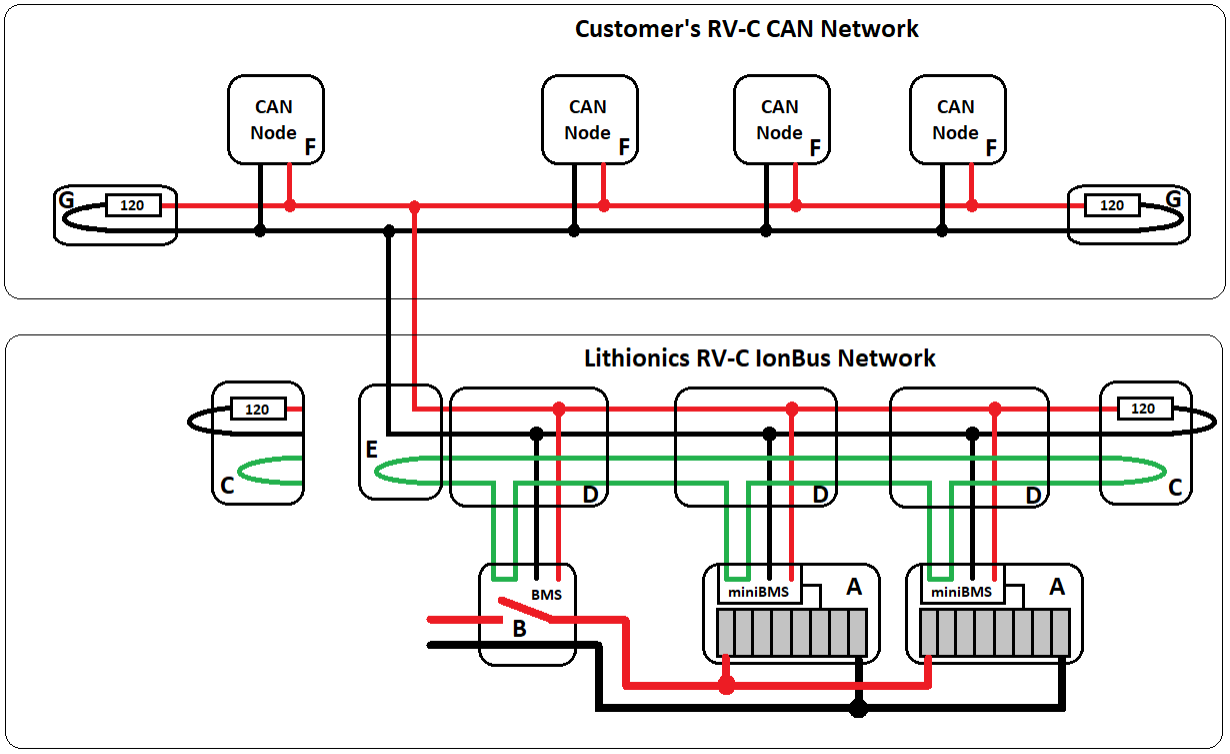
Lithionics Battery IonBus® Overview

Revison: A

The Lithionics Battery IonBus® is a data communication network used as a backbone for the distributed energy storage system (ESS) design, which consists of one or more battery modules and an external NeverDie® BMS unit. IonBus® combines two independent data channels, RV-C CAN and Optoloop®, into a single network, which provides redundancy required by strict safety standards such as UL1973, while also increasing amount and quality of the cell level data available to better manage customer's experience.

Functional diagram shown below demonstrates all key components of the IonBus® system and how they interconnect with customer's own RV-C CAN network. Each component is described below the diagram.

NOTE: Functional diagram is meant to demonstrate the design principles for educational purposes, it is not an installation guide. Please refer to detailed installation diagrams provided by Lithionics Battery for various system configurations.



