

# **BMS Service Tool Manual**

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# 1. Introduction

#### 1.1 Purpose

This document describes how to:

- Setting up the Altairnano BMS Service Tool software.
- Configuring single and multi-string battery management systems (BMS).
- Monitoring BMS status and generating log files.

#### 1.2 Scope

This document serves as a comprehensive guide for users of the Altairnano BMS Service Tool.

- It provides detailed instructions on configuring battery strings and monitoring BMS status.
- The guide covers both single-string and multi-string configurations of battery management systems.
- Users will learn how to generate log files in CSV format for analysis and reporting.

#### **1.3 Definitions, Acronyms, and Abbreviations**

Term	Definition
BMS	Battery Management System
BMU	Battery Management Unit
CAN	Controller Area Network
CSV	Comma Separated Values
DTC	Diagnostic Trouble Code tracks fault conditions in the battery string for reporting over the
	CAN bus
JDK	Java Development Kit (for Java software developers)
JRE	Java Runtime Environment (for typical Java software usage)
LMU	Local Monitoring Unit
LRU	Line Replaceable Unit (refers to a battery module or pack)
SOC	State of Charge



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# 2. BMS Service Tool Installation

#### 2.1 Windows PC with Open USB Port

Altairnano supports the BMS Service Tool with the Windows operating system installed. An open USB port is required to connect the Kvaser CAN communication device to the PC.



#### 2.2 Kvaser CAN Communication Device

The BMS Service Tool is designed to work with the Kvaser Leaf Family or USB Rugged CAN Tools. Kvaser product details and drivers can be found at the Kvaser website <u>http://www.kvaser.com/</u>. Drivers for the Kvaser CAN device must be installed onto the PC prior to running the BMS Service Tool software.



#### 2.3 Java Runtime Environment

#### 2.3.1 Oracle Java Software

For the BMS Service Tool to function properly, ensure you have the Oracle Java Runtime Environment (JRE) version 6 or higher installed on your PC. The BMS Service Tool is developed using the Java programming language. Compatible versions include the Windows x86 version 8u241 JRE (for regular Java application users) or the Windows x86 8u241 JDK (for programmers requiring source code compilation). It's noteworthy that while newer Java 8 versions may necessitate a purchased license from Oracle, they remain functional with the BMS Service Tool. For details regarding licensing requirements and usage restrictions, consult Oracle's guidelines. Download Oracle Java from the provided link: Java Download.

Oracle Java can be downloaded at the following location: Java Download



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#### 2.3.2 OpenJDK Java Software

The Java Runtime Environment version 8 must be installed on the PC. The BMS Service Tool is developed using the Java programming language. The BMS Service Tool is compatible with *version 8 Windows x86 32-bit JRE MSI* (the JRE version is for users of Java applications) or *version 8 Windows x86 32-bit JDK MSI* (the JDK version is for programmers that need to compile source code). Versions newer than version 8 may not function properly due to feature changes in the Java programming language.

**NOTE:** OpenJDK does not support Java Web Start like Oracle Java, so OpenJDK requires the offline Windows installer version of the BMS Service Tool software.

OpenJDK can be downloaded at one of the following locations: <u>Eclipse Temurin OpenJDK Download</u> <u>OpenLogic OpenJDK Download</u>

#### 2.4 BMS Service Tool Installation

#### 2.4.1 Java Web Start Installation

The BMS Service Tool can be installed from the website https://altairnano.com/service\_tool/

Select the 'Download BMS Service Tool' button. Make sure to use the button in the "*Java Web Start Version*" section of the website.



#### Select the 'Keep' button.





The BMS Service Tool should launch at this time.

#### 2.4.2 Offline Windows Installation

Installing the Offline Windows version does **NOT** require Administrator privilege on the Windows OS. The offline installer of the BMS Service Tool can be downloaded from the website: <u>https://altairnano.com/service\_tool/</u>

Select the 'Download BMS Service Tool' button. Make sure to use the button in the "*Offline Windows Version*" section of the website.





