AD-CELLPACKBM-SL

Quick Start Guide

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AD-CELLPACKBM-SL

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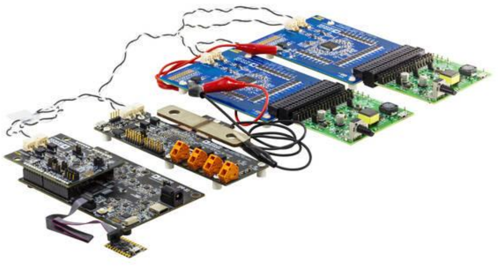
AD-CELLPACKBM-SL QuickStart Guide

Overview



AD-CELLPACKBM-SL Kit

The AD-CELLPACKBM-SL is a complete BMS kit consisting of the EVAL-ADBMS6830BMSW 16-channel cell monitoring module, the EVAL-ADBMS2950-BASIC pack monitoring module, EVAL-ADBMS6822 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 and solutions for BMS applications.

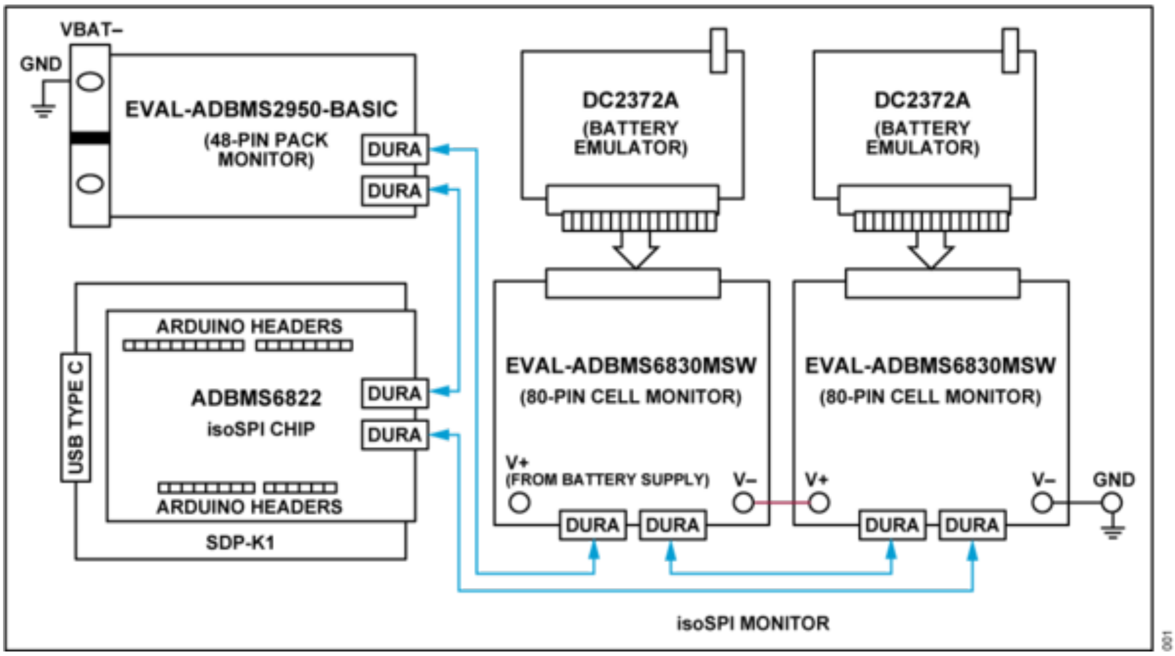
Features

- Accurate voltage and current measurement
- Highly scalable and ease of integration
- Robust isoSPI capability implementable in daisy chain high count
- Inclusive passive balancing with individual pulse-width modulation
- Isolated power supply between microcontroller and battery monitoring ICs

Applications

- IoT Battery Management
- Industrial Machine Vision
- Power Tools
- Mobile Robotics Battery Management
- Industrial Equipment Battery Monitoring
- Adaptive Battery Type System Monitoring
- Portable Energy Storage Systems
- Electric Two-Wheelers (E2W such as E-scooter, E-bikes)
- Light Electric Vehicles

System Architecture



System Architecture Diagram

Specifications

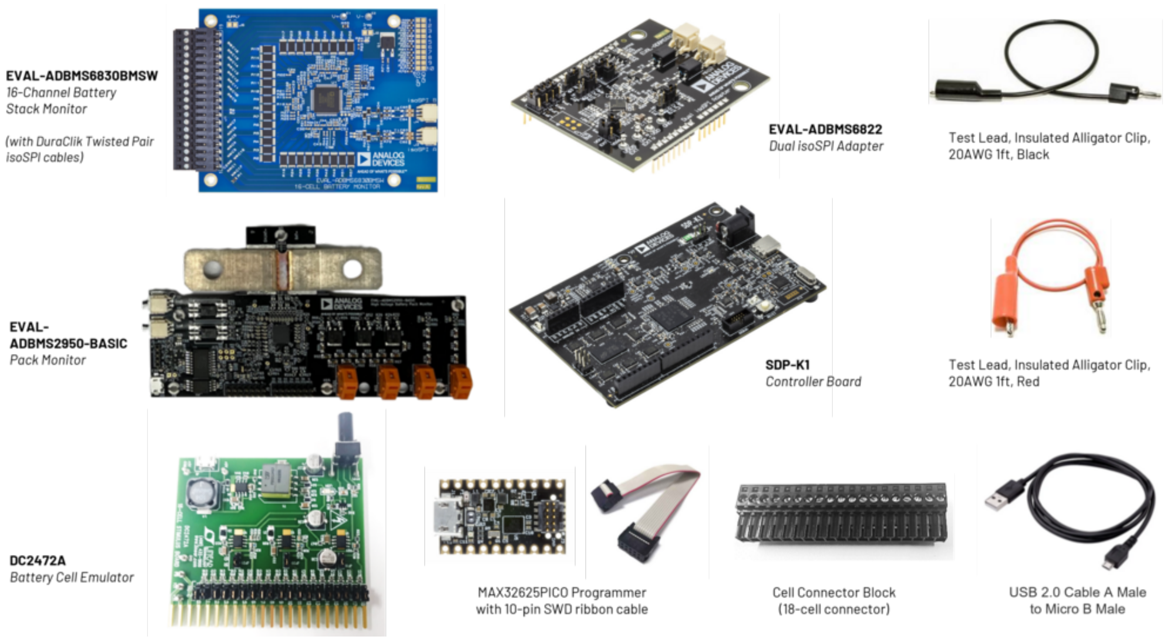
Below are the absolute maximum ratings of voltages relative to GND unless noted otherwise.

Parameter	Minimum	Typical	Maximum	Unit
System Vin+ Supply Voltage	6	12	60	V
Cell Monitoring Main Supply Voltage	11		85	V
VREG Supply Voltage	4.5	5	5.5	V
VREF1 1st Reference	3.0	3.2	3.3	V
Voltage No Load				
VREF2 2nd Reference	2.995	3	24	V
Voltage, 5k Load to V-				
CPIN Input Range	-2.5		5.5	V
Cell Count			16	
Pack Monitoring Main Supply Voltage In	21			V
Pack Monitoring Main Supply Voltage Out			1000	V
VREG Pack Monitor	4.5	5	5.5	V
Current Input S1A, I1A, I1B	-4		4	V

Parameter	Minimum	Typical	Maximum	Unit
Current Input S2A, I2A, I2B	-4		4	V
Current Input I3A, I3B	-4		4	V
MCU Supply Voltage	3.3		5.5	V
MCU Standalone Supply Range	5		5.5	V
MCU via USB Supply range	3.3		5.5	V
Cx Voltage	-0.3		85	V

What's Inside the Box?

Upon purchase of the AD-CELLPACKBM-SL kit, the package comes with the following boards and accessories



Package Contents

Key Components

EVAL-ADBMS6830BMSW 16-Channel Battery Cell Monitor

The EVAL-ADBMS6830BMSW is a full-featured evaluation board for the ADBMS6830B, a 16-channel battery stack monitor for broad market applications. This board allows multiple boards to be linked through a single twisted pair wire interface (isoSPI) to monitor a long series of cells in a stack. It provides access to full channel monitoring to all cells going to battery pack either in the supply line or in the V+ to V- line. The evaluation board also features reversible isoSPI that can access either path to do measurement functions and serve as a redundant communication path.

Click here to see the EVAL-ADBMS6830BMSW User Guide

EVAL-ADBMS2950-BASIC Battery Pack Monitor

The EVAL-ADBMS2950-BASIC battery pack monitoring evaluation board features the ADBMS2950B, a bidirectional current monitor, with 12 buffered high impedance voltage sense inputs, linked through a 2-wire isolated serial interface (isoSPI). This board also features reversible isoSPI, enabling a redundant communication path.