A. **Lithionics Battery Module.** Each battery module has the M12-8pin circular connector which is attached to the middle branch of the T-adaptor (D), included with each module.
B. **NeverDie® BMS.** The BMS also has the same M12-8pin circular connector as the battery module and also connects to the T-adaptor (D), included with the BMS.
C. **IonBus® Terminator.** Custom molded terminator with 2 opposite gender M12-8pin connectors, so it can be attached to either side of the network. The terminator also has a small wire loop protruding from the mold, which can be cut to disable the CAN termination resistor, while keeping the Optoloop termination function intact.
D. **IonBus® T-adaptor.** Custom molded wire harness which connects to adjacent units in Up/Down sequence to create a network between the BMS and one or more battery modules.
E. **IonBus® Edge Harness.** Custom wire harness which terminates the Optoloop® network, while extending the RV-C CAN network to link with customer's own CAN network. There are several edge harnesses available

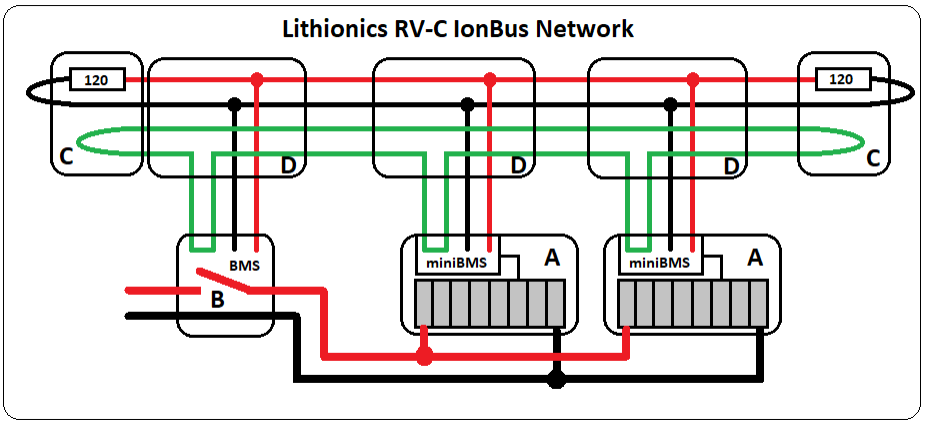
with different types of connectors on the customer side to mate with various types of CAN connection systems, such as Deutsch, Molex, Aptiv, etc.

F. **Customer's CAN enabled equipment.** Any CAN enabled equipment in the customer's system, including chargers, inverters, alternator regulators, multiplexing control panels, multi-function displays, etc. All equipment must support RV-C CAN protocol for compatibility between data messages.

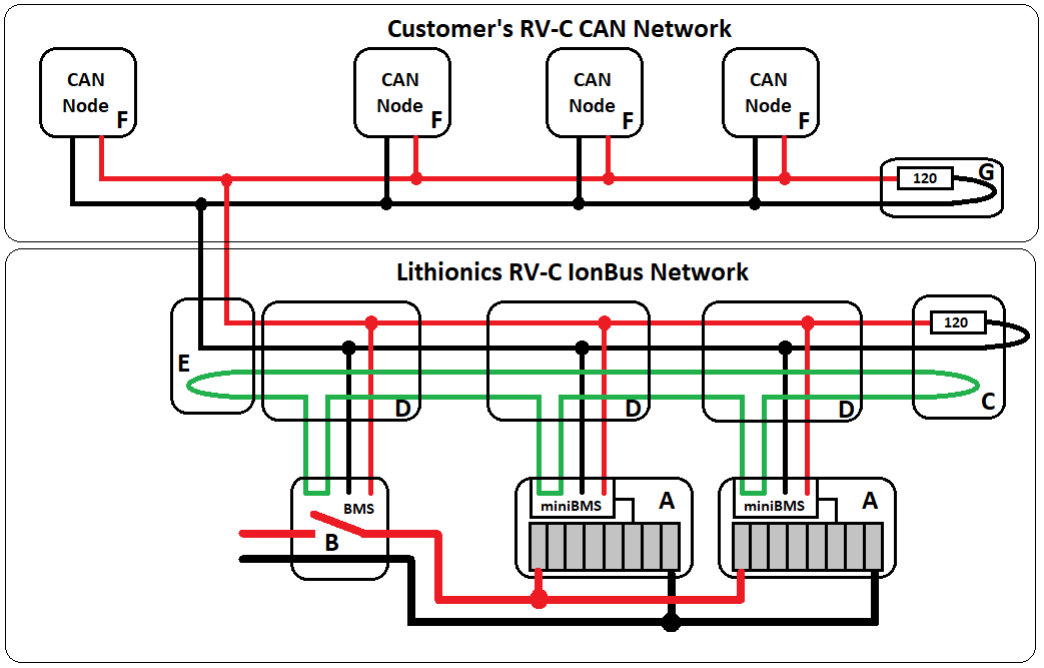
G. **Customer's CAN network terminator.** CAN terminators supplied with customer's own CAN network. Shown here to demonstrate that overall CAN network topology must have only 2 terminators, one at each end of the network, which contain 120 Ohm resistor. Any additional terminators must be removed or disabled, which may include cutting a small wire loop in the IonBus® terminator. See use cases described below for examples of correct use.

