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NXP MC33665A Isolated Network High Speed User Manual

Contents

NXP MC33665A Isolated Network High Speed

Product Information

Specifications

- **Product Name:** MC33665A
- **Type:** Battery Management System (BMS) Communication Gateway IC
- **Supported Protocols:** CAN, CAN FD
- **Transport Protocol Link (TPL) Ports:** 4
- **Manufacturer:** NXP Semiconductors

Product Usage Instructions

Introduction

The MC33665A is a general-purpose battery management system (BMS) communication gateway IC designed for CAN FD to four transport protocol link (TPL) ports. This user manual provides instructions on how to set up the CANoe environment for MC33665A and use the workspace to generate voltage and temperature measurements. The MC33665A is a general-purpose battery management system (BMS) communication gateway IC for controller area network flexible data-rate (CAN FD) to four transport protocol link (TPL) ports. The MC33665ATF4AE offers a CAN or CAN FD interface for communication with an MCU as defined in ISO 11898. The CAN physical layer is not included. An external CAN transceiver such as TJA1442 or TJA1443 of NXP or relevant transceivers must be used based on the application.

Note: MC33665A referred in this document is a CAN FD variant with MC33665ATF4AE. Communication can be established to MC33665A (MC33665ATF4AE) with a CAN or CAN FD protocol. CANoe is a software tool from Vector Informatik GmbH, which is known in the automotive industry. The goal of BJB3.0_CANoe_Demo is to use the features of CANoe to communicate with MC33665A. This is done by extracting the voltages, current, and temperatures from MC33772C battery cell controllers designed by NXP. This document describes how to set up the CANoe environment for MC33665A and use the workspace to generate the voltage and temperature measurements.

- MC33665A: Battery management communication gateway
- MC33772C: 6-Channel Li-ion battery cell controller IC

NXP offers the following board solutions to see the functionality of devices and support the setup in testing the devices.

- FRDM665CANFDEVB
- RD772BJBCANFDEVB
- RD772BJBTPL8EVB
- RD772BJBTPLEVB

RD772BJBCANFDEVB is compatible for CANoe workspace configuration.

Test Setup

Demo Prerequisites
Before running the BJB3.0_CANoe_Demo_V1, make sure you have the following devices or hardware:

- RD772BJBCANFDEVB board
- MC33665A (MC33665ATF4AE) with CAN or CAN FD protocol
- MC33772C battery cell controllers designed by NXP

Below is the list of devices or hardware required to run BJB3.0_CANoe_Demo_V1.

- A personal computer (PC) meeting the hardware and software requirements to install the CANoe from Vector
- CANoe tool with a valid license, which is either installed in the PC or in hardware (HW), such as a dongle connected to the PC. Note: BJB3.0_CANoe_Demo_V1 workspace configuration files are generated to support CANoe version 11, version 15, version 16, and version 17.
- Hardware to interface with a PC (USB) and CAN (DB-9). VN16XX from vector, typically VN1610 or VN1630, or relevant which had CAN FD capability of data speeds up to 5 Mbps. In CAPL (BJB_MC33772C_CANoe_V1) int channel = 1; is assigned for channel 1 of vector HW, change it to 1 or 2 based on the setup or Vector HW.
- RD772BJBCANFDEVB – A BJB reference design based on CAN/CAN FD. FRDM665CANFDEVB with RD772BJBTPLEVB- A 400 V BJB reference design based on TPL
- Standard 12 V output DC Power supply with a minimum of 25 W.

Software Setup

**To set up the software for the demonstration, follow these steps:**

- Download and install the CANoe software tool from Vector Informatik GmbH.
- Configure the workspace using the BJB3.0_CANoe_Demo Configuration Files.
- Set up the node configuration as shown in Figure 3.
- Install the CANoe from vector based on the availability of license. Follow the guidelines provided by vector for installing and setting up the CANoe and license.
- Download the BJB3.0_CANoe_Demo CANoe Configuration files from **www.nxp.com**.