The EVAL-ADBMS2950-BASIC board can be operated on the same isoSPI daisy-chain with other ADBMS2950B and ADBMS6830B devices.

Click here to see the EVAL-ADBMS2950-BASIC User Guide

EVAL-ADBMS6822 Dual isoSPI Adapter

The EVAL-ADBMS6822 is a dual SPI to 2-wire isolated serial port interface (isoSPI) adapter featuring the ADBMS6822. This board allows multiple ADBMS68xx battery monitors through daisy-chain connections. The EVAL-ADBMS6822 evaluation board also features reversible isoSPI, which enables a redundant path to the peripheral units. The PCB components and DuraClik connectors are optimized for low electromagnetic interference (EMI) susceptibility and emissions.

▶ Click here to see the EVAL-ADBMS6822 User Guide

EVAL-SDP-CK1Z (SDP-K1) Controller Board

The EVAL-SDP-CK1Z Controller Board provides a means of communicating with the PC from the other BMS boards in the Cellpack BMS System. The SDP-K1 provides USB connectivity through a USB 2.0 high speed connection to the computer, allowing users to evaluate components on this platform from a PC application. The SDP-K1 is based on an STM32F469NIH6 Arm® Cortex®-M4 microcontroller with the peripheral communication lines available to the daughter board(s) through a 120-pin small footprint connector and Arduino® Uno-compatible headers.

▶ Click here to see the SDP-K1 User Guide

Resources

- ▶ AD-CELLPACKBM-SL
- ▶ EVAL-ADBMS6830BMSW
- ▶ EVAL-ADBMS2950-BASIC
- ▶ EVAL-ADBMS6822
- ▶ SDP-K1

Design & Integration Files

≡ Download

AD-CELLPACKBM-SL Design Support Package

- Schematic
- PCB Layout
- Bill of Materials
- Allegro Project

Guides&Sample Software

Hardware User Guide

AD-CELLPACKBM-SL

System Setup

This section describes the procedure for establishing hardware connection between the boards, how to download the system requirements such as the firmware and software, and eventually obtain and view BMS readings through the Broad Market BMS graphical user interface.

Equipment Needed

For easy identification of the components included in the kit, refer to the figure below.

Boards

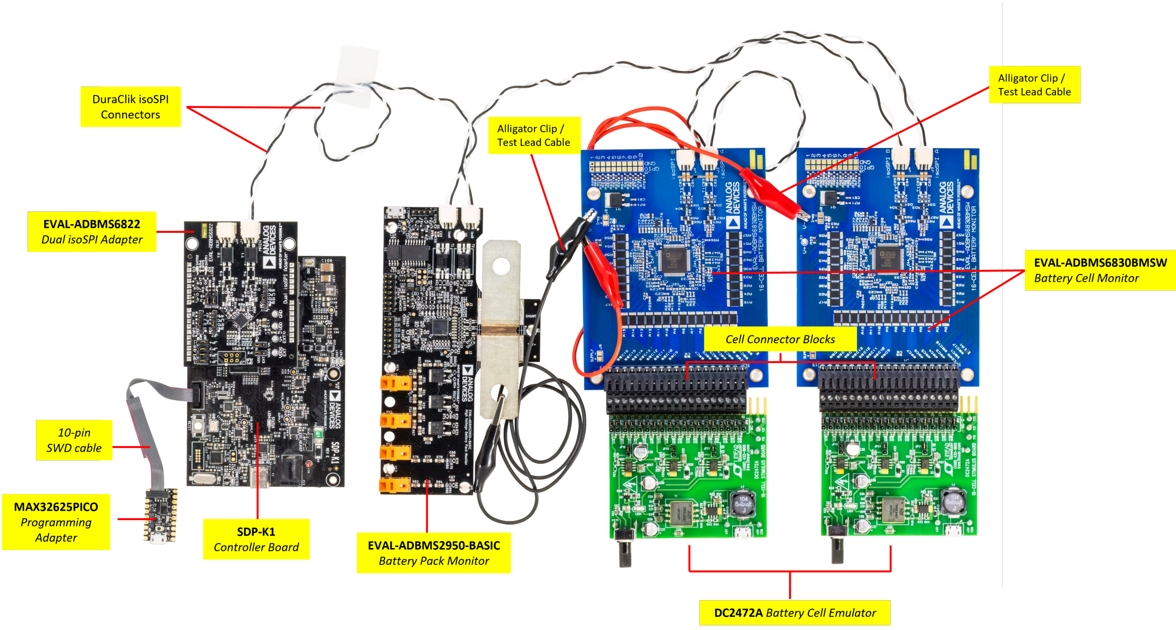
- 2x EVAL-ADBMS6830BMSW 16-Channel Battery Cell Monitor
- 1x EVAL-ADBMS2950-BASIC Battery Pack Monitor
- 1x EVAL-ADBMS6822 Dual isoSPI Adapter
- 1x EVAL-SDP-CK1Z (SDP-K1) Controller Board
- 2x DC2472A Battery Cell Emulator
- 1x MAX32625PICO Programming Adapter with 10-pin SWD cable (loaded with firmware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



Software

The BMS Browser GUI is a PC browser based Graphical User Interface (GUI) tool designed to work in conjunction with the hardware in the AD-CELLPACKBM-SL. MyAnalog.com account will be required to download the BMS Browser GUI from below link:

BMS Broad Market GUI

When software updates or new versions of the software 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 & Setup

> **Note**
>
> By default (upon purchase), the AD-CELLPACKBM-SL Kit comes with a MAX32625PICO programmer adapter that is already loaded with the appropriate 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 BMS Kit. If you do not know how to load the image, follow the instructions below.

The MCU should be programmed using the following steps:

MAX326825PICO Debugger (One-time setup)

1. Download and install the BMS Browser GUI Broadmarket.
2. Open the program files folder of the BMS Browser GUI in the host PC and look for the SDP-K1 .bin file.
   `C:\Analog Devices\BMS_Browser_GUI_Broadmarket-Rel2.0.0\USB_TO_SPI_Firmware`
3. Plug the micro USB cable to the MAX32625PICO.
4. Press the button on the MAX32625PICO and then plug the other end of the micro-USB cable into the PC. A red LED should blink, then hold steady, and a MAINTENANCE drive should appear on your PC.
5. Drag and drop the `SDP_K1_PyBMS_USB_TO_SPI_Bytes_Debug_USB_Port.bin` file onto the MAINTENANCE drive. The file transfer should be complete in about 30 seconds.
6. Unplug and replug the device.

7. After completing this step, a **DAPLINK** drive should appear. You can drag and drop the firmware (.bin files separate from the above) onto it to program the SDP-K1.

BMS Browser GUI Installation

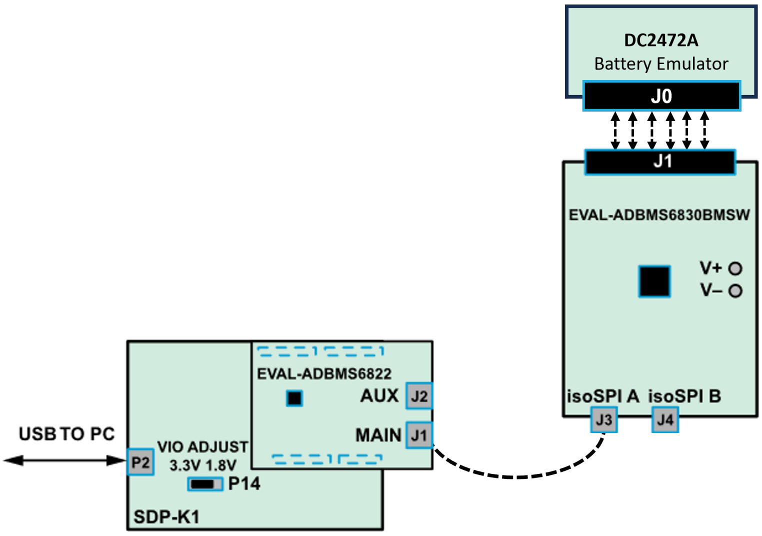
1. Download the BMS Browser GUI in your Host PC.
2. Double click on `bms_browser_gui_broadmarket-relX.Y.Z.exe` to install the GUI.
3. Accept the license terms and click *Next*` to proceed with the installation. The default installation directory will be in `C:\Analog Devices\`.

Launching the BMS Browser GUI

1. Open the BMS Browser GUI either by searching for it in the *Start Menu*` or using the shortcut on the Desktop.
2. Run the application to launch the BMS Browser GUI.
3. Upon launching, a console window will appear to display background information.
4. Two new tabs will open in the default browser on the PC, with the User Guide tab as the default.
5. Switch to the alternative tab to access the BMS Browser configuration page, which should be displayed.
6. Ensure that the SDP-K1 is connected to the PC via the USB-C cable on P10. The Blue LED, D31 will illuminate when powered.
7. In the Serial Port dropdown box, select the COM port associated with SDP-K1.