Different use case examples for IonBus® termination

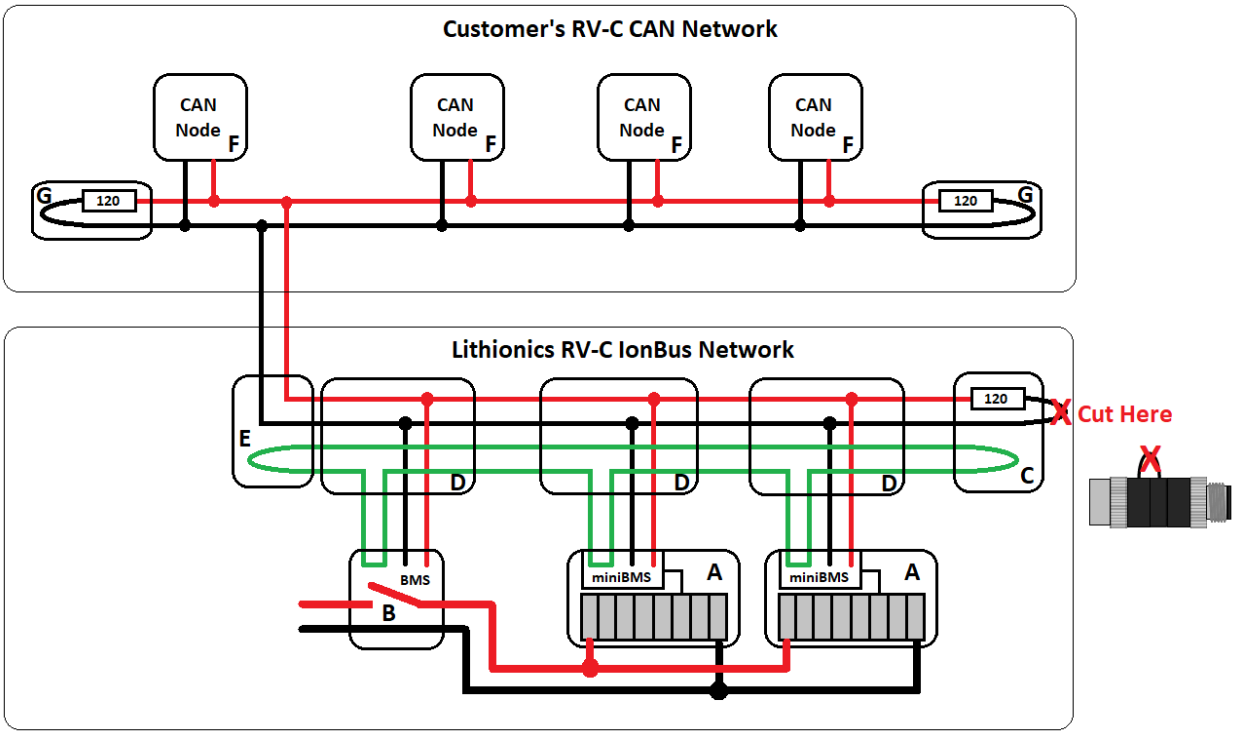
1. **Lithionics Battery ESS works as a standalone system, without customer's own CAN network.** In this case use 2 IonBus® terminators, one at each end of the network



2. **Use one CAN terminator from the customer's CAN network and one IonBus® terminator.** If customer's CAN network spans the distance where Lithionics ESS is at one end and additional CAN equipment is at the other end, it might be convenient to use one IonBus® terminator (**C**) at the ESS end and one customer's CAN terminator at the other end, see diagram example below.



3. **Use both terminators from customer's CAN network and disable CAN termination resistor at the IonBus® terminator.** IonBus® terminator (**C**) still must be used to terminate the Optoloop® network, but its CAN termination resistor must be disabled by cutting the black wire loop protruding from the terminator's side.



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