aaa-053491

Figure 1. BJB3.0_CANoe_Demo Configuration Files

- Database folder has .dbc files to support communication with MC33665A and MC33772C. NXP_BMS_QPHY_V2.dbc file supports for BJB3.0_CANoe_Demo. Contact the NXP sales team for any support on database for MC33665A and MC33772C.
- Two Panels to support the BJB3.0_CANoe_Demo can be located in the Panels folder.
- BJB_MC33772C_CANoe_V1.can is the CAPL file to support as BJB node in BJB3.0_CANoe_Demo.
- BJB3.0_CANoe_Demo is compatible for CANoe 17, BJB3.0_CANoe_Demo_ver160 is compatible for CANoe 16, BJB3.0_CANoe_Demo_ver150 is compatible for CANoe 15 and BJB3.0_CANoe_Demo_ver110 is compatible for CANoe 11. BJB3.0_CANoe_Demo configuration files are forward compatible for latest CANoe version. Select the latest version of BJB3.0_CANoe_Demo configuration files for the compatible CANoe from vector.
- Open the CANoe installed in PC. Select the license of CANoe, to run the full features of BJB3.0_CANoe_Demo.
- Select the File → Click the Open button → Browse to the location of BJB3.0_CANoe_Demo configuration files → Select the compatible BJB3.0_CANoe_Demo CANoe configuration file → Click open button to open the workspace in CANoe
- Workspace of BJB3.0_CANoe_Demo in the configuration tab consists of a Simulation setup window and Trace window as shown in Figure 2.

Figure 2. BJB3.0_CANoe_Demo workspace
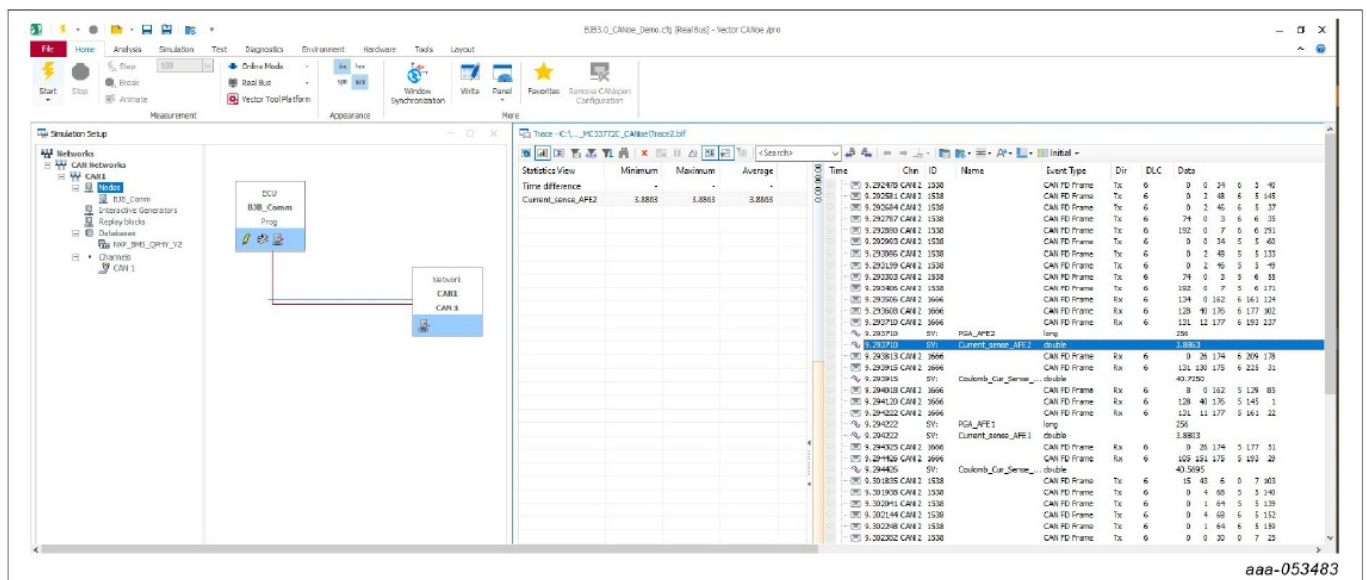
- BJB_Comm node is the simulation of a battery junction box communicating to MC33665A and MC33772C with appropriate CAN or CAN FD messages on CAN1 network. Based on hardware availability and interface of the CAN setup, select the right CAN network in Channels and CAN Networks.
- BJB_Comm node specification is preselected with CAPL file BJB_MC33772C_CANoe_V1.can.