Battery Cell Monitoring

Setup



This setup 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.

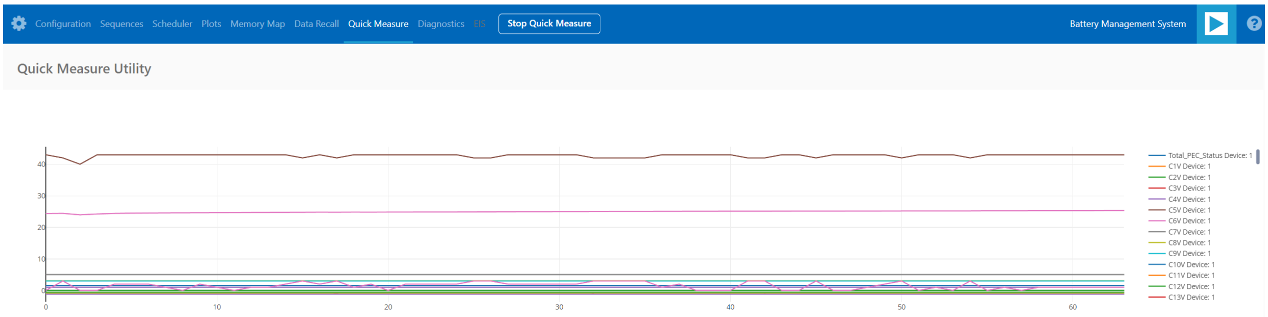
The DC2472A Battery Emulator Board was also used for cell voltage input. Alternatively, resistors can be used to simulate battery cell voltages. 100 Ω ½ W or equivalent resistors are recommended because 100 Ω (or lower values) typically will not induce measurement errors, and the ½ W (or greater rating)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

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

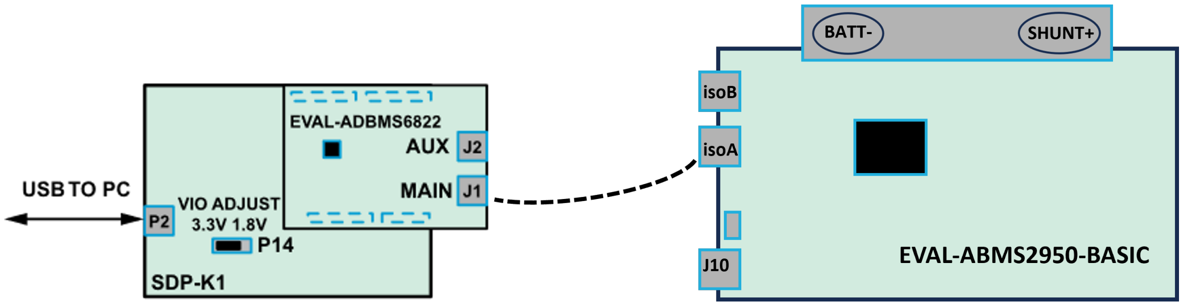
1. Connect the **EVAL-ADBMS6822** dual isoSPI adapter to the EVAL-SDP-CK1Z (SDP-K1) controller board through the Arduino headers.
2. Set the P14 jumper of the SDP-K1 to the 3.3 V position.
3. Connect the SDP-K1 (P2) to the Host PC using a USB cable.
4. Connect the **EVAL-ADBMS6822** (J1) to the **EVAL-ADBMS6830BMSW** (J3) using the 2-wire twisted-pair patch cable from the main DuraClik connector to isoSPI A DuraClik connector.
5. 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.
6. Connect the **DC2472A** battery emulator board to the **EVAL-ADBMS6830BMSW** through the connected cell voltage connectors (J1).
7. 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.
8. 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 the EVAL-ADBMS6830BMSW is powered through the **DC2472A**.
9. Attach the **MAX32625PICO** programmer to the SDP-K1 using the 10-pin ribbon SWD cable. Observe correct polarity when connecting the SWD cable.

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*` dropdown 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 3rd row under the *Memory Map*. This indicates the status of the isoSPI link between the **EVAL-ADBMS6822** and the EVAL-ADBMS6830BMSW.
8. Ensure the **EVAL-ADBMS6830BMSW** board is powered correctly, indicated by the Blue LED on the DC2472A being illuminated.
9. Verify the connection of the twisted cable between the **EVAL-ADBMS6822** and the **EVAL-ADBMS6830BMSW**.
10. 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.



Battery Pack Monitoring



Setup

1. Connect the **EVAL-ADBMS6822** dual isoSPI adapter to the **EVAL-SDP-CK1Z (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 isoSPI cable.
4. Choose between two options for powering the **EVAL-ADBMS2950-BASIC**:
    - Supply 5 V to J1 and set the current limit to 200 mA. The **EVAL-ADBMS2950-BASIC** consumes less than 50 mA in idle mode and ~100 mA in active mode.
    - Alternatively, power it using a micro-USB cable connected to 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.
6. Connect one end of the USB cable to **SDP-K1** (P2) and the other end to the host PC.

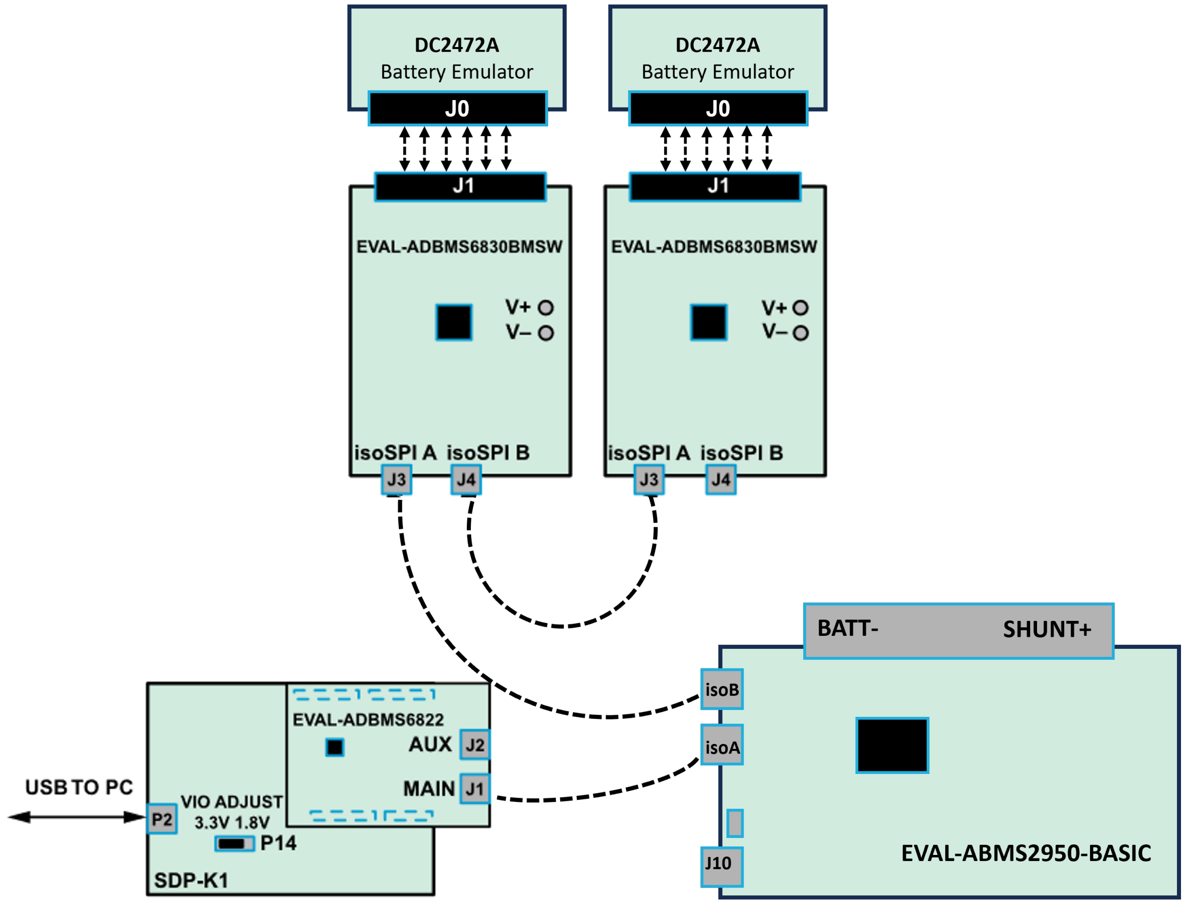
Test

1. Open the BMS Browser GUI.
2. Go to the *Interface Connection*` section and select the **COM port** associated with the SDP-K1.
3. Under the *Daisy Chain*` section, ensure the *Generation*` dropdown 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

Setup



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

1. Connect the hardware using the DuraClik isoSPI cables, as shown in the diagram below.
2. Power each **DC2472A** battery emulator board using a 5 V external source connected to J1 through 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**.
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.
7. Connect one end of the USB cable to SDP-K1 (P2) and the other end to the host PC.