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Once the file has finished downloading, double click on the file in Windows Explorer. A dialog box like the image below may appear. If so, **select the 'More info' link**.





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Select the 'Run anyway' button.



If a previous version of the Service Tool was installed using the Windows installer, the following dialog box will appear. Select the 'Yes' button to remove the old version.





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#### Select the 'OK' button.



On the Altairnano BMS Service Tool installation dialog panel, select the 'Next' button.





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# Select the 'I Agree' button.

G Altairnano BMS Service Tool 2.3.136 Setup −	$\times$
License Agreement Please review the license terms before installing Altairnano BMS Service Tool 2.3.136.	Nutr
-	
Press Page Down to see the rest of the agreement.	
Property of Altairnano, Inc. Battery Management System (BMS) and Altairnano BMS Service Tool Developed by Altairnano, Inc.	^
THIS SOFTWARE IS PROVIDED "AS IS," WITHOUT A WARRANTY OF ANY KIND. ALL EXPRESSED OR IMPLIED CONDITIONS, REPRESENTATIONS AND WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT, ARE HEREBY EXCLUDED. ALTAIRNANO, INC. SHALL NOT BE LIABLE FOR ANY DAMAGES SUFFERED AS A RESULT OF USING, MODIFYING OR DISTRIBUTING THE SOFTWARE OR ITS DERIVATIVES. IN NO EVENT WILL ALTAIRNANO, INC. BE LIABLE FOR ANY LOST	*
If you accept the terms of the agreement, click I Agree to continue. You must accept the agreement to install Altairnano BMS Service Tool 2.3.136.	
Nullsoft Install System v3.08	el

#### Select the 'Install' button.

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Choose Start Menu Folder Choose a Start Menu folder for the Altairnano BMS Service Tool 2.3.136 sh	ortcuts.	
Select the Start Menu folder in which you would like to create the program's can also enter a name to create a new folder.	shortcuts.	You
Altairnano, Inc		
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#### Select the 'Finish' button.



The BMS Service Tool should launch at this time.



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# 3. First Time Startup of BMS Service Tool

The following sections describe the process for using the BMS Service Tool for the first time, including how to configure a new Altairnano Battery System for use.

#### 3.1 BMS Service Tool Launching

After installation, accessing the BMS Service Tool can be achieved through various methods:

- **Desktop Icon:** Look for the Altairnano BMS Service Tool desktop icon and double-click to launch the software.
- **Start Menu Link:** Navigate to the Start menu, find the Altairnano folder, and click on "Altairnano BMS Service Tool" to launch it.

If using the Java Web Start version, the software will automatically check for updates upon launch. In case of no internet connection, expect a potential delay as the software attempts to connect. For the offline Windows installer version, updates need manual intervention upon new releases.





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#### 3.2 BMS Service Tool Settings

Configuring the BMS Service Tool for optimal performance involves navigating through its settings:

- Access the settings menu by selecting "CAN\_Settings" or right-clicking on any blank area of the • application screen.
- Configure the "BMU Address," which comprises the last two digits of the hexadecimal address (default is 0x03) for CAN communication with the BMU.
- The Tool Baud Rate is the CAN bus speed of the BMU (default is BITRATE\_250K). •

NOTE: If the default settings are not working and the correct settings are not known, see section 6 CAN Test Software to help find the correct settings.





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#### 3.3 BMS Service Tool Connection

**Click the 'Connect to BMS' button.** If the CAN bus connection and CAN settings are correct and the proper drivers are installed the service tool will communicate with the BMU.





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### 3.4 Configuration & LMU Setup Screen (First Time Startup of BMS)

The BMU software configuration should define the battery cell, temperature and LMU connection details to the BMU. At initial startup, the BMU will not know the LMUs it is connected to or the order in which they are connected to the batteries. The BMU will discover the LMUs communicating on the internal CAN bus but does not know if the communicating LMUs are associated with the battery system the BMU manages. The BMS Service Tool helps configure the BMU to know what LMUs are connected to the battery system and the sort order of the LMUs. The number of LMUs found and configured must match the battery configuration defined in the BMU firmware.