Figure 3. Node configuration
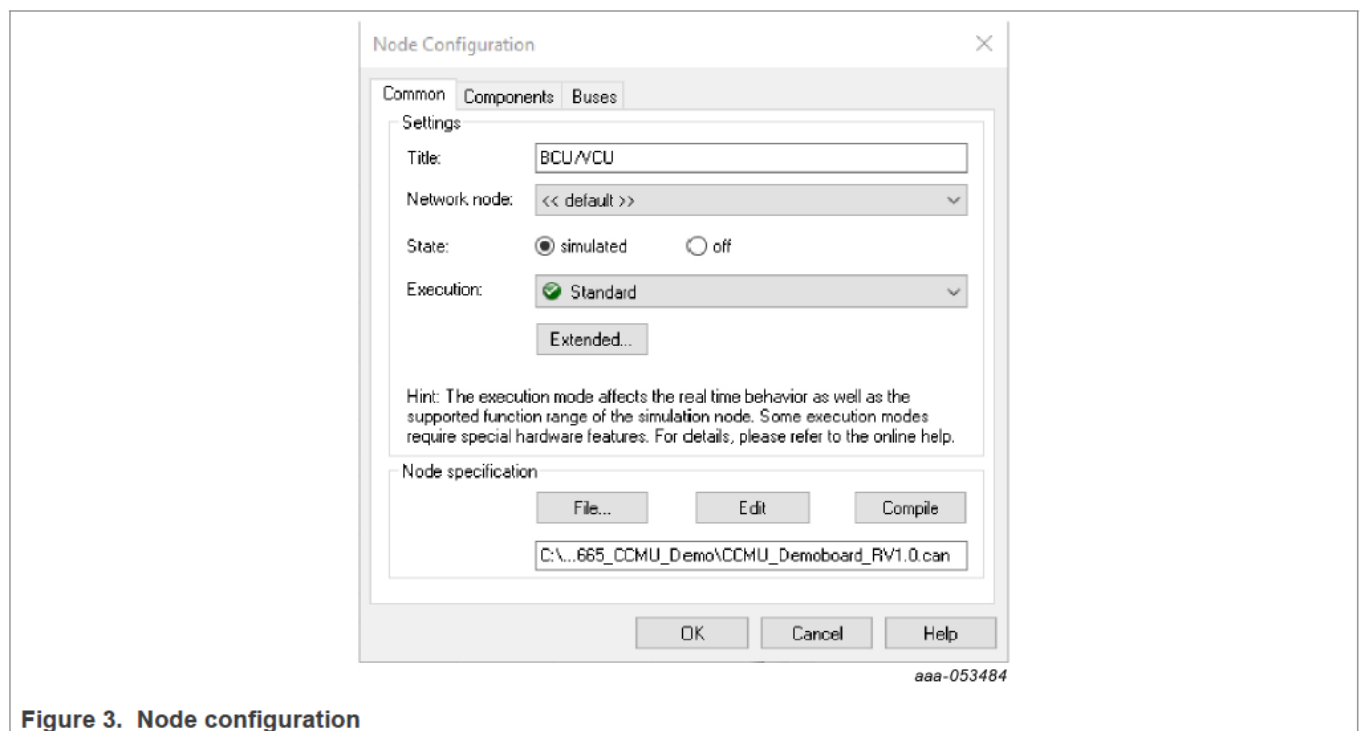
- NXP_BMS_QPHY_V2 database is connected to Databases in simulation setup to interpret the messages of MC33665A and MC33772C.

Hardware Setup

The BJB3.0_CANoe_Demo is designed to work with specific hardware configurations. Follow these steps to set up the hardware:

1. Ensure the CFG Pins of MC33665A on RD772BJBCANFDEVB are set according to the desired baud rate (CAN or CAN FD Arbitration) as listed in Table 1.
2. Connect the necessary components as shown in Figure 6.

BJB3.0_CANoe_Demo is built to work in CANoe from Vector. The demo can work with specific preconditions in hardware that are listed below.

- CAN Network must be interfaced to a board that has MC33665A CAN FD silicon. ID0 to ID3 pins of MC33665A must be preselected to 0. A relevant database must be selected for any mandatory change of ID0 to ID3 pins in MC33665A.
- Connect MC33772C BCC devices from NXP only on Daisy Chain Port 0 to MC33665A. The demo supports up to two MC33772C BCC devices on Daisy Chain Port 0.
- In customer-specific hardware, check the CAN transceiver and interface circuit of MC33665A to support the baud rates and IDx pins (CANID) requirements for the MC33665_CCMU_Demo.
- Cross-check the CAN Termination and bus impedance before starting the Demo.
- CFG0 and CFG1 pins on MC33665A must be aligned with the setup in CANoe configuration.

CFG Pins of MC33665A

CFG1	CFG0	Baud rate (CAN or CAN FD Arbitration)
0	0	250 kbit
0	1	500 kbit
1	0	1 Mbit
1	1	Reserved