Test

1. Launch the BMS Browser following the previous instructions and choose the appropriate COM port.

2. Set up the Daisy Chain according to the diagram provided. The **EVAL-ADBMS2950-BASIC** is positioned at the top, indicating it is the initial device on the chain, connected to the **EVAL-ADBMS6822**. The first **EVAL-ADBMS6830BMSW** connects to the **EVAL-ADBMS2950-BASIC**, while the second **EVAL-ADBMS6830BMSW** is linked to the first one via the isoSPI cable.
3. 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.
4. In the *Files*` column, select the **ADBMS6830-ADBMS2950.json**. This action will load a preconfigured sequence into the tool.
5. Click on *Initialization Sequence*` followed by *General Initialization*` under the *Sequences*` column to load the defined sequences from the ADBMS6830-ADBMS2950.json file into the tool.
6. Next, select *Loop Sequence*` and then click on *General Readback Loop*` under the Sequences column. This action loads the loop sequence defined in the ADBMS6830-ADBMS2950.json file into the tool.
7. Finally, click on *Start Freerun*` to initiate the freerun mode.
8. 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.
9. After activating freerun mode, navigate to the *Memory Map*` tab. This section displays a numerical representation of the ongoing command loop. Additional details can be accessed in the GUI's help section. The accompanying screenshot illustrates this output.
10. The *Plots*` tab allows for the visualization of parameters recorded during the command loop. It supports the creation of up to four plots simultaneously.

> ✎ Note
>
> In the configured Daisy Chain, the EVAL-ADBMS2950-BASIC is designated as Device 1, the first EVAL-ADBMS6830BMSW as Device 2, and the third EVAL-ADBMS6830BMSW as Device 3. An example illustrates how to plot each parameter separately: I1ACC and I2ACC on Plot 1, the average cell voltages for the first EVAL-ADBMS6830MSW on Plot 2, and the averaged cell voltages for the third EVAL-ADBMS6830BMSW on Plot 3.

Simply choose the desired Plot number from the dropdown menu under each device to display the relevant data.

Plot settings can be saved to the PC to be reloaded for future session to save time.

Resources

- AD-CELLPACKBM-SL
- EVAL-ADBMS6830BMSW
- EVAL-ADBMS2950-BASIC
- EVAL-ADBMS6822
- SDP-K1

Design & Integration Files

Download

AD-CELLPACKBM-SL Design Support Package

- Schematic
- PCB Layout
- Bill of Materials
- Allegro Project

Software User Guide

This software guide provides the essential steps for firmware installation, launching the GUI, configuring the launcher, establishing interface connections, and utilizing various tabs for effective device evaluation. This covers tasks such as daisy chain configuration, quick measurements, custom command sequences, scheduling, memory mapping, plotting, data recall, diagnostics, and EIS measurements.

Prerequisite

The AD-CELLPACKBM-SL Kit can use the available no-OS BMS embedded drivers as well as the Broadmarket BMS GUI for monitoring of crucial BMS parameters.

MyAnalog.com account is required to download the BMS software resources.

Follow the steps below to create a MyAnalog account:

1. Go to MyAnalog and create an account using email. Select the **Register with email** option to get started.
2. Once you have a MyAnalog account, log in to MyAnalog using your credentials.

Request for BMS Embedded Drivers

This reference design comes with no-OS BMS Embedded Drivers designed to run BMS measurements using a serial terminal.

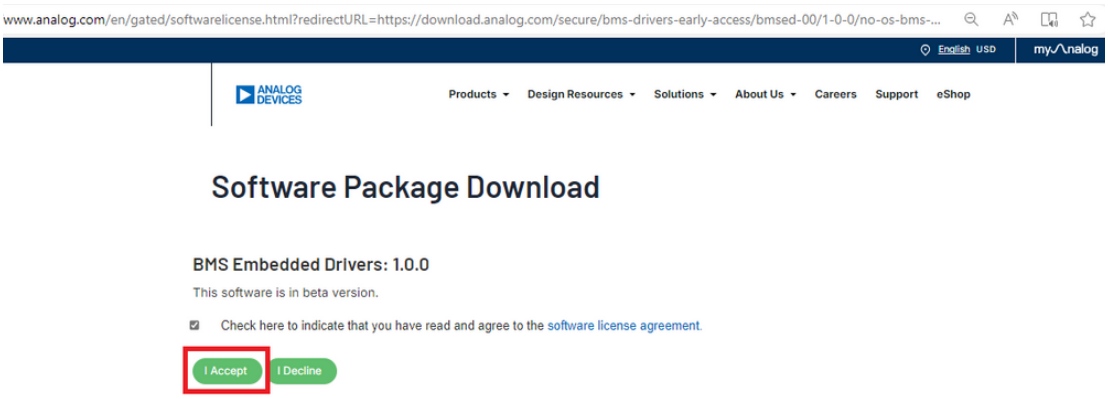
The example projects feature the ADI Broad Market BMS boards such as the EVAL-ADBMS6830BMSW cell monitor and EVAL-ADBMS2950-BASIC pack monitor, the AD-APARD32690-SL as the microcontroller, and the DC2472A battery emulator for cell voltage input.

> Tip
>
> **The BMS Embedded Drivers Installer is available upon request.**
> To request for access, send the following details to this email address:
> **BM_BMSSoftwareSupport@analog.com**
>
> - Email address used for MyAnalog account creation
> - Company/School
> - Country
> - Purpose/Name of Project
>
> You will receive an email confirmation that you have been granted access to the BMS Embedded Installer Package. Follow the steps below to download and properly install the file to your host PC.

Downloading the BMS Embedded Drivers Installer

#. Download from: BMS Embedded Drivers Version 1.0.0 2. You will be directed to the *Software Package Download* page.

- Tick the checkbox.
- The, click the **I Accept** button to indicate acceptance of the license agreement.

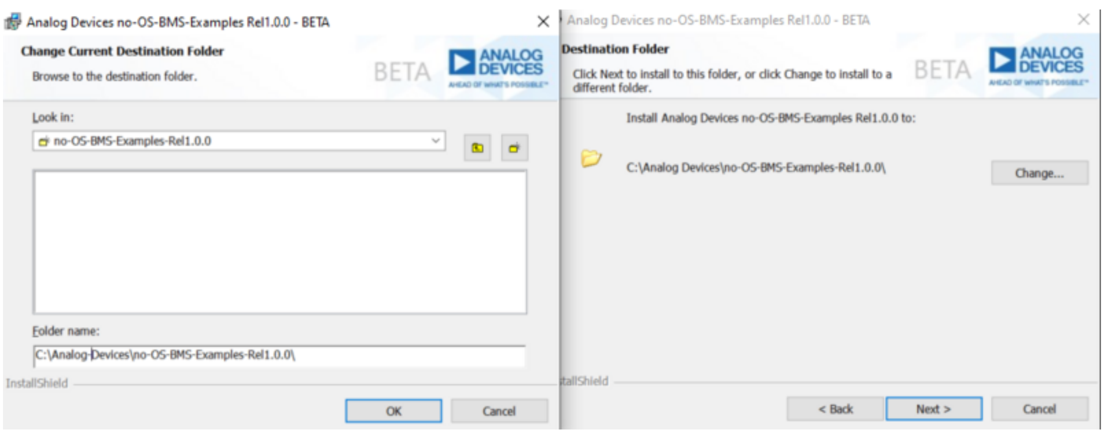


1. Click the **Download** button to download the installer package.

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

Installing the BMS Embedded Drivers

1. Install the **no-OS-BMS-Examples-Rel1.0.0.exe** file.

> Important
>
> Change the SPACE character with a dash (-) on the folder name or installation directory.
>
> | Change | To |
> | --- | --- |
> | `C:\Analog Devices` | `C:\Analog-Devices` |
> | `C:\Analog Devices\no-OS-BMS-Examples-Rel1.0.0` | `C:\Analog-Devices\no-OS-BMS-Examples-Rel1.0.0` |
>
> 
>