During the initial startup, configuring the BMU's software settings is essential:

- Navigate to the "Configuration & LMU Setup" screen.
- Verify that the LMUs communicating on the internal CAN bus are correctly identified.
- Confirm that the LMU configuration matches the battery configuration defined in the BMU firmware.
- Enable the LMUs to be monitored and save the configuration once complete.

#### Select the 'Configuration & LMU Setup' button.





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The BMS Service Tool will list the LMUs that are communicating on the internal CAN bus. Verify that the Batch# (6-digit number highlighted in yellow) and Serial# (4-digit number highlighted in pink) match the LMUs' Labels.



The BMU will not know the order that the LMUs are in. LMU# column designates the order that the BMU will sort the LMU information (cell voltage 1, 2, 3, etc.). LMU# 1 is the LMU monitoring the lowest battery module voltage. As the LMU# increases the battery voltage monitored increases in order. See image below for clarification.





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The Cell Groups and Temperatures column numbers must match the number of cell groups and temperature sensors monitored by the LMUs. The numbers in the columns should be common for each LMU, but in some rare cases the numbers will be different for each LMU if there is not a consistent ratio of LMUs to battery modules.

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				r												
					L	MU#	Enabled	Batch#	Serial#	Cell Groups	Temperatures					
						1		000000	0000	1	1					
						2		000000	0000	1	1					
						3		000000	0000	1	1					
						4		000000	0000	1	1					
						5		000000	0000	1	1					
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					<u> </u>								J			
											Clear		Refresh	Sat	ve	
										Erase l	LMU configuration	Re	ad config from BMS	Write Chang	ges to B	MS
											S	td Ap	op [0x03]			

After the configuration is set up and the LMUs are in the proper order, the LMUs monitored must be enabled and the configuration must be saved. Mouse click the box in the enabled column to enable the BMU to monitor the discovered LMU. When the configuration is complete, **select the 'Save' button**.

The 'Clear' button erases the LMU configuration stored in the BMU. This can be useful if a hardware change was made to the BMS.

The 'Refresh' button will ask the BMU to resend the information to the BMS Service Tool and update the list.

**NOTE:** The BMU will only connect to a battery if the BMU configuration and the LMU configuration are compatible. Also, if the BMU receives communication from an LMU it does not recognize, it will not close the battery contactors and will set a fault condition.



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#### 3.5 Current Sensor Calibration Screen (First Time Startup of BMS)

The Current Sensor Calibration screen is used to calibrate the current sensor. The BMS Service Tool prompts to set the charging or discharging currents. This data is used to determine the slope of the current sensors. All Disconnect level fault codes must be cleared for the BMS to connect DC bus.

**NOTE:** During calibration '+' current is charging the battery string and '-' current is discharging the battery string. The negative sign should be added when typing the value into the dialog box.

- Select the 'Start' button in the 'Calibration Options' frame to begin calibration.
- Set the charging and discharging currents as prompted.
- Validate the calibration data by clicking the "Check" button.
- Save the calibration settings once validated.

The 'Current Slope' frame displays the slope translation that the BMU is currently using to measure current from the current sensor. The Sensor 1 and Sensor 2 values can be manually adjusted, but you must clear the current value, type the new value and **press 'Enter' on the keyboard** to save the value. **Select the 'Reset to Nominal' button** to change the slope values back to firmware defaults.