- Any changes to CFG0 and CFG1 pins on MC33665A should be reflected for baud rate settings in the CANoe workspace → Network Hardware Configuration. Refer to Table 1 and CFG0 and CFG1 pin settings of MC33665A on RD772BJBCANFDEVB before updating the Network Hardware Configuration.
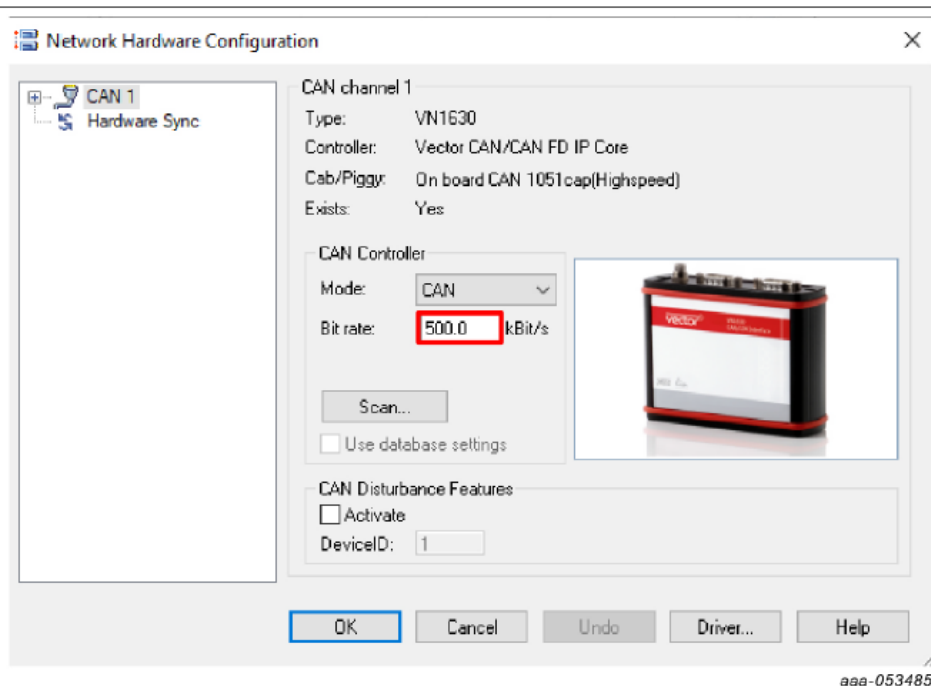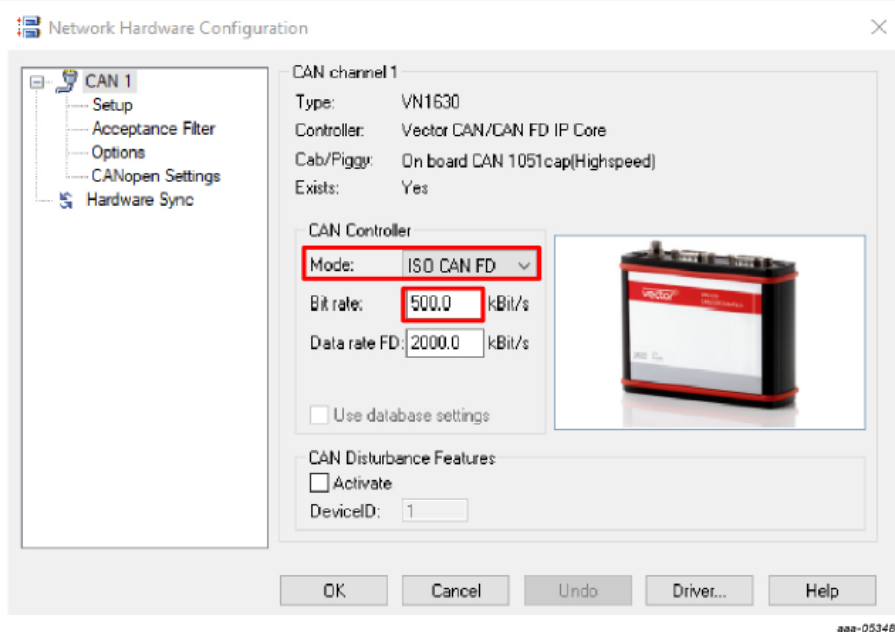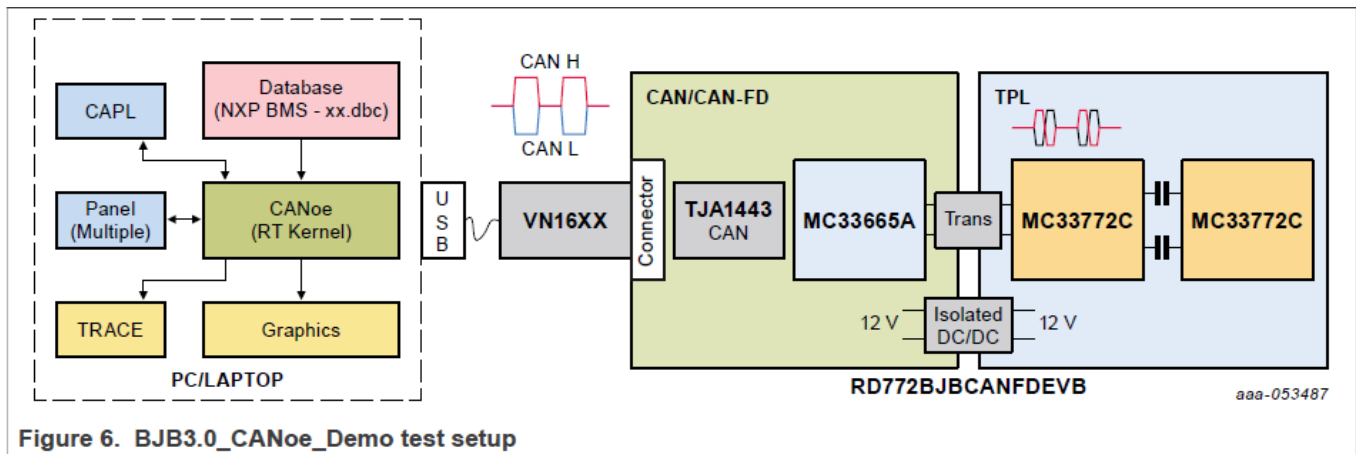
Figure 4. CAN HW baud rate

