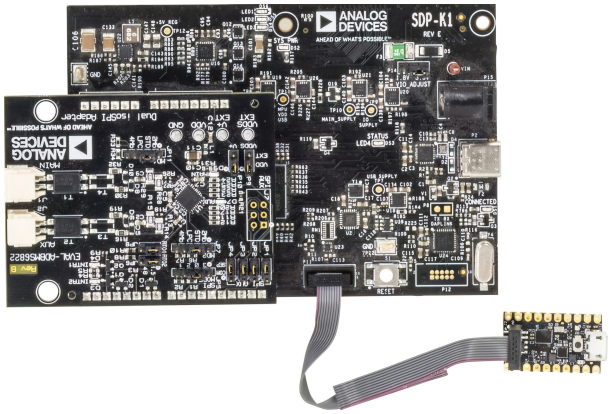

Figure 3. Connecting the MAX32625PICO to SDP-K1 Using an SWD Cable

8. Connect one end of the USB cable to SDP-K1 (P2) and the other end to the host PC.

Test

1. Open the BMS Browser GUI.
2. Go to the **Interface Connection** section and select the COM port associated with the SDP-K1.
3. Under the **Daisy Chain** section, ensure the *Generation* drop down box is set to **ADBMSGEN6**.
4. From the **Products** list, select the **ADBMS6830**, then click on the right arrow to add it to the Daisy Chain. Settings can remain as default.
5. Click **Launch**.
6. Upon launching, the **Quick Measure** tab will open. ***Note:*** this utility only supports a single BMS product in a Daisy Chain. Click **Start Quick Measure** to begin measurements.
7. Check the *Total PEC Status* on the **Memory Map.** It should reflect *true*, indicating a successful isoSPI link between the EVAL-ADBMS6822 and the EVAL-ADBMS6830BMSW.
   - Ensure the EVAL-ADBMS6830BMSW board is powered correctly, indicated by the *Blue LED* on the DC2472A being illuminated.
   - Verify the connection of the twisted cable between the EVAL-ADBMS6822 and the EVAL-ADBMS6830BMSW.
8. Check the voltage readings by adjusting the potentiometer (POT1) on the DC2472A to modify the emulated cell voltages.
   - Monitor the voltage channels on the **Quick Measure Utility graph.**
   - Select which signals to display on the graph under the **Plot All Devices** column.

PACK MONITORING

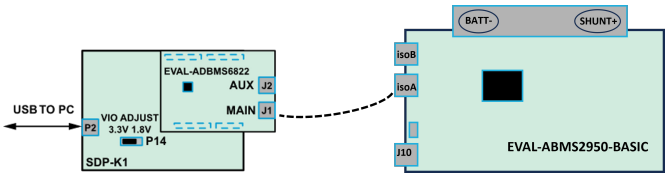

Figure 4. Pack Monitoring Setup

1. Connect the EVAL-ADBMS6822 dual isoSPI adapter to the SDP-K1 controller board through the Arduino headers.
2. Set the P14 jumper of the SDP-K1 to the 3.3 V position.
3. Connect the EVAL-ADBMS6822 (J1) to the EVAL-ADBMS2950-BASIC (isoA) using the provided using the 2-wire twisted-pair DuraClik cable.
4. Choose between two options for powering the EVAL-ADBMS2950-BASIC:
   - Using the an external power source, supply 5 V to J1 and set the current limit to 200 mA. The EVAL-ADBMS2950-BASIC consumes <50 mA in idle mode and ~100 mA in active mode.
   - Alternatively, power it through PC using a micro-USB cable to be connected via J10.
5. Attach the MAX32625PICO programmer to the SDP-K1 using the 10-pin ribbon SWD cable. Observe correct polarity when connecting the SWD cable, refer to Figure 3.
6. Connect one end of the USB cable to SDP-K1 (P2) and the other end to the host PC.

Test

1. Open the BMS Browser GUI.
2. Go to the **Interface Connection** section and select the COM port associated with the SDP-K1.

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3. Under the **Daisy Chain** section, ensure the Generation drop down box is set to **ADBMSGEN6**.
4. From the **Products** list, select the **ADBMS2950**, then click on the right arrow to add it to the Daisy Chain. Settings can remain as default.
5. Click **Launch**.
6. Upon launching, the **Quick Measure** tab will open. ***Note:*** it can only handle one BMS product in a Daisy Chain. Click **Start Quick Measure** to begin measurements.
7. Check the *Total PEC Status* on the **Memory Map.** It should reflect *true*, indicating a successful isoSPI link between the EVAL-ADBMS6822 and the EVAL-ADBMS2950-BASIC. If false, there is an error in the signal chain.