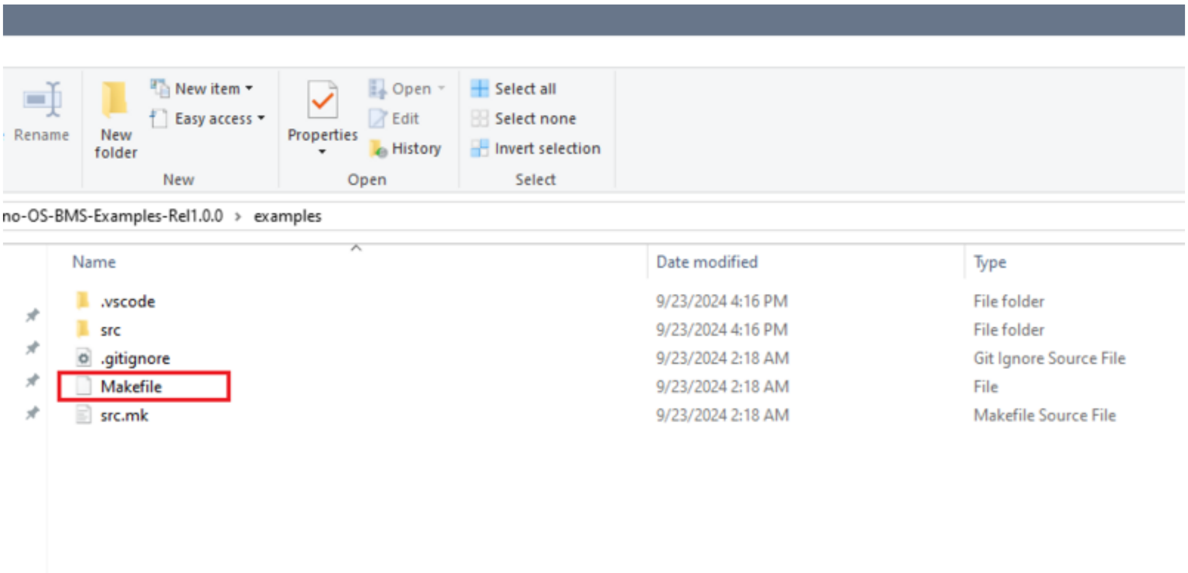
1. Download and install MaximSDK for Maxim MCUs.

> Note
>
> Make sure that the location has NO WHITESPACES! For example, a typical installation location for the Maxim SDK could be **C:MaximSDK** (Windows file location notation)

2. While MaximSDK installation is in progress, set up the no-OS-BMS-Examples by going to the no-OS-BMS-Examples directory:
    - Examples Directory: C:Analog Devicesno-OS-BMS-Examples-Rel1.0.0
3. Select the **run_setup.bat file** and run it as administrator.

> ✎ Note
>
> This process will take a few minutes. Please ensure you have a stable internet connection.

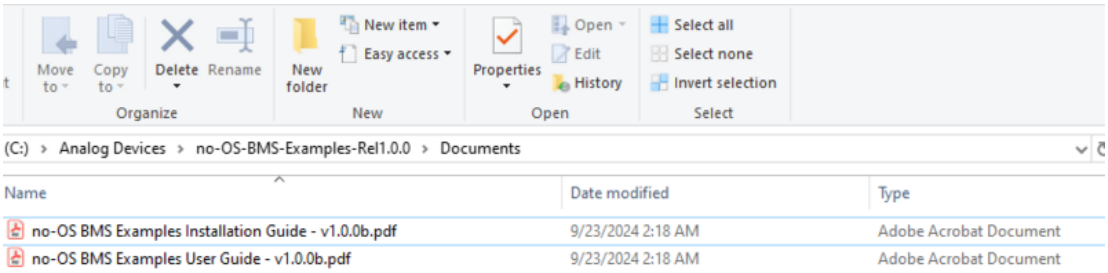
4. During this process, the Git Bash application will pop up (running as admin).
5. Wait for the setup to complete.
    - A message "**Set-up completed! with no error message**" will be displayed on the command line if the setup is successful.
    - Press **ANY KEY** to close the command prompt.
6. Double check if the MaximSDK is successfully installed.
    - Click the **Finish** button once installation is complete.
7. Open the no-OS-BMS-Examples file on VS Code or any other code editor.
    - Examples Directory: `C:\Analog Devices\no-OS-BMS-Examples-Rel1.0.0`
8. Open the Makefile inside `C:\Analog Devices\no-OS-BMS-Examples-Rel1.0.0\examples` folder.
    - This will display all the available example projects on the code editor.



9. Configure the Makefile on your desired example project.

The complete procedure on how to use the no-OS BMS examples can be found in the guide inside the **Documents** folder:

File Location: `C:\Analog Devices\no-OS-BMS-Examples-Rel1.0.0\Documents`



Graphical User Interface

Downloading the GUI Installer

Download

Evaluation GUI for ADI Broad Market BMS products:

BMS Browser GUI Version 2.0.0

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

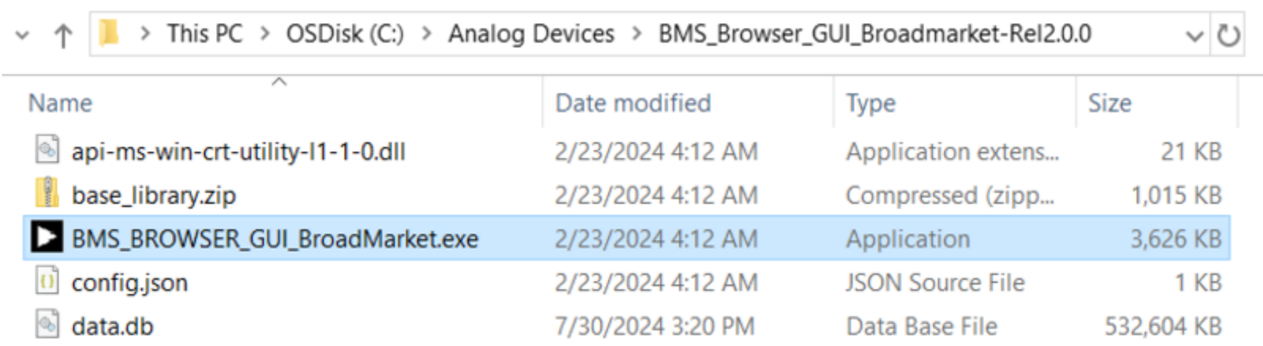
Launching the GUI

To launch the GUI, navigate to the BMS_BROWSER_GUI_BroadMarket_V2.0.0 directory.

Double-click the **BMS_BROWSER_GUI_BroadMarket_V2.0.0.exe** file.

Launcher Configuration

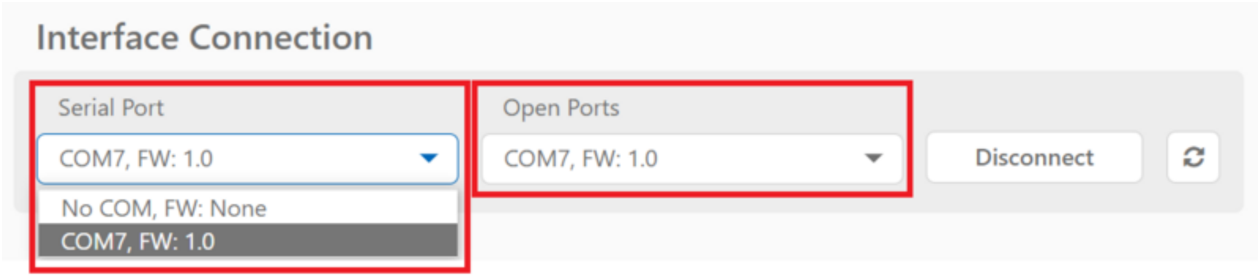
1. Use the launcher page to configure a daisy chain of ADBMS devices.
2. Select an appropriately flashed microcontroller board (for this example, SDP-K1).
3. Launch the evaluation GUI.



Establishing Interface Connection

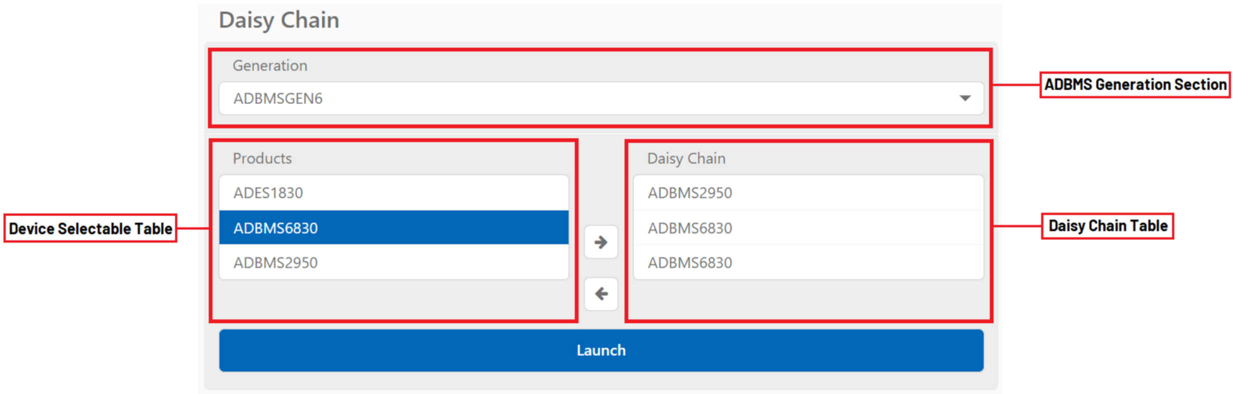
1. The *Interface Connection*` section displays available SDP-K1 devices on the left.

