Quick Start Guide for the Freescale Freedom Motor Control Development Platform

FRDM-KV31F

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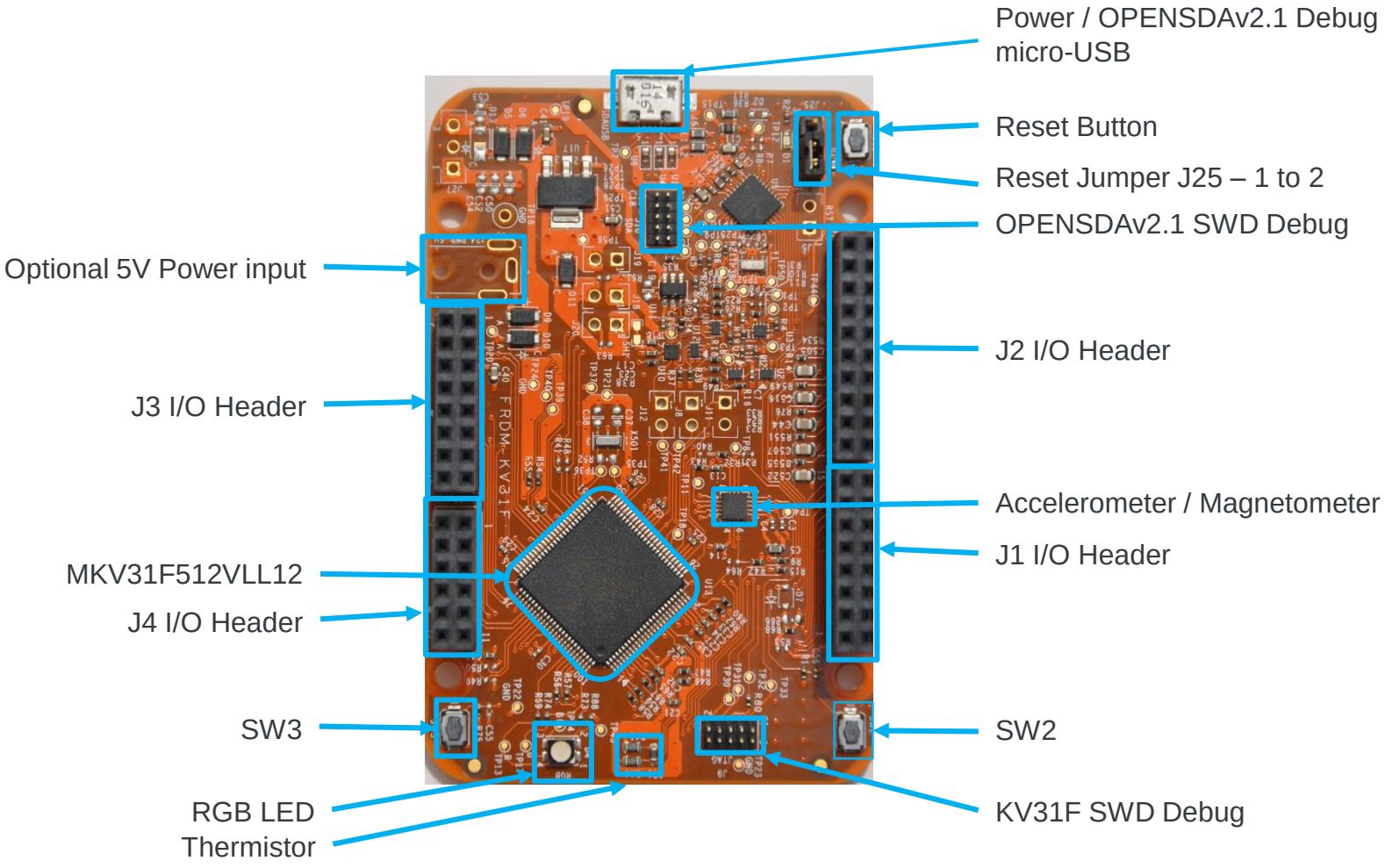
Quick Start Package Overview

These items are available as part of the Quick Start Package:

Name	Type	Description
FRDM-KV31F Quick Start Package	Zip file	Quick Start Guide and supporting files for getting started with the FRDM-KV31F
Quick Start Guide	PDF	This document
Debug_Binary	Folder	OpenSDA Applications for the FRDM-KV31F
Precompiled Demo Code	Folder	binary-record images of demo projects for use with the MSD Flash Programmer
FRDM-KV31F User's Manual	Folder	Overview and detailed information for the FRDM-KV31F and FRDM-MC-LVPMSM and FRDM-MC-LVBLDC shields hardware
Schematics	Folder	PDF schematics for the FRDM-KV31F board and FRDM-MC-LVPMSM and FRDM-MC-LVBLDC shields hardware
Design Packages	Folder	Zip file containing all design source files for FRDM-KV31F board and FRDM-MC-LVPMSM and FRDM-MC-LVBLDC shields hardware
Application notes	Folder	Collection of various application notes for MKV31F
KV31F-sc	Folder	Sample Code for KV31F for IAR tools

Additional reference documents are available on freescale.com/FRDM-KV31F:

Get to Know the FRDM-KV31F



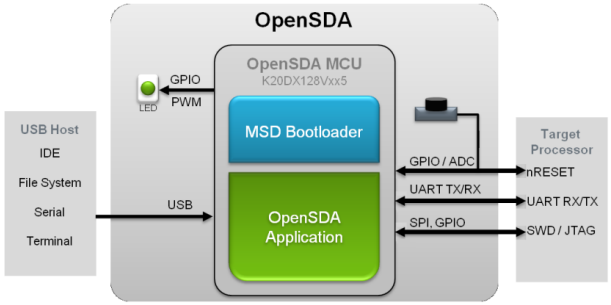
Get to Know the FRDM-KV31F

The Freescale Freedom development platform offers a wide variety of small, low-power, cost-effective evaluation and development boards for quick application prototyping and demonstration of Kinetis MCUs and Freescale sensors.

Kinetis V series is a family of devices targeting motor and power control applications for the mass market with a strong focus on enablement. The FRDM-KV31F motor development kit is a board platform comprising two Freescale Freedom development boards, including the FRDM-KV31F and FRDM-MC-LVPMSM

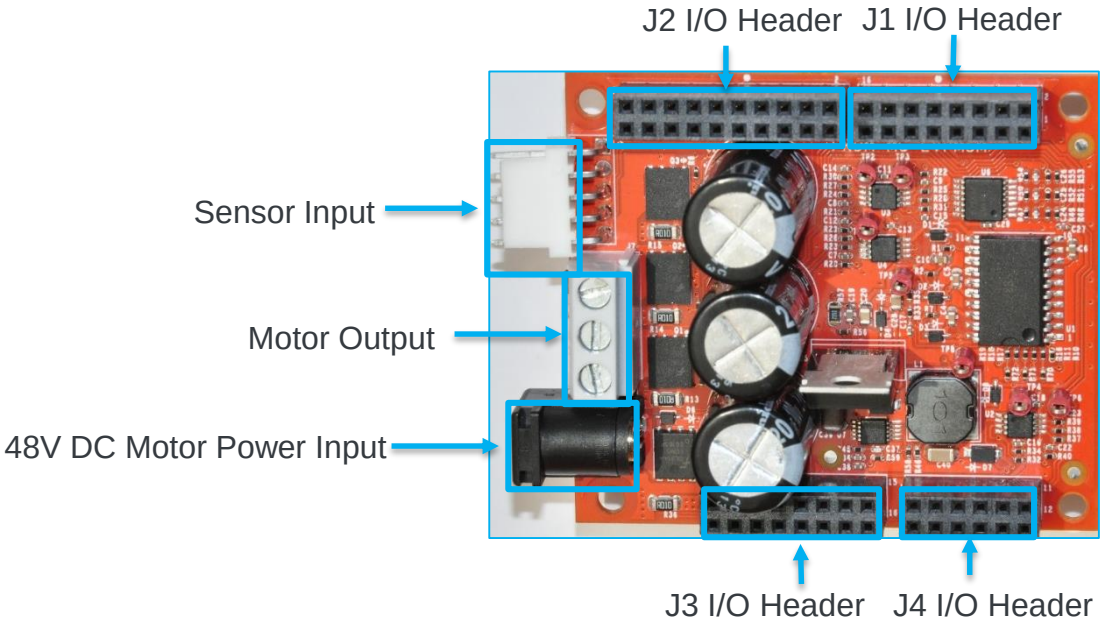
Features:

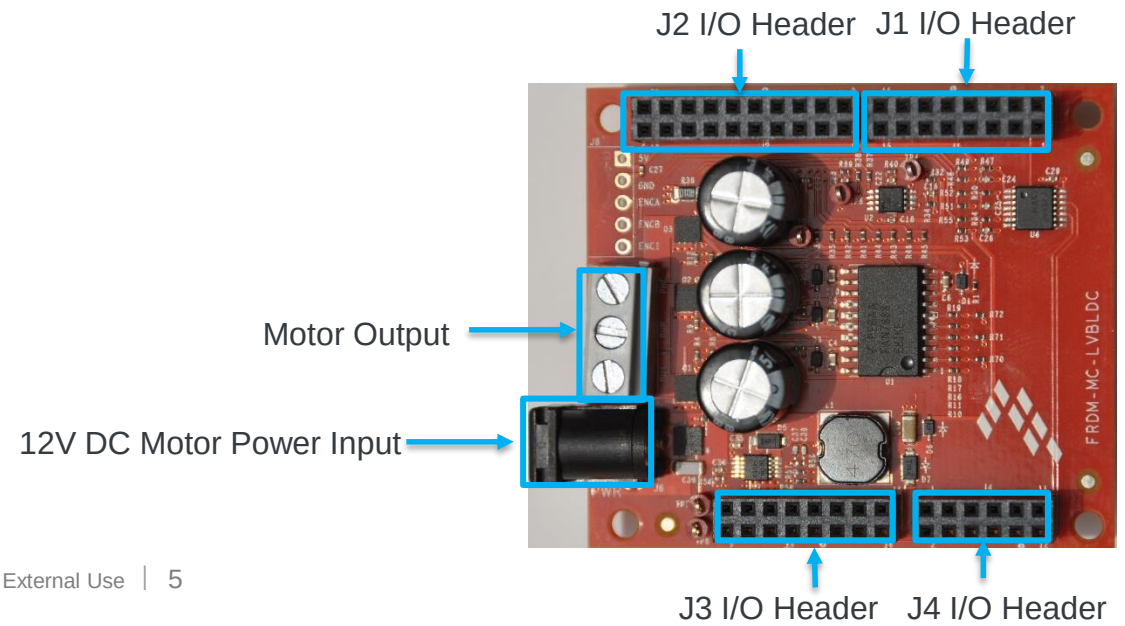
- MKV31F512VLL12 MCU with FPU – 120MHz, 512KB Flash, 64KB SRAM, 100 LQFP
- Motor Control I/O, accelerometer/Magnetometer FXOS8700CQ, Tri-color LED, Flexible power supply options – USB, external source
- Two (2) user push-button switches for NMI interrupts and LLWU wake up (SW2/SW3)
- Thermistor sensor to measuring temperature
- Form factor compatible with Arduino ™ R3 pin layout
- New, OpenSDA debug interface
  - Mass storage device flash programming interface (default) – no tool installation required to evaluate demo apps
  - MBED Debug interface provides run-control debugging and compatibility with IDE tools
  - CMSIS-DAP interface: new ARM standard for embedded debug interface



Refer to the *FRDM-KV31F User's Manual* for more information.

Get to Know the FRDM-MC-LVPMSM and FRDM-MC-LVBLDC





Running KV31F Out of the Box Demos

FRDM-KV31F Stand-alone

0 Install the mbedWinSerial_16466.exe OpenSDA USB Drivers found in your quick start package in folder FRDM-KV31F_QSP\Debug_Binary. The demo software delivered with the board demonstrate the features of the KV31F board standalone or with a motor shield.