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6	Dual-Pickup Sen	sor Calibration -						Calibration Options
	Actual Current	Sensor 1 Measured A/D	Sensor 1 Calculated	Sensor 1 Error (%)	Sensor 2 Measured A/D	Sensor 2 Calculated	Sensor 2 Error (%)	Start Check Save
	0.0	0	0.0	0.0	0	0.0	0.0	Current Sensor
	0.0	0	0.0	0.0	0	0.0	0.0	Auto-Zero
	0.0	0	0.0	0.0	0	0.0	0.0	
	0.0	0	0.0	0.0	0	0.0	0.0	Current Slope
	0.0	0	0.0	0.0	0	0.0	0.0	Reset to Nominal
								Sensor 1 -0.3676147 Amps/count
								Sensor 2 0.3676453 Amps/count
L								
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## 4. Service Tool Interface Information

#### 4.1 Pack Summary Information Screen

The Pack Summary Information screen provides the status of the BMS and battery at a glance. The screen summarizes battery information such as battery SOC, voltage, temperature, active conditions, faults, contactor states, and other information. The screen information adapts to the software configured in the BMU; only displaying relevant information. Many of the information fields will display quick summaries by hovering over the field with the mouse cursor. This is most useful with the Fault Summary fields.

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Summary         Pack SOC       30.1 %         Charge Limit       0 Amps         Discharge Limit       0 Amps         Pack Voltage       43.6 Volts         Pack Current       0.0 Amps         Pack Power       0.0 kW         V-Max [ID: 6]       2.185 Volts         T-Max [Zone: 2]       21.5 Deg C         T-Min [Zone: 2]       21.2 Deg C	Image: State     Power-Up     Idle     Pre-charge     Ready to Power Down     Disconnect     Cell Voltage Summary     Image: Cell Volta	Fault Summary         FC101       FC103       FC104         FC105       FC106       FC107         FC108       FC109       FC110         FC111       FC112       FC113         FC114       FC115       FC122         FC133       FC134       FC130         FC131       FC137       FC138         FC139       FC140       FC142         FC143       FC144       FC146         FC150       FC151       FC152         FC150       FC151       FC152         FC150       FC157       FC158         FC159       FC160       FC161         FC162       FC163       FC164         FC165       FC165       FC164
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#### 4.2 Cell Group Information Screen

The Cell Group Information screen displays a summary for all cell groups monitored by the BMS and their associated temperatures. The BMS Service Tool displays each cell group's information: system level cell group 'ID', 'LMU' number (same number as Configuration & LMU Setup screen), LMU 'Cell Group' number, 'LRU' is the battery module or pack number, 'SOC' (state of charge), 'Volts', 'Temperature' (zoned), and 'Balance' activity (green dot means balance resistor is on). This screen is used to view specific details of a cell group and battery module.

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	- <u>~</u> 0;													
C	cell Group S	ummary												
	ID	LMU	Cell Group	LRU	SOC	Volts	Tempe	rature	Balance					
	1	1	1	1	76.0%	2.359 V	23.6°C (2	Zone 1)						
	2	1	2	1	77.9%	2.374 V	34.8°C (2	Zone 1)						
	3	1	3	1	77.8%	2.373 V	23.6°C (2	Zone 1)						
	4	1	4	1	77.8%	2.373 V	,							
	5	1	5	1	77.8%	2.374 V								
	6	1	6	1	77.9%	2.374 V	,							
	7	1	7	1	78.0%	2.375 V	,							
	8	1	8	1	78.0%	2.375 V								
	9	1	9	1	78.0%	2.375 V								
	10	1	10	1	78.1%	2.375 V	,							
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#### 4.3 Fault Information Screen

The Fault Information screen displays detailed information on the DTC's (Diagnostic Trouble Code) of the BMS. If a fault code is selected, a description of the fault will be displayed in the description frame along the bottom of the Fault Information screen.

The BMU keeps track of fault code history. If a fault condition is present a green dot is displayed in the 'State' column. The 'Count' column displays how many times the fault has been active. The 'Parameter' column displays additional details of the fault condition if applicable. The 'Timer' column displays how long the fault has been active. Some fault conditions are latched and must be cleared either with the Application Command message or by the BMS Service Tool. Select the 'Clear Faults + History' button to clear any latched fault conditions. The BMS Service Tool clears the state, count, parameters and timer information; however, the Application Command message only clears the state.