2. Left-side selection determines the device for launching the evaluation GUI with the *Launch Button*.
3. If the GUI is open, the connected COM port appears on the right.
4. Click *Disconnect*` to terminate the connection for a new one.
5. Use the refresh button to reload the available MCU boards list.



Daisy Chain Connection

The Daisy Chain section facilitates the creation of a daisy chain using compatible ADBMS devices. This process involves selecting a generation of ADBMS devices, adding devices to the daisy chain, and configuring the setup for the evaluation GUI.



Select ADBMS Generation

1. Navigate to the Daisy Chain section.
2. Use the first option to choose a specific generation of ADBMS devices.

> ✎ Note
>
> Devices within a selected generation are compatible and can be used together in the evaluation GUI.

Add Devices to the Daisy Chain:

1. After selecting the generation, locate the available devices list.
2. Choose a device for the daisy chain.
3. Press the right chevron button to append the selected device to the daisy chain.
4. This added device becomes the next farthest in the daisy chain.

Remove Devices from the Daisy Chain:

1. To remove a device, go to the daisy chain table.
2. Select the device you want to remove.

3. Press the trash can button to delete the selected device from the daisy chain.

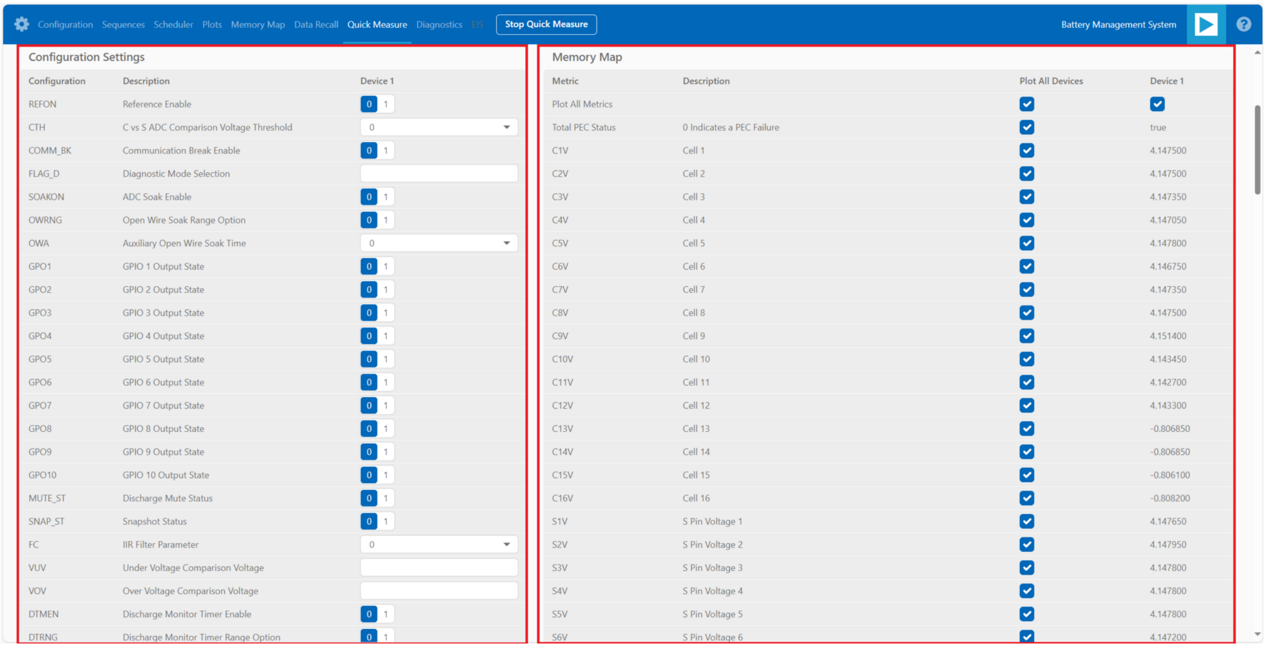
Configure Daisy Chain for GUI Launch:

1. In the Interface Connection section, select the desired MCU board.
2. Configure the daisy chain in the Daisy Chain section.
3. Click on the launch button to initiate the evaluation GUI.

GUI Tabs

Quick Measure

The Quick Measure tab simplifies metric measurement with a preloaded command sequence. Note that it supports a single device in the daisy chain, and key features enhance configuration and visualization.



Preloaded Commands:

- Access the Quick Measure tab for easy metric measurement with a preloaded command sequence.

Daisy Chain Limitation:

- Note: Quick Measure tab supports only a single device in the daisy chain, configured for the last device.

Quick Configuration:

- Utilize the lower-left section for swift changes to commonly modified bitfields.

Numeric Data Display:

- In the lower-right section, view numeric data returned from devices.
- Control plotted data on the central plot using checkboxes.

Central Plot Visualization:

- The central plot provides a graphical representation of captured data.
- X-axis: Sample number;

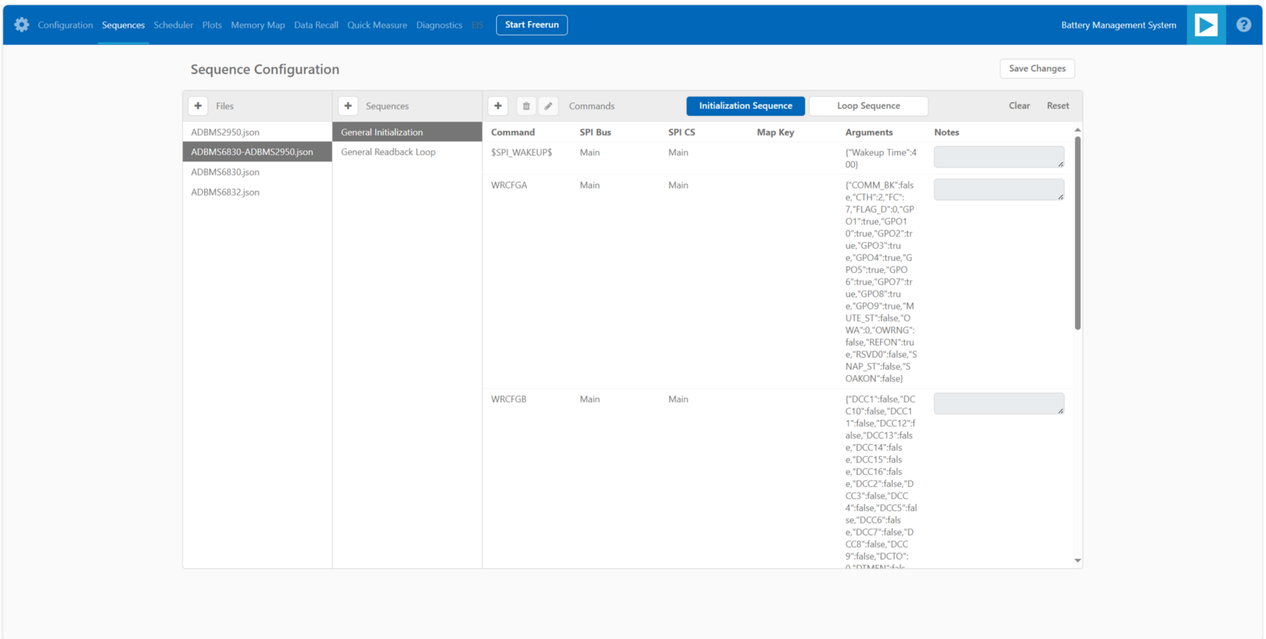
- Y-axis: Metric-specific variation.

Measurement Loop Control:

- Initiate and terminate the measurement loop with the top button.
- The button turns yellow during loop activation and green when deactivated.

Sequences

The Sequences tab 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.



Load Existing Sequence:

- Use the Existing Sequence Files select bar to choose an existing sequence file.
- Select the desired sequence from the Existing Sequences select bar.

Save Sequence:

- In the New Sequence File text area, enter the name for the new sequence file.
- Specify the sequence name in the New Sequence Name text area.
- Press the save button to save the sequence.

Load Defaults:

- Load the default command list for the Quick Measure tab by pressing the Load Defaults button.
- All sequence files are saved in the installation location under the data/sequence directory.

Add Command:

- On the left side of the screen, use the select boxes and buttons to add a command to the selected command list.
- Select a command from the Commands select box to load available bitfields on the bottom left.

- Modify bitfields as needed and press Add to add the command to the list on the right side.

Manage Commands:

- On the right side, select a command to highlight it for modification.
- Replace, move (drag and drop), or delete the highlighted command using the corresponding buttons.