Figure 5. CAN FD arbitration baud rate

BJB3.0_CANoe_Demo configuration is compatible to work with different hardware configurations that meet preconditions of the demo.

Figure 6. BJB3.0_CANoe_Demo test setup

- Figure 6 figure shows the block diagram of the setup for CANoe Demo with the BJB board. RD772BJBCANFDEVB can be interfaced from a PC with vector hardware. Power supply (12 V) and CAN for RD772BJBCANFDEVB can be interfaced to J12.
- Check the CFG0, CFG1, ID0, ID1, ID2, ID3 pins of MC33665A populated on RD772BJBCANFDEVB before starting the demo.
- Install a 120 Ω resistor for CAN communication as shown in Figure 6. Ignore the same if there is an additional termination in network, which is not part of the setup shown above.
- Follow the precautions guided by lab or supervisor to set up and run the demo.
- Follow the guidelines of individual boards for set up and smooth operation.
- Contact the NXP sales team for any queries.

Running CANoe demo

BJB3.0_CANoe_Demo can be run from a PC that is installed per guidelines specified in Section 3 "Software setup". Follow the steps below to install and run the BJB3.0_CANoe_Demo.

1. Set up the PC that is used to install and run the BJB3.0_CANoe_Demo. Complete the procedure specified in Section 3 "Software setup" before starting the BJB3.0_CANoe_Demo.
2. Set up the hardware as specified and shown in Section 4 "Hardware setup". Make sure the preconditions of the hardware setup are done appropriately before finalizing and running the setup. Power ON the hardware by checking the interconnections.
    - Vector HW USB to PC → DB-9 connector CAN Interface to RD772BJBCANFDEVB board
    - Power Supply (12 V/20 W) to RD772BJBCANFDEVB board with J12
3. Start CANoe installed in the PC. Set up the workspace as described in Section 3 "Software setup". Set up the CAN Channel as per the Vector hardware connected to PC.
4. Open the Hardware → Network Hardware to set the initial baud rate for CAN communication matching to CFG0 and CFG1 settings of MC33665A in RD772BJBCANFDEVB board.
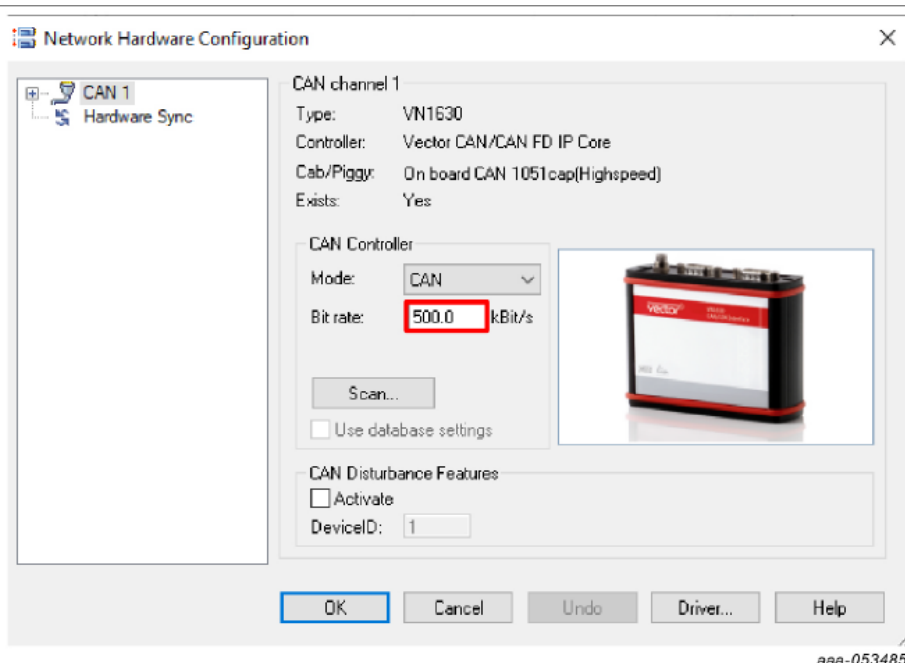
Figure 7. Initial CAN setup - baud rate

5. Click the Start button seen on left top corner of CANoe tool to run the initial configuration of MC33665A with CAN and set the CAN FD baud rate. Initial settings for CAN FD baud rate from CAPL script to MC33665A is Data: 2 Mbps where as Arbitration is set by CFG0 and CFG1 pins of MC33665A.

