

DRV10987 Evaluation Module User's Guide

This user's guide provides complete details of the customer evaluation module (EVM) for the DRV10987 device including hardware implementation, jumper configuration, and operating procedure to run 3-phase BLDC motors. This EVM user's guide is intended to be used with the [DRV10987 Tuning Guide](#) to optimally tune a user motor.

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1 DRV10987 EVM Kit Contents

The DRV10987 evaluation kit contains the following:

- DRV10987 EVM board
- USB2ANY communication board for I²C GUI interaction
- USB cable
- 10-pin ribbon cable to connect the USB2ANY and DRV10987 EVM
- DRV10987 EVM GUI

The DRV10987 EVM boards and GUI are designed to work together to evaluate the device features.

2 Introduction

The DRV10987 EVM is a complete solution for evaluating the DRV10987 12-V or 24-V, three-phase sensorless BLDC motor drivers. Device evaluation and configuration for specific applications is possible with the provided DRV10987 EVM GUI. This document describes the kit details and explains the functions and locations of test points, jumpers, and connectors present on the kit. This document is also a quick-start guide for using the GUI to tune a motor for application. For detailed information about the operating modes of the DRV10987 device, refer to the [DRV10987 12- to 24-V, Three-Phase, Sensorless BLDC Motor Driver data sheet](#).