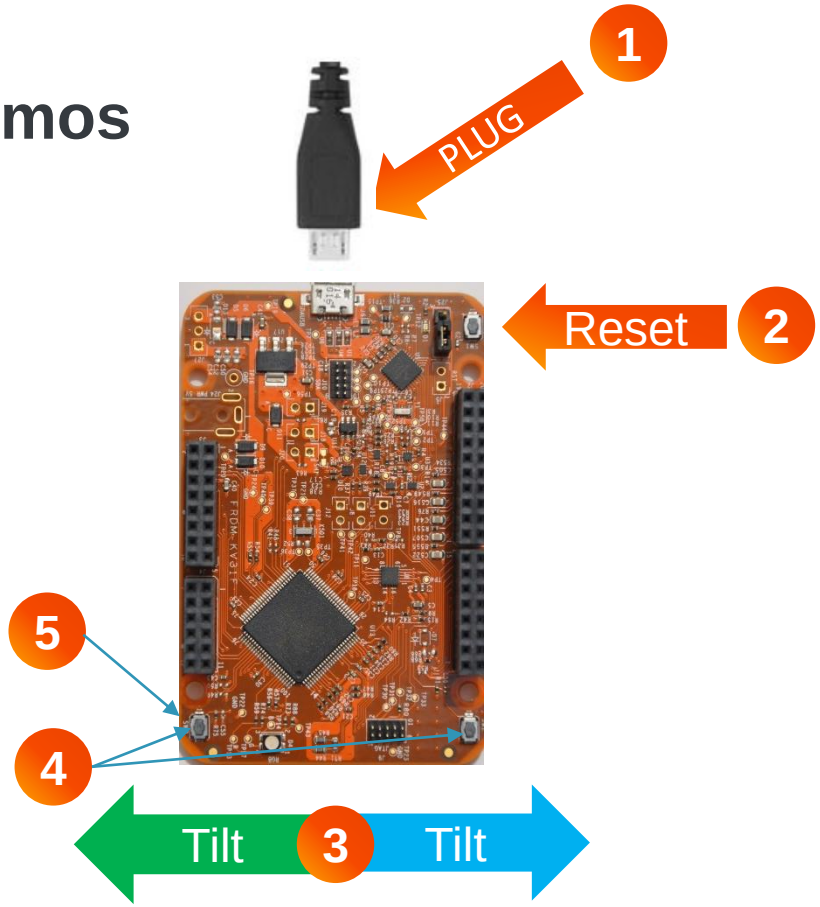
1 Plug in a USB cable (not included) from a USB host to the OpenSDA micro USB connector. The FRDM-KV31F will be powered by this USB connection. Wait for the PC to enumerate drivers. Note the serial port number.

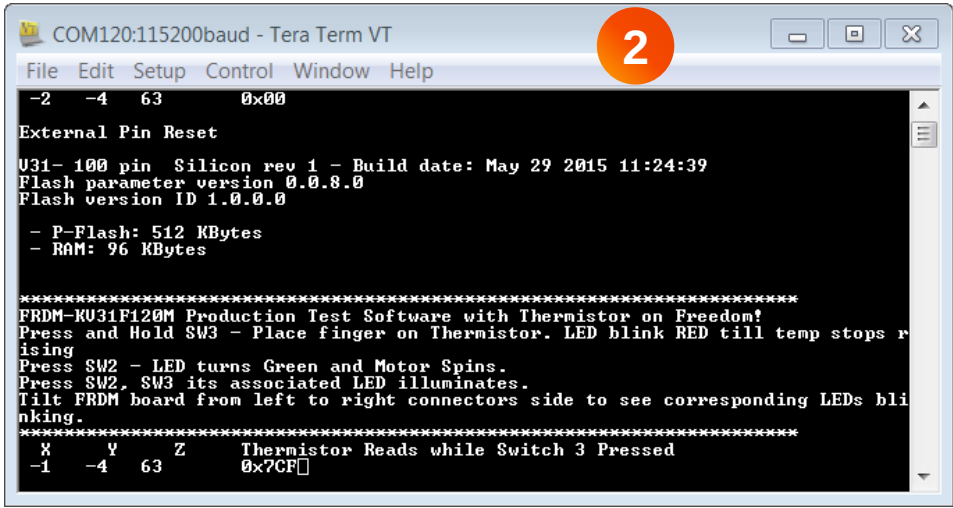
2 UART Test:
Open PuTTY or TeraTerm, connect to Serial Port identified above, set for 115200 baud. Hit Reset (SW1) and Observe output.

3 Accelerometer demo-
1) Tilt board on left edge and the Green LED flashes.
2) Tilt board on right edge and the Blue LED flashes.