6. Update the Initial CAN FD settings in CANoe. Select the Hardware → click on Network Hardware → change the Mode to ISO CAN FD and update the Data rate to 2000 kBit/s → press OK
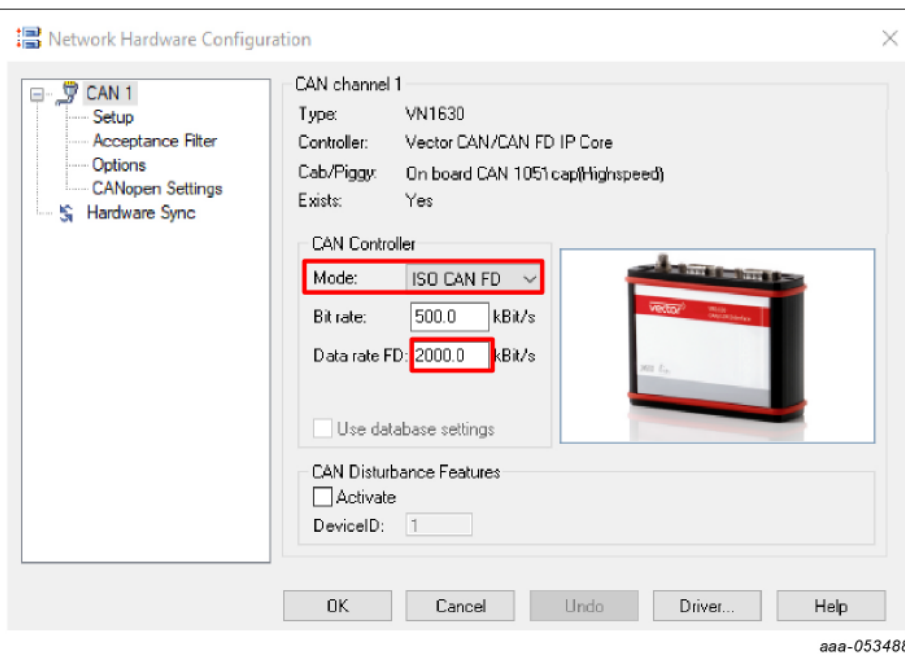
Figure 8. Initial CAN FD setup- data baud rate

7. Click the start button to run the setup in CAN FD with updated data settings. CAN FD traffic can be monitored and logged in the Trace window as shown in picture Figure 2

8. Panels can be used to visualize the data from RD772BJBCANFDEVB with appropriate GUI and run the demo. Select Home → Click on Panel drop down menu → Select and click Add Panel → Select the location of files stored in Figure 1 → Open Panels folder → Select the BJB_Panel1 panel file → Press Open.