SPI Bus and Chip Select:

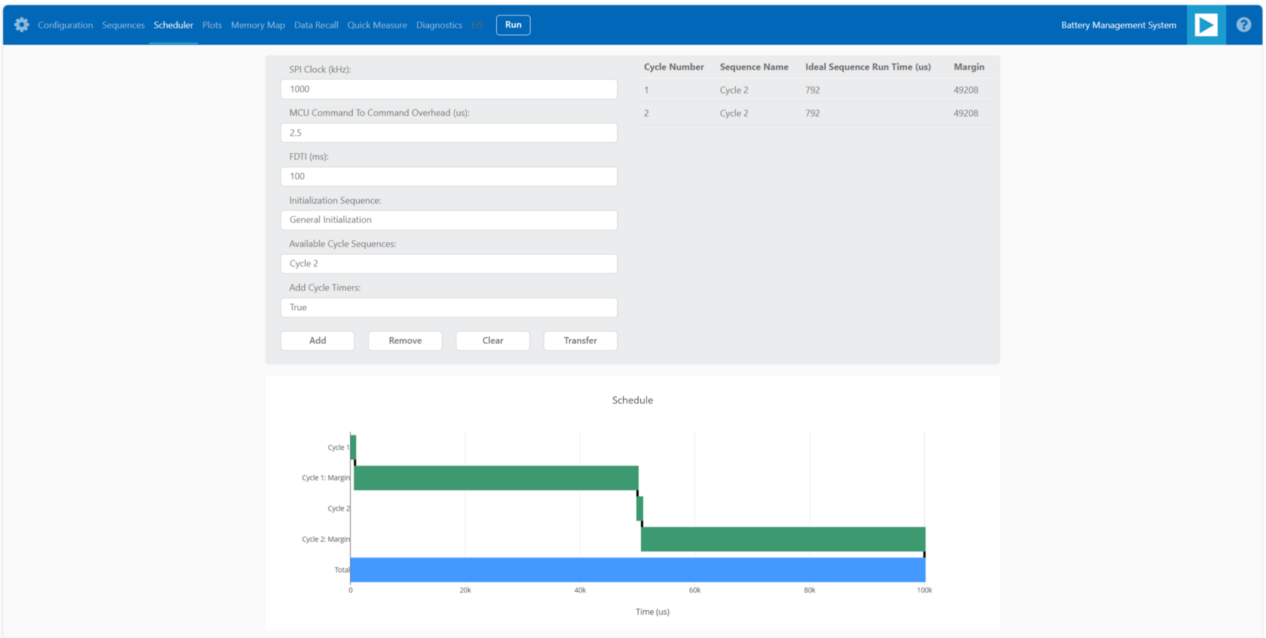
- Under the Command select bar, use the SPI Bus and SPI CS Select bars to change the SDP-K1 SPI bus and chip select for the command.

Optional Map Key:

- Below the SPI Bus and SPI CS Select bars, use the optional Map Key field to apply a label to the command.
- Labels organize output data, grouping commands with the same label together for focused data analysis.

Scheduler

The Scheduler tab 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.



Timing Adjustments:

- Utilize the SPI Clock field to adjust timings based on the system SPI clock frequency (kHz).
- The MCU Command to Command Overhead field adjusts timing between commands to accommodate MCU transaction timings.
- The FDTI field represents the total loop time, used for margin calculations.

Initialization and Sequence Management:

- Choose the Initialization field to pick the sequence for daisy chain initialization.
- The Available Cycle Sequences list displays all available sequences for scheduling.

- Use the Add button to add selected cycles to the schedule.

Hardware Timers and Timing Verification:

- Add hardware timers to cycle sequences with the Add Cycle Timers field for timing verification in freerun mode.

Schedule Management:

- Remove and Clear buttons allow removal of cycles from the schedule.
- Drag and drop cycles to rearrange them within the schedule.

Schedule Overview:

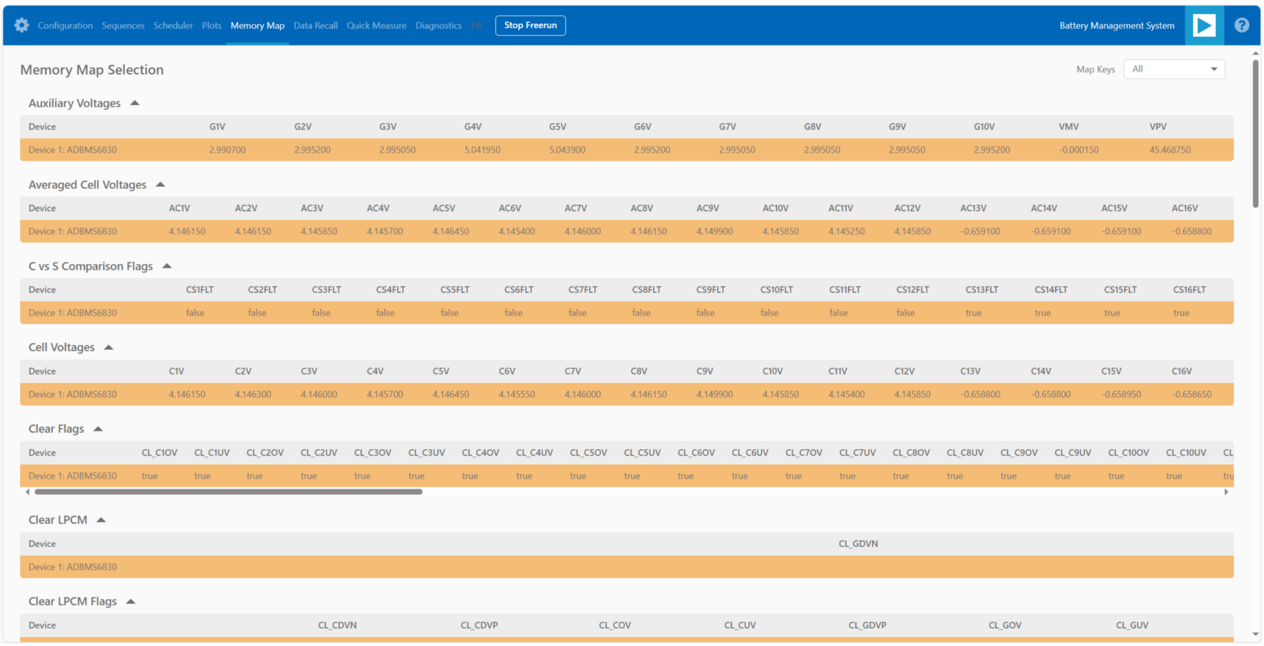
- The schedule table displays added cycles, their execution time, and margin for the selected daisychain.
- The plot at the bottom visually represents the same information in a waterfall format.

Transfer for Real Hardware Timing:

- Use the Transfer button to move all cycles into a single sequence in the Sequences tab.
- Run the transferred sequence to assess real hardware timing.

Memory Map

The Memory Map tab 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.



Organized Data Display:

- Access the Memory Map tab for a numerical output of the currently running command loop.
- Multiple tables organize the data into useful groups.

Table Management:

- Each table can be minimized for a more streamlined view.

Default View and Map Key Selection:

- The default view presents all data from the command list.
- Use the Map Key select bar to switch to a specific group of data for focused analysis.

Device-specific Data:

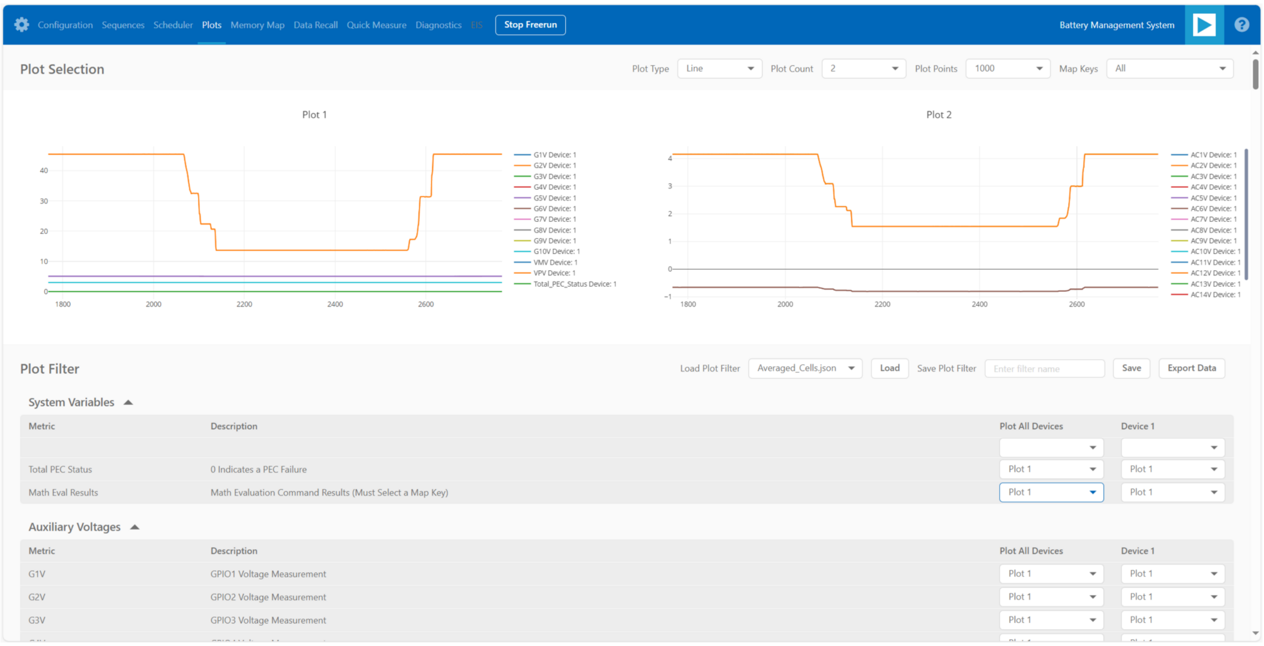
- Tables contain data returned by all devices in the daisy chain.