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Tault Community														
Fault Sum	nary	Fault Accommodation												
Code	Name	State	Count	Parameter	Timer		Warning							
FC101	EXTERNAL_ESTOP_FAULT		0		00:00:00		Derate							
FC103	COMM_TIMEOUT_APP_BUS	•	1		00:06:06		Disconnect							
FC104	LMU_NOT_REPORTING		0		00:00:00									
FC105	PACK_VOLTAGE_MISMATCH		0		00:00:00	_	Clear Faults							
FC106	CELL_TEMPERATURE_ABOVE_NORMAL_RA		0		00:00:00		Clear Faults + History							
FC107	CELL_TEMPERATURE_BELOW_NORMAL_RA		0		00:00:00									
FC108	CELL_TEMPERATURE_FAR_ABOVE_NORMA		0		00:00:00									
FC109	CELL_TEMPERATURE_FAR_BELOW_NORMA		0		00:00:00									
FC110	CELL_VOLTAGE_ABOVE_NORMAL_RANGE		0		00:00:00									
FC111	CELL_VOLTAGE_BELOW_NORMAL_RANGE		0		00:00:00	88								
FC112	CELL_VOLTAGE_FAR_ABOVE_NORMAL_RA		0		00:00:00									
FC113	CELL_VOLTAGE_FAR_BELOW_NORMAL_RA		0		00:00:00									
FC114	MCU_POWER_SUPPLY_FAULT		0		00:00:00									
FC115	CELL_VOLTAGE_SENSOR_OOR		0		00:00:00									
FC122	DISCONNECT_TOO_SLOW		0		00:00:00									
FC123	MAIN_CONTACTOR_FAULT		0		00:00:00									
FC128	CURRENT_SENSOR_LARGE_OFFSET		0		00:00:00									
FC130	MULTI_STRING_ADDRESS_MISMATCH		0		00:00:00									
FC131	MULTI_STRING_COMM_TIMEOUT		0		00:00:00									
FC137	MCU_TEMP_BELOW_NORMAL_RANGE		0		00:00:00									
FC138	MCU_TEMP_FAR_BELOW_NORMAL_RANGE		0		00:00:00									
FC139	MCU TEMP ABOVE NORMAL RANGE		0		00:00:00									
FC140	MCU TEMP FAR ABOVE NORMAL RANGE		0		00:00:00									
FC142	LMU HW OVERTEMP		0		00:00:00									
FC143	PACK OUT OF BALANCE		0		00:00:00									
FC144	PRECHARGE RESISTOR PROTECTION		0		00:00:00									
FC146	PRECHARGE FAILURE		0		00:00:00									
FC147	HVIL FAULT		0		00:00:00									
FC148	CONTACTOR STATUS MISMATCH		0		00.00.00									
Descriptio	n:													
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					Sta App [0x03]									



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## 4.4 Data Logging Screen

The Data Logging screen allows the logging of BMS information to a \*.csv file format. The BMS Service Tool captures the BMS information periodically according to the Data Logging Rate and stores it to the selected Log File. The \*.csv file can be imported to spreadsheet software like Microsoft Excel. 'Allow split among multiple files' selection box adds the ability to put large amounts of data in multiple files to overcome limitations importing to the spreadsheet software.

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Parameters Parameters Available Amp_Hours_Charging Amp_Hours_Discharging APP_Commanded_Charge_ APP_Commanded_Discharg APP_External_Contactor_State BMS_Main_Contactor_State BMS_Main_Contactor_State BMS_Main_Neg_Contactor_ BMS_Min_Neg_Contactor_ BMS_Mid_Pack_Contactor_ BMS_PC_Contactor_State BMS_PC_Contactor_State BMU_Power_override	Current_Limit ate 		
Options Stop Start Date Logging Rate Auto-Start On Connect Restart At Midnight Allow Split Among Multiple Files Log File	1 sec 		
	Std App [0x03]		



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#### 4.5 Diagnostic Information Screen

The Diagnostic Information screen gives information on the BMU inputs and outputs. The 'Discrete Inputs' and 'Discrete Outputs' frames show the state of the configured input and output ports. A green dot shows when the input or output is active. The 'Analog Inputs' frame shows the reading of the measured unswitched and switched pack voltages along with the A/D counts of the current sensor.