4 Switch Test:
1) Press SW3 and hold then RED LED lights, release and OFF.
2) Press SW2 and hold then BLUE LED lights, release and Green is lit.

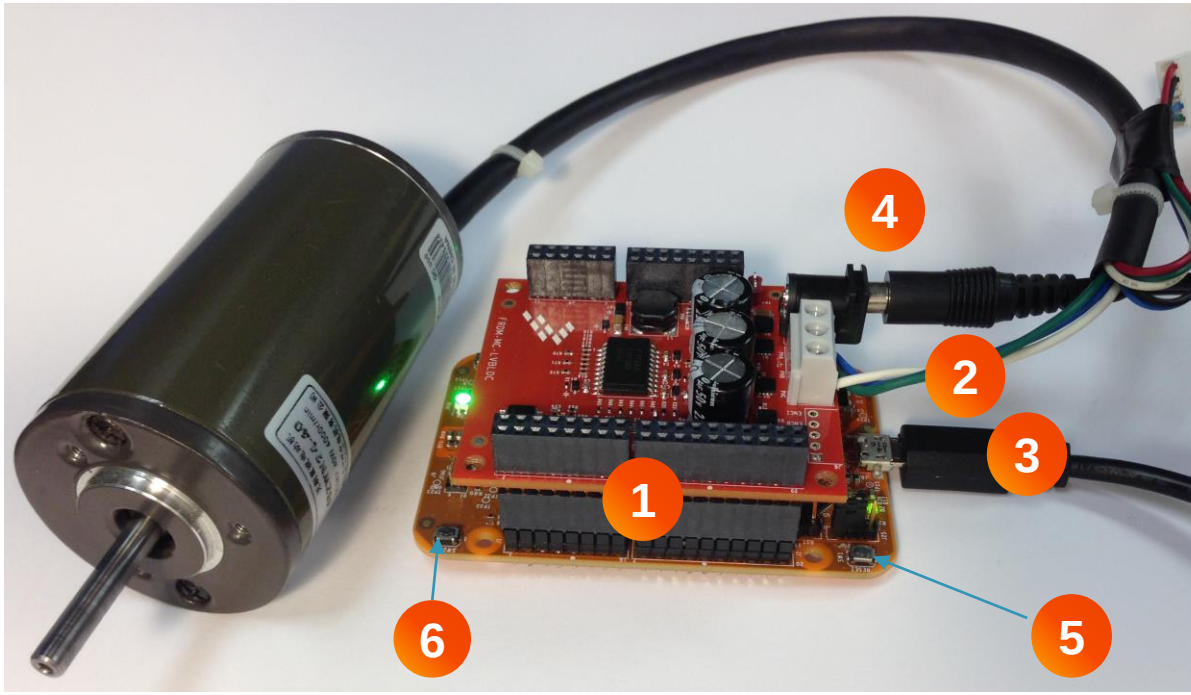
5 Thermistor Test:
1) Press SW3 and hold – RED LED flash until the temperature of the Thermistor stops rising.