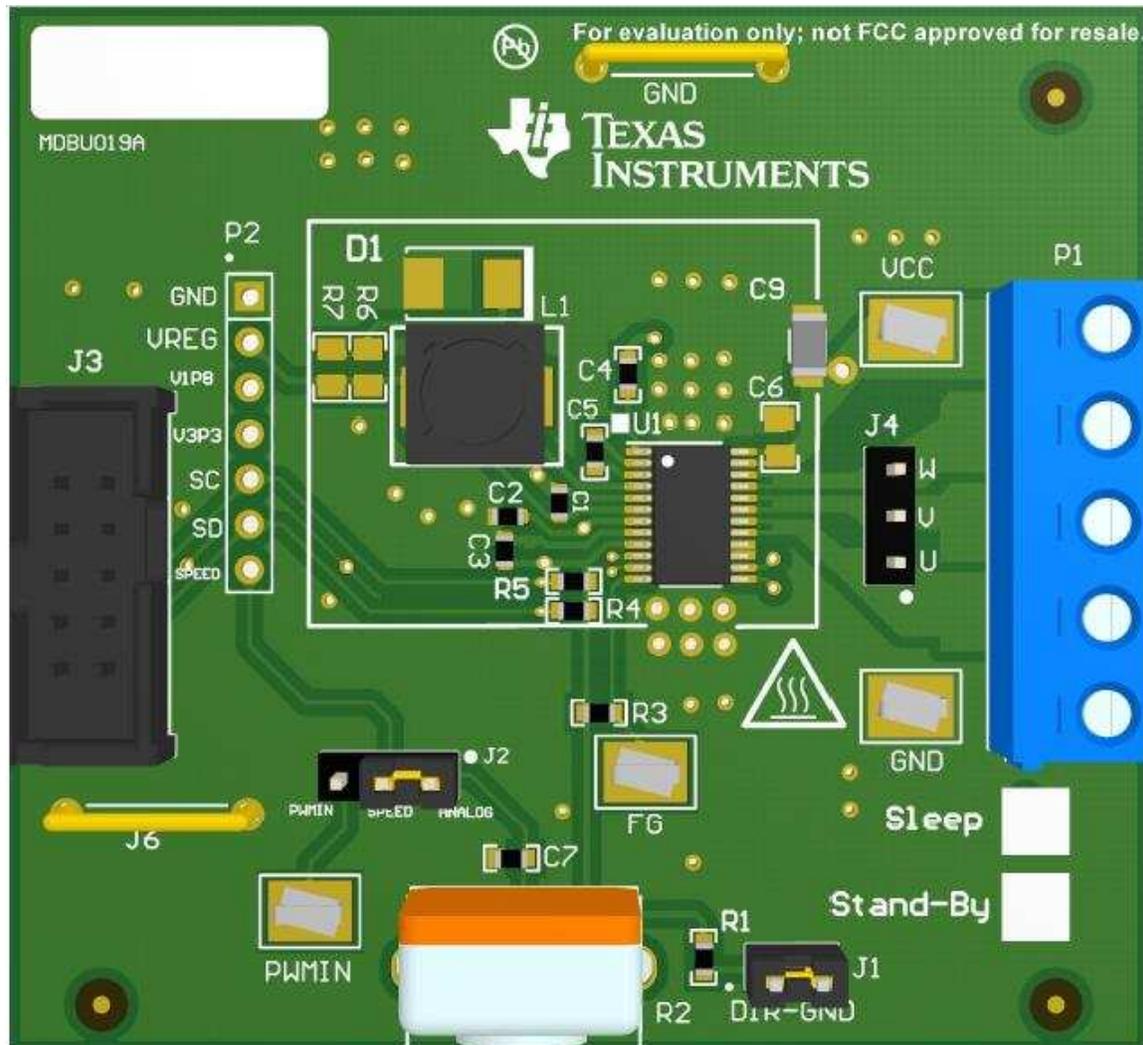


Figure 1. DRV10987 EVM

3 DRV10987 EVM Board

3.1 Power and Motor Connectors P1

The DRV10987 EVM shares terminal P1 for power supply and motor-phase output. Use a single power-supply rail between 6.2 V to 28 V to operate the EVM. [Table 1](#) lists the pin assignment of terminal P1.

Table 1. P1 Terminal Assignments

Pin	Description
1	VCC
2	W
3	V
4	U
5	GND

3.2 Test Point Connector P2

The P2 connector can be used to measure signals from the DRV10987 device. P2 is not populated. [Table 2](#) lists the pin assignment of terminal P2.

Table 2. P2 Terminal Assignments

Pin	Description
1	GND
2	VREG
3	V1P8
4	V3P3
5	SC from J3 (connects to SCL of device)
6	SD from J3 (connects to SDA of device)
7	SPEED input from PWMIN or ANALOG (R2)

3.3 Control Input Connectors J3

The J3 connector is used for the I²C interconnection with the GUI. [Table 3](#) lists the pin assignment of terminal J3.

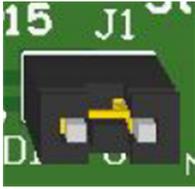
Table 3. J3 Terminal Assignments

Pin	Description
6	GND
9	SD (connects to SDA of device)
10	SC (connects to SCL of device)

3.4 Jumper J1 (Direction)

To control the spin direction of the motor, the DRV10987 EVM is equipped with a direction jumper. Depending if 3V3 or GND is supplied to the DRV10987 direction input, the motor spins either in forward or reverse direction.

Table 4. DIR PIN Setting

J1 Connection	Description	
	Unconnected	DIR is set to 3.3 V
	Connected	DIR is set to GND (shown)

3.5 Jumper J2 (Speed Input)

The motor speed input source is configured with J2. If J2 pins 2-3 is populated, supply a PWM to the PWMIN test pin to control the motor speed. If J2 pins 1-2 is populated, the motor speed is controlled with the analog potentiometer R2 equipped on the EVM.

Table 5. SPEED Pin Setting

J2 Connection	Description	
	1-2	Analog Pot R2 (shown)
	2-3	PWMIN digital input

NOTE: The motor operation can be unpredictable if the internal register setting the DRV10987 device does not match the J2 selection.

3.6 FG Test Pin

The frequency generator (FG) test pin outputs the motor speed, depending on the internal DRV10987 divider setting and the number of motor poles.

4 DRV10987 GUI

4.1 Overview

The DRV10987 EVM is provided with a GUI to configure the device and tune the application. See [Appendix A](#) for instructions to download and install the [GUI application](#). The GUI is structured into three tabs (*Basic Settings*, *Advanced Settings*, and *Display*) allowing configuration of the register settings and tuning of the device parameters for the target application. For details about the settings, refer to the [DRV10987 12- to 24-V, Three-Phase, Sensorless BLDC Motor Driver data sheet](#).

The following sections include DRV10987 GUI images to explain the various features of the GUI.

4.2 Basic Settings

The *Basic Settings* tab is the landing screen after launching the GUI on the computer. The tab sets the motor parameters, startup parameters, initial speed detection prior to startup, and current limits. This tab can also load and save motor parameters and program the EEPROM with optimized settings.