**NOTE:** The 'IN 4' reading may not be shown if the current sensor configuration is only for single channel and not dual channel.

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ſ	I/O Information																	
				Disc	rete I	nputs			Discrete Outputs									
				IN 1	L				3	1	OUT 1			3				
				IN 2	2				3		OUT 2			3				
				IN 3	3				3		оит з	Main Pos Contactor	r Cmd	3				
				IN 4	4				3		OUT 4	PC Contactor Cmd		3				
				IN 5	5				3		OUT 5	Main Neg Contactor	r Cmd	3				
				IN 6	5				3		OUT 6			3				
				IN 7	7		3				OUT 7	3						
				IN 8	3				3		OUT 8							
							Analo	g Inputs-										
							IN 1	Pack Volta	ige Unsw	vitched		0.0 volts						
							IN 2	Pack Volta	age Swite	ched		0.0 volts						
							IN 3	Current S	ensor 1			1970 counts						
							IN 4	Current S	ensor 2			1974 counts						
													Std App [0x03]					



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#### 4.6 BMU Software Update Instructions

The service tool uses a \*.bms file to update the software for the BMU. This file contains the software build and configuration information that the tool uses to generate battery system specific software. This file is encrypted and cannot be viewed. The service tool verifies the \*.bms file and will indicate if there if a problem with the file. Click the Flash Programming button in the BMS Service Tool.

BMU software revision information can be viewed in the 'System Information' frame of the Flash Programming screen.

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N 0.			A 🤧		2	-E (	) 🗊						
-2 <u>0</u> 3					•		<b>9</b>						
Flash Update	2												
	Current T									00/	Complete		
	Idle	156.								070	Complete		
	Overall Pro	ogress:								0%	Complete		
	Options-										-h Davies		
	Flash File								Browse	Fla	sh Device		
		<ul> <li>System (</li> </ul>	Information										
		BIOS Vers	sion					02.01.00					
		Build Type	е				COM	MERCIAL_CP	_V3				
		Build ID						014					
		Configura	tion ID					94F7					
		Bootloade	er Version					03.00.00					
		MCU Hard	lware Part Number					0900065					
		MCU Hard	ware Version					0202					
		MCU Prod	luction Date (mm.d	d.yyyy)				03.22.2019					
		MCU Seria	al Number (batch/s	erial)			2	01846/0055					
		1						10					
									Sta App [0x03	5]			

Click the 'Browse' button and locate the \*.bms file on the PC to flash update the BMU. Click the 'Open' button when the \*.bms file is located and selected. The service tool flash programming window will display a new 'Flash Device' button. Click the 'Flash Device' button to program the software into the BMU.

The service tool will begin flashing the BMU with new software. The status bar will show the progress of the BMU software update. This will take a few minutes and a notification will occur when complete.



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# 5. Use BMS Service Tool to Configure Multi-string

Steps involved in setting up the multi-string operation are as follows:

- 1. The BMU is configured to operate at address 0x01 in multi-string mode (if no input is provided to the digital inputs to select an address).
- 2. Update each individual BMU settings for the LMUs per the instructions in 3.4 Configuration & LMU Setup.
- 3. Calibrate the current sensor on each individual strings per the instructions in 3.5 Current Sensor Calibration.
- 4. Navigate to the 'Multi-string Configuration' screen and select 'Clear BMU Address'.

Altairnano BMS Configuration Tool - 2.3.11	3				-	
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Multi-String Information						
		Clear BMU Address				
			Std A	pp [0x01]		

- 5. Switch Off the power to the BMU.
- 6. Go to 'Home' screen (Altairnano logo icon) and select 'Disconnect from BMS'.