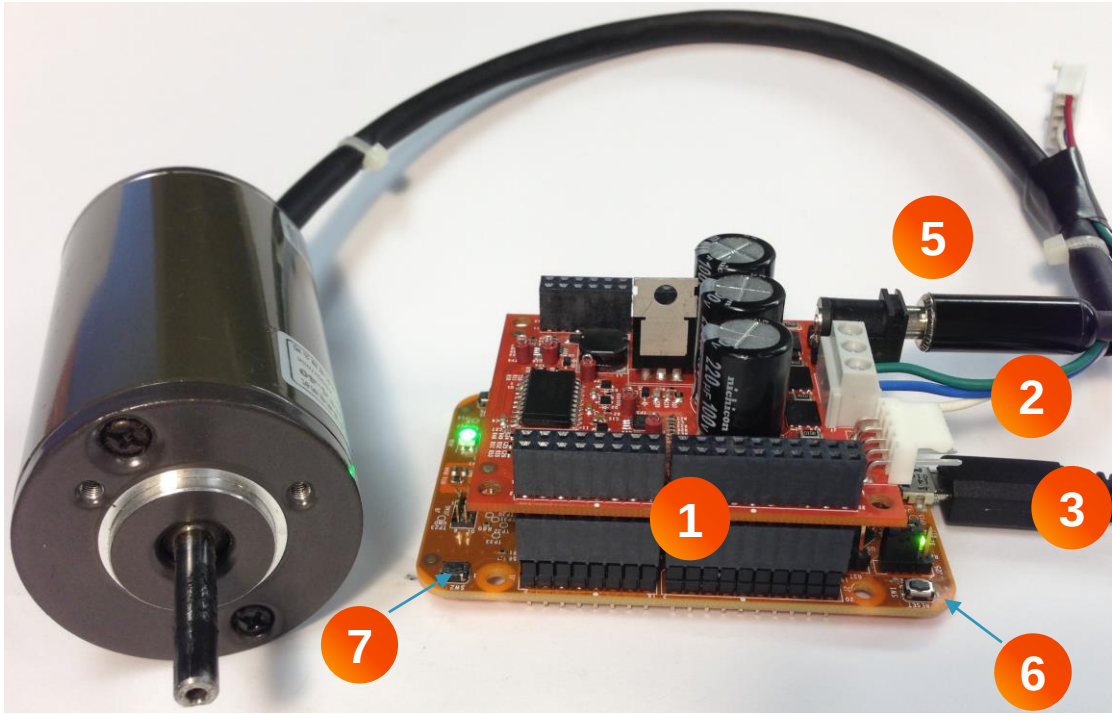
Running Out of the Box Demo KV31F with MC-LVBLDC

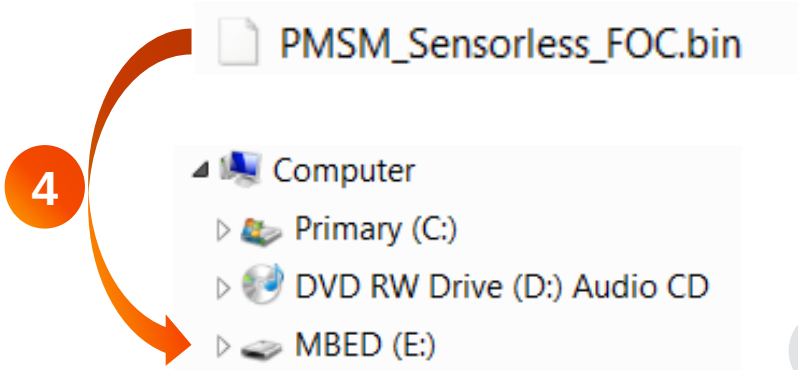
1. Connect the FRDM-MC-LVBLDC shield on top of FRDM-KV31F board.
2. Connect the BLDC motor three phase wires into the screw terminals on the board.
3. Plug in a USB cable (not included) from a USB host to the OpenSDA micro USB connector.
4. Plug in a 12V DC power supply to the DC Power jack
5. Press Reset Button (SW1)
6. Press and release SW2, green LED lights, BLDC demo starts.
   Press SW2 and Green LED goes off and BLDC demo stops.



Running KV31F with MC-LVPMSM Shield Demo

1. Connect the FRDM-MC-LVPMSM shield on top of FRDM-KV31F board.
2. Connect the PMSM motor three phase wires into the screw terminals on the board.
3. Plug in a USB cable (not included) from a USB host to the OpenSDA micro USB connector.
4. Program new project: Drag and Drop or Copy (CTRL-C) and Paste (CTRL-V) file from “FRDM-KV31F_QSP\Pre-Compiled\ Demo Code\PMSM_Sensorless_FOC.bin” to MBED drive.
5. Plug in a 24V DC power supply to the DC Power jack
6. Press Reset Button (SW1)
7. Press and release SW2, green LED lights, PMSM demo starts.
   Press SW2 and Green LED goes off and PMSM demo stops.





Software Installation Instructions

1 Download Software and Tools

Download installation software and documentation under **"Jump Start Your Design"** at **freescale.com/FRDM-KV31F**

2 Install the Software and Tools

- Install the IDE toolchain IAR Embedded Workbench for ARM v7.20 or later, 30-day free evaluation license, at **iar.com/Freescale**
- Install the mbedWinSerial_16466.exe Windows USB Driver.
- Install the free debug monitoring and data visualization tool Freescale FreeMASTER v1.4, or later, at freescale.com/FreeMASTER.