Error Highlighting:

- Rows highlight in orange if data returned with a PEC error.
- Valid data does not have any highlighting for easy differentiation.

Plots

The Plots tab 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.



Plot Selection:

- Use the Plot Selection area at the top to control the central Plot.
- Checkboxes in the Plot Filter area at the bottom filter data for the Plot.

Metric Plotting:

- Check the Plot Filter checkboxes for desired metrics and device numbers.
- Additional checkboxes allow for plotting all devices for a metric, all metrics for a device, or all metrics for all devices.

Save and Load Filter Setups:

- Save a filter setup for future use by providing a name in the Save Plot Filter text box and clicking Save.
- Load existing filter setups using the Load Plot Filter select.

Map Key Group Selection:

- Narrow data to a specific map key group using the Map Key select in the Plot Selection area.

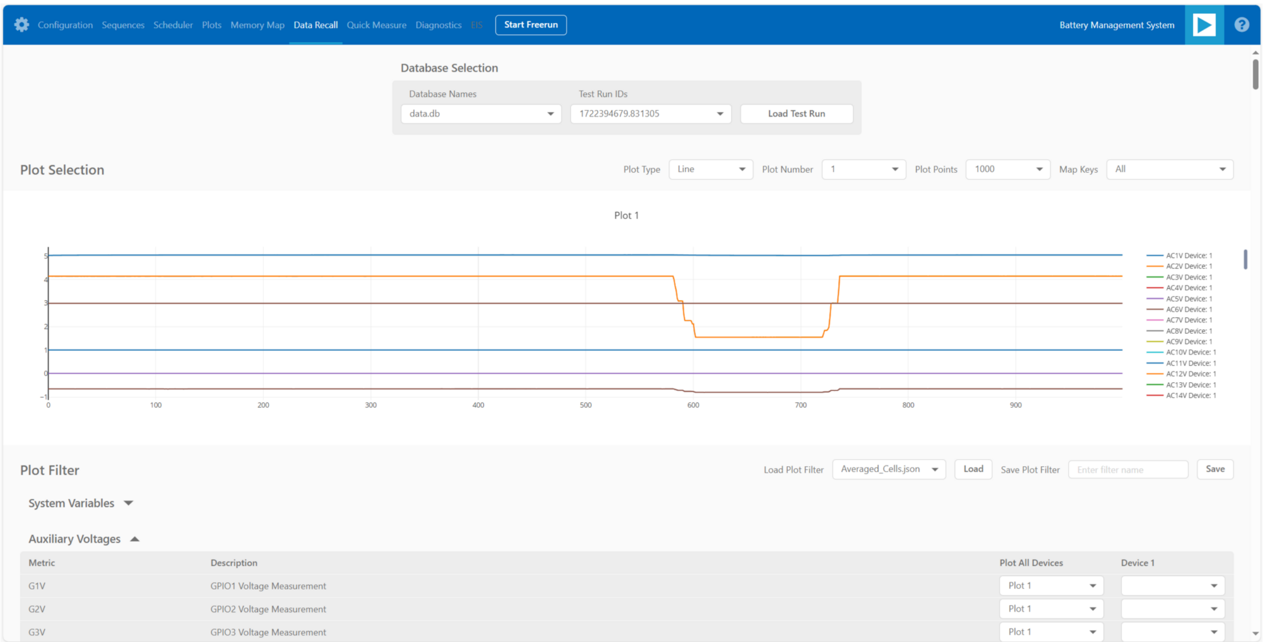
Plot Options:

- Choose between line chart and histogram using the Plot Selection Type select.

Export Data:

- Click the Export Data button to export captured data as a CSV file for further analysis.
- Data is exported to the data directory, grouped by map key.

Data Recall



The Data Recall tab allows you to retrieve and plot 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.

Access Data Recall Tab:

- Navigate to the Data Recall tab for recalling and plotting data from previous freerun sessions.

Database File Selection:

- Click on the select box under the Database Names label.
- Choose the desired database file; the default is data.db.

Test Run Selection:

- Click on the select box under the Test Run IDs label.
- Pick the specific test run from the list, arranged chronologically and UTC timestamped.

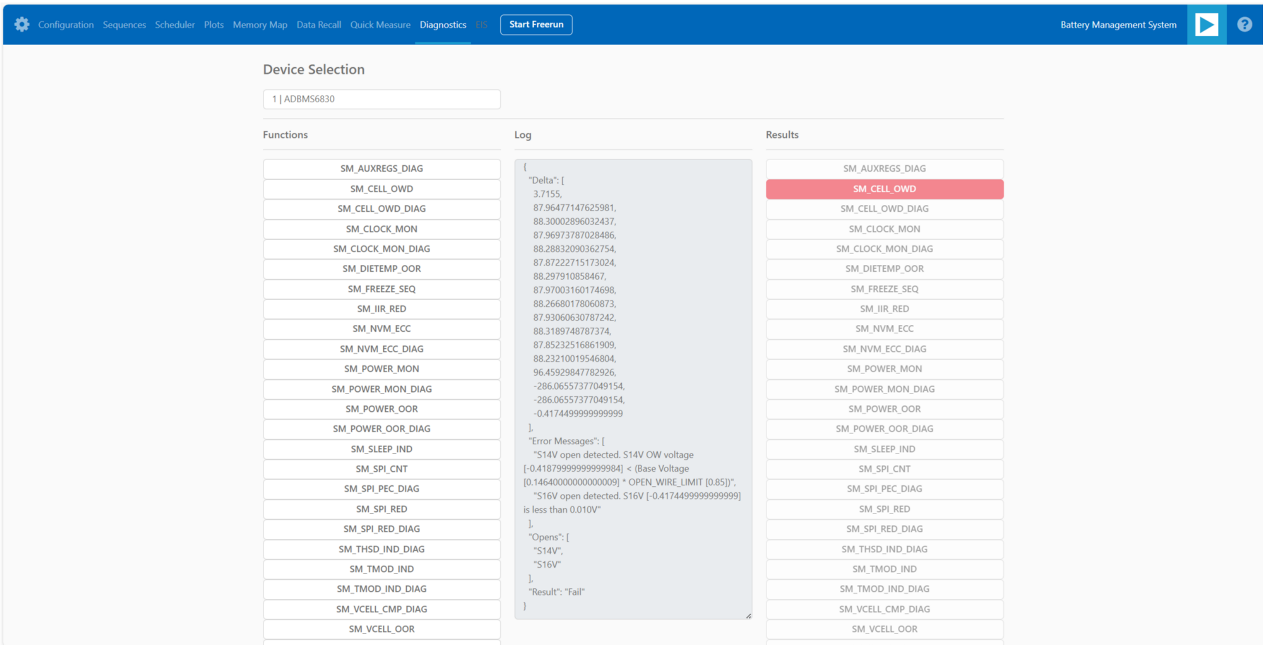
Load Test Run:

- Click the Load Test Run button to recall data from the selected database file and test run.

Customize Plot:

- After loading the test run, customize the plot using the same methods as the Plots tab.

Diagnostics



The Diagnostics tab 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.

Access Diagnostics Tab:

- Navigate to the Diagnostics tab for on-device diagnostics execution.

Device Selection:

- Use the Device Selection bar to switch between devices.

Run Diagnostics:

- In the Functions section on the left, click on the button with the name of the desired diagnostic.
- The diagnostic runs, and results are displayed on the right side: highlighted green for pass and red for failure.

Diagnostic Log:

- A log of diagnostic-specific data appears in the center of the screen.
- The log provides context for understanding why a diagnostic may have failed.

Help and Support

For questions and more information, please visit the EngineerZone Support Community.