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7. Set the BMU address to an appropriate binary value between 0x01 and 0x06. Locate the MCON C connector on the BMU hardware. Figure below shows the MCON C connector:



8. Pins 5, 6 and 7 of the Molex connector are digital inputs 1, 2 and 3 respectively and are reserved for BMU CAN addressing in a multi-string application. In the table below 'NC' means No Connection and 'High' means 5 – 24 Vdc with a DC ground reference in one or more of these pins 1 – 4. Use the table below to configure suitable addresses for your multi-string BMU:

Pin 7	Pin 6	Pin 5	Address to communicate
NC	NC	NC	0x01
NC	NC	High	0x02
NC	High	NC	0x03
NC	High	High	0x04
High	NC	NC	0x05
High	NC	High	0x06

**NOTE:** Addresses of each string connected in a multi-string configuration shall be distinct from one another.

- 9. Switch On the power to the BMU.
- 10. Follow the procedure 3.2 BMS Service Tool Settings to change the BMU address. The address selected in this step must co-relate to the BMU connected to the PC.
- 11. Navigate to the 'Pack Summary Information' screen. The Pack Summary Information screen displays information of the batteries that are connected to the BMU directly interfacing with the PC.



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12. Use the buttons highlighted in the fig. shown below to navigate to rest of the strings connected in parallel.

* Altairnano BMS Configuration Tool - 2.3.11	13	– 🗆 X
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Summary	BMS State Power-Up Warning	Fault Summary
Pack SOC 36.4 %	Idle Pre-charge Ready Stopping Derate	FC105 FC106 FC107
Charge Limit 0 Amps	Ready to Power Down Disconnect	FC108 FC109 FC110
Discharge Limit 0 Amps	Cell Voltage Summary	FC114 FC115 FC122
Pack Voltage 43.6 Volts		FC123 FC128 FC130
Pack Current 0.0 Amps	1.000 2.000 3.000	FC131         FC137         FC138           FC139         FC140         FC142
Pack Power 0.0 kW	Temperature Summary	FC143 FC144 FC146
V-Max [ID: 6] 2.185 Volts		FC147         FC148         FC149           FC150         FC151         FC152
V-Min [ID: 9] 2.181 Volts	-40 -20 0 20 40 60 80	FC153 FC154 FC155
T-Max [Zone: 2] 21.6 Deg C	Contactor Status	FC156 FC157 FC158 FC159 FC160 FC161
T-Min [Zone: 2] 21.3 Deg C	Main () Open	FC162 FC163 FC164
	Precharge Open	FC165
	Ah Meter	
	Resettable       Charge     0.0 Ah       Discharge     0.0 Ah	
	Std App [0x01]	

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13. Navigate to the 'Multi-string Information' screen. This screen displays the data related to each string connected in the parallel system.

* Altairnano BMS Configuration Tool - 2.3.113						-	×
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- Multi-String Information	Pack SOC Pack Volt Pack Cur Pack Pow DTC	PC ing #1 36.0% age 44 V rent 0 A ver 0.0 kW Disconnect	String #2 String #2 Pack SOC II Pack Voltage II Pack Current II Pack Power II DTC Inval	PC nvalid nvalid id			
Multi-String M		Tmin	Tmax	Vmin	Vmax		
DC-Parallel     DC Farallel	Global	0.0 °C	0.0 °C	0.000 V	0.000 V		
O DC-Independent	Connected	0.0 °C	0.0 °C	0.000 V	0.000 V		
				ci	td Ann [0x01]		_

14. Each string needs to be disconnected and individually connected to do any firmware upgrades.



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#### 6. CAN Test Software

The CAN Test Software is intended to assist customers in identifying the parameters of the connected BMU's CAN bus. The software will report the CAN channel, CAN bus speed, and address of the BMU.