Figure 9. BJB Panel 1
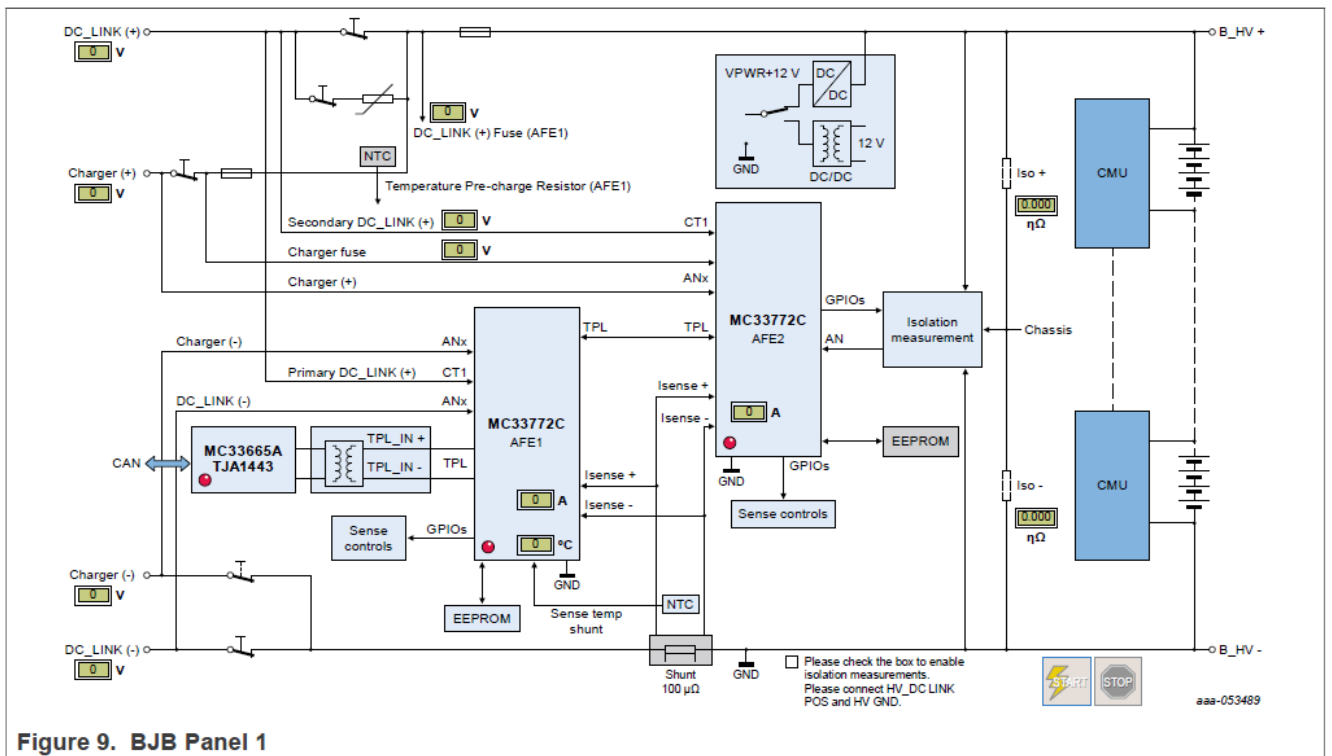
9. BJB_Panel1 gives an overview of communication from CANoe to the RD772BJBCANFDEVB board. MC33772C (AFE1 and AFE2) can be used for monitoring voltages, currents, and temperatures.

10. Isolation monitoring can be enabled, before enabling Isolation measurements it is required to Power DC_LINK(B_HV+ and B_HV-). Isolation conductance (℧-"mho's") can be measured with respect to chassis ground connected at J11 of RD772BJBCANFDEVB.

11. Trace window in CANoe offers to see the log of CAN or CAN FD messages on the network.

12. Raw data of TPL2 message with CADD, DADD, RADD, MADD and relevant information can be monitored and checked for the timing of requests and responses from MC33665A.

13. BJB_Panel2 panel can be used to see the performance of BJB with an MC33772C. Select Home → Click on Panel drop down menu → Select and click Add Panel → Select the location of files stored in Figure 1 → Open Panels folder → Select the BJB_Panel2 panel file → Press Open.
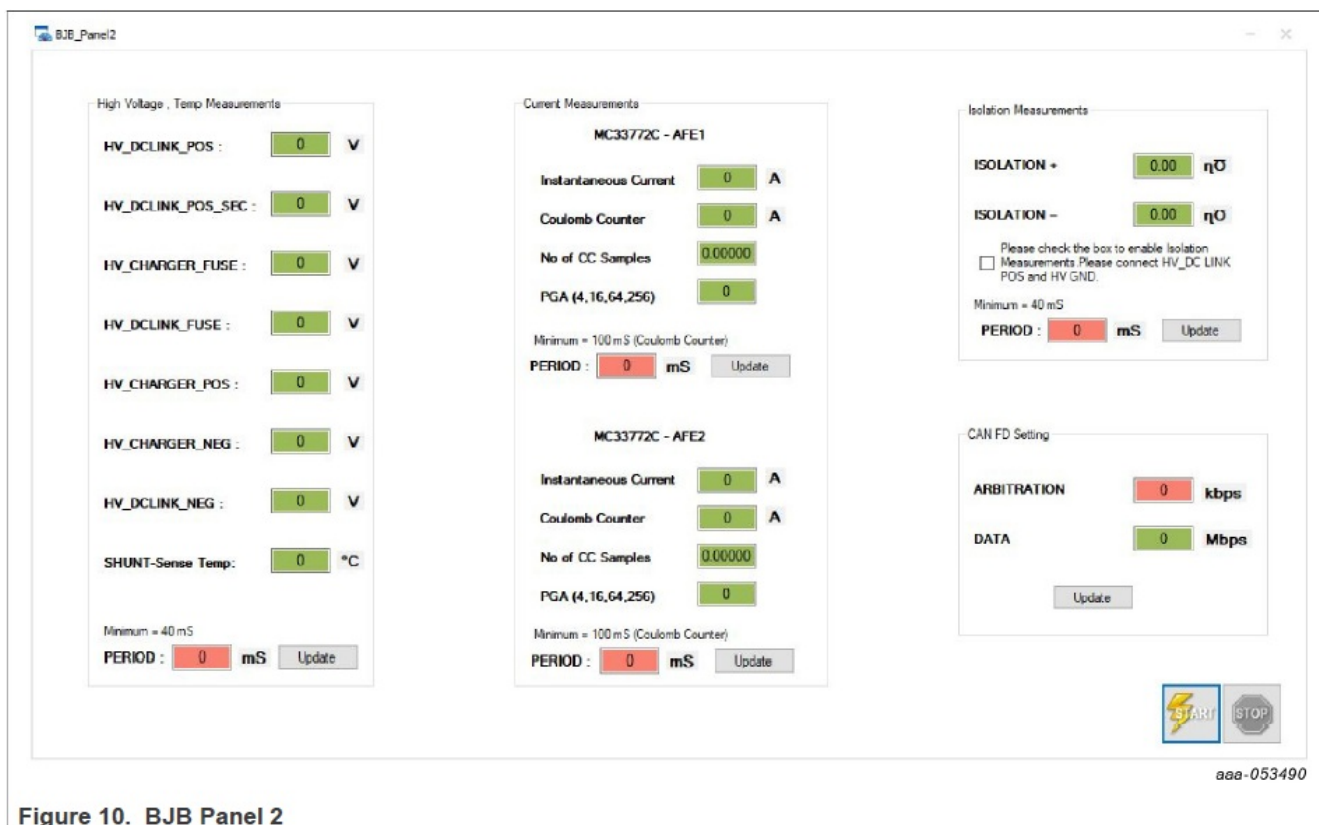
Figure 10. BJB Panel 2