Introduction to OpenSDA

OpenSDA is an open-standard serial and debug adapter. It bridges serial and debug communications between a USB host and an embedded target processor. OpenSDA software includes a flash-resident USB mass-storage device (MSD) bootloader and a collection of OpenSDA Applications. FRDM-KV31F comes with the MSD Flash Programmer OpenSDA Application preinstalled. Follow these instructions to run the OpenSDA Bootloader and change the installed OpenSDA Application to P&E Debug Application that provides debugging and a virtual serial port all in one application.

Enter OpenSDA Bootloader Mode

1. Unplug the USB cable if attached.
2. Press and hold the Reset button (SW1).
3. Plug in a USB cable (not included) between a USB host and the OpenSDA USB connector (labeled “OpenSDA”). .
4. Release the Reset button.

A removable drive should now be visible in the host file system with a volume label of `BOOTLOADER`. You are now in OpenSDA Bootloader mode.

IMPORTANT NOTE: Follow the “updated an OpenSDA Application” instructions to update the OpenSDA firmware on your FRDM-KV31F to the latest version. It is likely that the version provided in this package is newer than what was preprogrammed on your FRDM-KV31F.

Update an OpenSDA Application

1. While in OpenSDA Bootloader mode, double-click `SDA_INFO.HTML` in the `BOOTLOADER` drive. A web browser will open the OpenSDA homepage containing the name and version of the installed Application. This information can also be read as text directly from `SDA_INFO.HTML`.
2. Locate the `OpenSDA Applications` folder in the FRDM-KV31F Quick Start Package.
3. Copy & paste or drag & drop the MSD Flash Programmer and Debug Application (`0221_k20dx128_kv31f_0x8000.bin`) to the `BOOTLOADER` drive.
4. Unplug the USB cable and plug it in again. The new OpenSDA Application should now be running and a `FRDM-KV31F` drive should be visible in the host file system.

You are now running the latest version of the MSD Flash Programmer and Debug.

Introduction to OpenSDA

The MSD Flash Programmer is a composite USB application that provides a virtual serial port and an easy and convenient way to program applications into the KV31F MCU. It emulates a FAT16 file system, appearing as a removable drive in the host file system with a volume label of FRDM-KV31F. Raw binary and Motorola S-record files that are copied to the drive are programmed directly into the flash of the KL27 and executed automatically. The virtual serial port can be opened with standard serial terminal applications.

Using the MSD Flash Programmer

1. Locate the `Precompiled Examples` folder in the FRDM-KV31F Quick Start Package.
2. Copy & paste or drag & drop one of the `.srec` files to the `FRDM-KV31F` drive.

The new application should now be running on the FRDM-KV31F. And you can program repeatedly without the need to unplug and reattach the USB cable before reprogramming.

Program rtc_func.srec example to replace the out-of-box demo on your FRDM-KV31F.

Using the Virtual Serial Port

1. Determine the symbolic name assigned to the FRDM-KV31F virtual serial port. In Windows open Device Manager and look for the COM port named “PEMicro/Freescale – CDC Serial Port”.
2. Open the serial terminal emulation program of your choice. Examples for Windows include Tera Term, PuTTY, and HyperTerminal.
3. Program one of the “serial test” applications from the `Precompiled Examples` folder using the MSD Flash Programmer.
4. Configure the terminal program. Most embedded examples use 8 data bits, no parity bits, and one stop bit (8-N-1). Match the baud rate to the selected serial test application and open the port.
5. Press and release the Reset button (SW1) at anytime to restart the example application. Resetting the embedded application will not affect the connection of the virtual serial port to the terminal program.

NOTE: Refer to the *OpenSDA User’s Guide* for a description of a known Windows issue when disconnecting a virtual serial port while the COM port is in use.

NOTE: Flash programming with the MSD Flash Programmer is currently only supported on Windows operating systems. However, the virtual serial port has been successfully tested on Windows, Linux and Mac operating systems.

Explore Further

Now that you are familiar with the FRDM-KV31F and OpenSDA, it's time to explore the additional software and lab guides available on www.freescale.com/FRDM-KV31F. Select your next path from the links in the **Jump Start Your Design section.**

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