COMPLETE DAISY CHAIN

Once familiar with the setup for each of the individual boards, the entire signal chain can be verified.

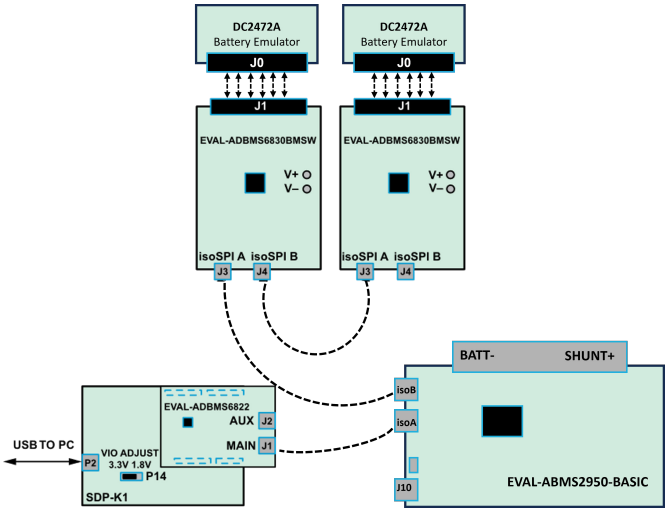

Figure 5. Complete Daisy Chain Setup

1. Connect the hardware using the DuraClik isoSPI cables, following the instructions in earlier sections. Refer to Figure 1 to see the actual daisy chain setup.
2. Power each DC2472A using a 5 V external source connected to J1 via the USB cable.
3. Power the EVAL-ADBMS2950-BASIC either through J1 or J10, as explained earlier.
4. Using the black alligator clip cable, connect the **V-** pin of the second EVAL-ABMS6830BMSW to the **BATT-** port of the EVAL-ADBMS2950-BASIC (see Figure 1).
5. Using the red alligator clip cable, connect the **V-** pin of the first EVAL-ABMS6830BMSW board to the **V+** pin of the second EVAL-ADBMS6830BMSW.
6. Attach the MAX32625PICO programmer to the SDP-K1 using the 10-pin ribbon SWD cable. Observe correct polarity when connecting the SWD cable, refer to Figure 3.
7. Connect one end of the USB cable to SDP-K1 (P2) and the other end to the host PC.

Test

1. Open the BMS Browser GUI.
2. Go to the **Interface Connection** section and select the COM port associated with the SDP-K1.
3. Under the **Daisy Chain** section, ensure the *Generation* drop down box is set to **ADBMSGEN6**.
4. From the **Products** list, select the following devices from drop down options. Click the right arrow to add to the Daisy Chain.
   - ADBMS2950 (designated as Device 1)
   - ADBMS6830 (designated as Device 2)
   - ADBMS6830 (designated as Device 3)
5. Click on **Launch** to initiate the GUI.
   - After the GUI launches in the browser, go to the **Sequences** tab located in the top toolbar, which will open the *Sequence Configuration* page.
6. In the Files column, select the **ADBMS6830-ADBMS2950.json**. This action will load a preconfigured sequence into the tool.
   - Click on **Initialization Sequence** followed by **General Initialization** under the **Sequences** column to load the defined sequences from the **ADBMS6830-ADBMS2950.json** file.
   - Next, select **Loop Sequence** and then click on **General Readback Loop** under the **Sequences** column. This action loads the loop sequence defined in the example .json file.
   - Finally, click on **Start Freerun** to initiate the freerun mode.
7. During free run mode, the Initialization Sequence is performed once initially. Subsequently, the loop sequence continues to run continuously until the “Stop Freerun” button is clicked.
8. After activating freerun mode, navigate to the **Memory Map** tab. This section displays a numerical representation of the ongoing command loop.
9. The **Plots** tab allows for the visualization of parameters recorded during the command loop. It supports the creation of up to four plots simultaneously.
   - In the configured Daisy Chain, the EVAL-ADBMS2950-BASIC is designated as Device 1, the first EVAL-ADBMS6830BMSW as Device 2, and the second EVAL-ADBMS6830BMSW as Device 3.
   - Simply choose the desired Plot number from the drop down menu under each device to display the relevant data.
10. Plot settings can be saved to the PC to be reloaded for future session to save time.

NOTES

Visit the AD-CELLPACKBM-SL Wiki User Guide for more comprehensive information on the hardware components and software controls.

ESD Caution
ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.