#### 6.1 CAN Test Software Installation

There are two options for installing the CAN Test software just like with the BMS Service Tool. The Java requirements are the same as well, so if you are running the BMS Service Tool and

#### 6.1.1 Java Web Start Installation

The CAN Test software can be installed from the website <u>https://altairnano.com/service\_tool/</u>

Select the 'Download CAN Test Tool' button. Make sure to use the button in the "Java Web Start Version" section of the website.

======================================
You must have Java v1.8 241 (JRE or JDK) installed prior to downloading and installing the Service Tool.
You can download and install the JRE from the following site:
♦ Oracle Java Download
Download BMS Service Tool
Download CAN Test Tool

Select the 'Keep' button.



This type of file can harm your computer. Do you want to keep altair\_can\_test.jnlp anyway?

Keep	Discard

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Select t	he downloaded .jnlp	file.			
	altair_can_test.jnlp	^			

The CAN Test software should launch at this time.

#### 6.1.2 Offline Windows Installation

Installing the Offline Windows version does **NOT** require Administrator privilege on the Windows OS. The offline installer of the BMS Service Tool can be downloaded from the website: <u>https://altairnano.com/service\_tool/</u>

The CAN Test software installs as part of the same bundle as the BMS Service Tool software for the offline version. If you are already using that version of software, then it is already available.



#### 6.2 CAN Test Software Launching

After installation, the CAN Test software can be launched by the *Altairnano CAN Test* desktop icon or *Altairnano, Inc*  $\rightarrow$  *Altairnano CAN Test* start menu link. After installation the Java Web Start version will check for updates through the internet, apply any updates, and launch. If the internet is unavailable the CAN Test software will launch, but there can be a delay while the software tries to find an internet connection. For the offline Windows installer version, the software needs to be updated manually when new releases are published.

<i>≫</i> (	AN Bus Test			—	$\times$
		Test			



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**NOTE:** The CAN Test software will not function properly if the BMS Service Tool or other software is currently using or blocking the Kvaser USB to CAN device. A message similar to the following will popup if the device is blocked.





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#### 6.3 CAN Test Software Usage

Select the 'Test' button.

💸 CAN Bus Test	_	×
Test		
*********		^
TRY ch=0, BITRATE_125K		
TX: fail		
TRY ch=0, BITRATE_250K		
TX: success		
Listening for RX packets		
RX: 570 packets		
RX-ID: 0x18FF0003		
RX-ID: 0x18FF0103		
RX-ID: 0x18FF0203		
RX-ID: 0x18FF0303		
RX-ID: 0x18FF0403		
RX-ID: 0x18FF0503		
RX-ID: 0x18FF0603		
RX-ID: 0x18FF0703		
TRY ch=0, BITRATE_500K		
TX: fail		
***********		
TRY ch=1, BITRATE_125K		
INIT FAIL		
TRY ch=1, BITRATE_250K		~

In the above example, the CAN Test software detected the Altairnano BMU on CAN Channel '0'. The baud rate is 'BITRATE\_250K' and BMU Address is 0x03 (last 2 digits of the CAN addresses).

**NOTE:** A multi-string system could have more than one BMU Address shown on the messages if multiple BMUs are connected to the same CAN bus. The channel might be greater than '0' if there are more than one Kvaser CAN to USB device channels present.



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# 7. Revisions History

Version	Author	Date	Comment
00	J. Lyon	7/19/2010	• Initial draft.
01	K. Tipnis	2/23/2012	Various updates
03	Mike Long	4/6/2021	• Revisions to support BMS v14 release
			• Deployment website change
04	Tim Hoover	5/2/2024	<ul> <li>Changed document structure to assist with first time setup and usage of BMS hardware</li> <li>Added information about the offline Windows installation of the BMS Service Tool</li> <li>Added CAN Test software sections</li> </ul>
			<ul> <li>Added CAR Test software sections</li> <li>Changed the Java section to add information about versions and different software vendor options</li> <li>Changed all 'Normal' body text to 12 point font</li> <li>Added some acronyms to the definition table</li> </ul>