14. Enter the period (time), in order to monitor the performance of the respective function in BJB (RD772BJBCANFDEVB). Click the Update button for the new data of respective section within the given time period. Note that the minimum time period of the respective section is maintained.

15. CAN FD Communication from CANoe to RD772BJBCANFDEVB can be done at different data baud rates. Enter the appropriate data speeds (1, 2, or 5 Mbps) in BJB_Panel2. Press Update button to update the settings from CANoe(BJB_Panel2) to MC33665A on RD772BJBCANFDEVB board. Note: Demo will still stop running while updating CAN FD speed to MC33665A.

16. Update the same data speed entered on panel to CANoe configuration. Select Hardware → Press Network Hardware → Update Data rate same as provided in BJB_Panel2 panel→ Click OK → Press the Start in CANoe or on Panel to resume the demo at updated CAN FD baud rates.

17. There is a need to wait for the LEDs (D1 and D4) to turn off before pressing the Start button or pressing F9.

18. Initial time period is 100 mS, update in BJB_Panel2 if required.

19. BJB_Panel2 provides an option to perform Isolation measurements. Click or check the box for enabling isolation measurements after connecting and powering ON both HV_DCLINK_POS and HV_DCLINK_NEG.

20. **Important:** Upon Reset or Power ON of RD772BJBCANFDEVB, start the demo procedure from step 4 or repeat at least until step 6 to set up the initial configuration and complete settings to MC33665A

References

1. Product Summary Page for MC33665A — **http://www.nxp.com/MC33665A**
2. Product Summary Page for MC33772C — **https://www.nxp.com/products/power-management/battery-management/battery-cell-controllers/6-channel-li-ion-battery-cell-controller-ic:MC33772C**
3. Product Summary Page for TJA144x — **https://www.nxp.com/products/interfaces/can-transceivers/can-with-flexible-data-rate/automotive-can-fd-transceiver-family:TJA144x**

Revision history

Rev	Date	Description
UM11939 v.1	20231208	Initial version

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FAQ (Frequently Asked Questions)

1. **Q: What is the purpose of the MC33665A?**

   A: The MC33665A is a general-purpose battery management system (BMS) communication gateway IC designed for CAN FD to four transport protocol link (TPL) ports.

2. **Q: What software tool is recommended for communication with MC33665A?**

   A: CANoe, a software tool from Vector Informatik GmbH, is recommended for communication with MC33665A.

3. **Q: What hardware configurations are compatible with BJB3.0_CANoe_Demo?**

   A: BJB3.0_CANoe_Demo is compatible with different hardware configurations that meet the preconditions of the demo.

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Documents / Resources

UM11939	**NXP MC33665A Isolated Network High Speed** [pdf] User Manual MC33665A Isolated Network High Speed, MC33665A, Isolated Network High Speed, Network High Speed, High Speed, Speed

References

- **Automotive, IoT & Industrial Solutions | NXP Semiconductors**
- **MC33665A: Isolated Network High Speed Transceiver and CAN FD Gateway | NXP Semiconductors**

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- **User Manual**