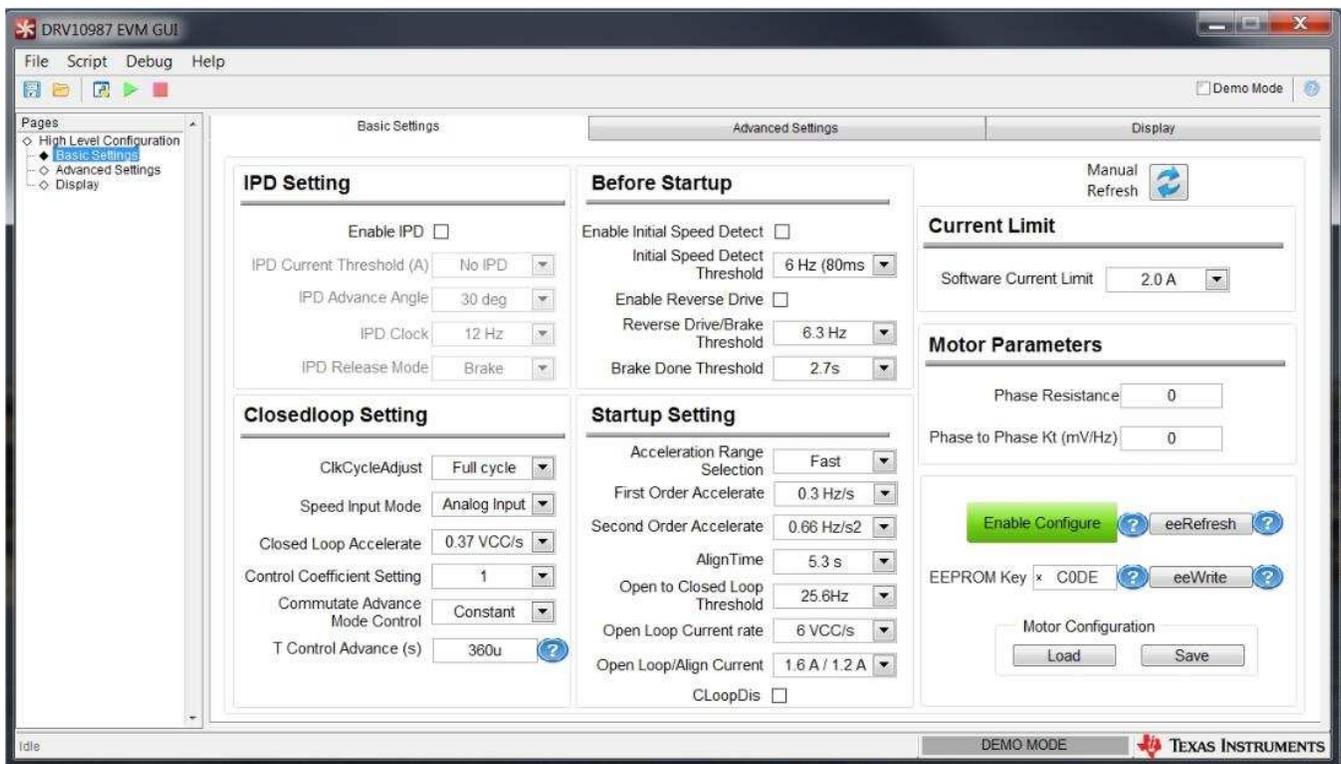


Figure 2. DRV10987 GUI Basic Settings

4.2.1 Communication

The GUI is designed to work with and without the hardware connected, allowing evaluation of the available settings. Click the *Demo Mode* checkbox in the top right to work offline when the box is checked. When the EVM is connected to the GUI, this box should be unchecked and the status bar in the bottom right displays *Connected*. If the GUI cannot connect to the hardware, check that the hardware is powered and the I²C communication is correctly established.

4.2.2 Register Access – Enable Configure

To access the register settings, click the *Enable Configure* button (see [Figure 2](#)). When selected, the button changes from the default gray to green, and the settings can be changed.

4.2.3 Changing Register Settings

The GUI supports three different input types to set the register values which are defined as follows:

Dropdown menu — This menu provides a list to select a predefined setting as shown in [Figure 3](#).



Figure 3. Example Dropdown Menu

Checkbox — Select this checkbox to set single bit values. [Figure 4](#) shows the checkbox enabled.



Figure 4. Example Checkbox

Text box — The text box allows users to input data that might be changed by the device because of the data type conversions. In [Figure 5](#), a value of 1.5 was entered and the nearest value, 1.552, was selected.



Figure 5. Example Text Box

4.2.4 Work With EEPROM

The settings are saved and loaded using the *Save* and *Load* buttons on the *Basic Settings* tab. When saved, the file is written as a .csv file that can be loaded at a later time.

To program the DRV10987 devices and change the default EEPROM settings, follow the instructions listed in the [DRV10987 12- to 24-V, Three-Phase, Sensorless BLDC Motor Driver data sheet](#).

4.2.4.1 Advanced Settings

The *Advance Settings* tab controls functions such as lock detection, anti-voltage surge (AVS), dead time, PWM frequency, Current Limit for Lock Detection, slew rate, Duty Cycle Limit, spread-spectrum modulation, and Temp Warning Action.

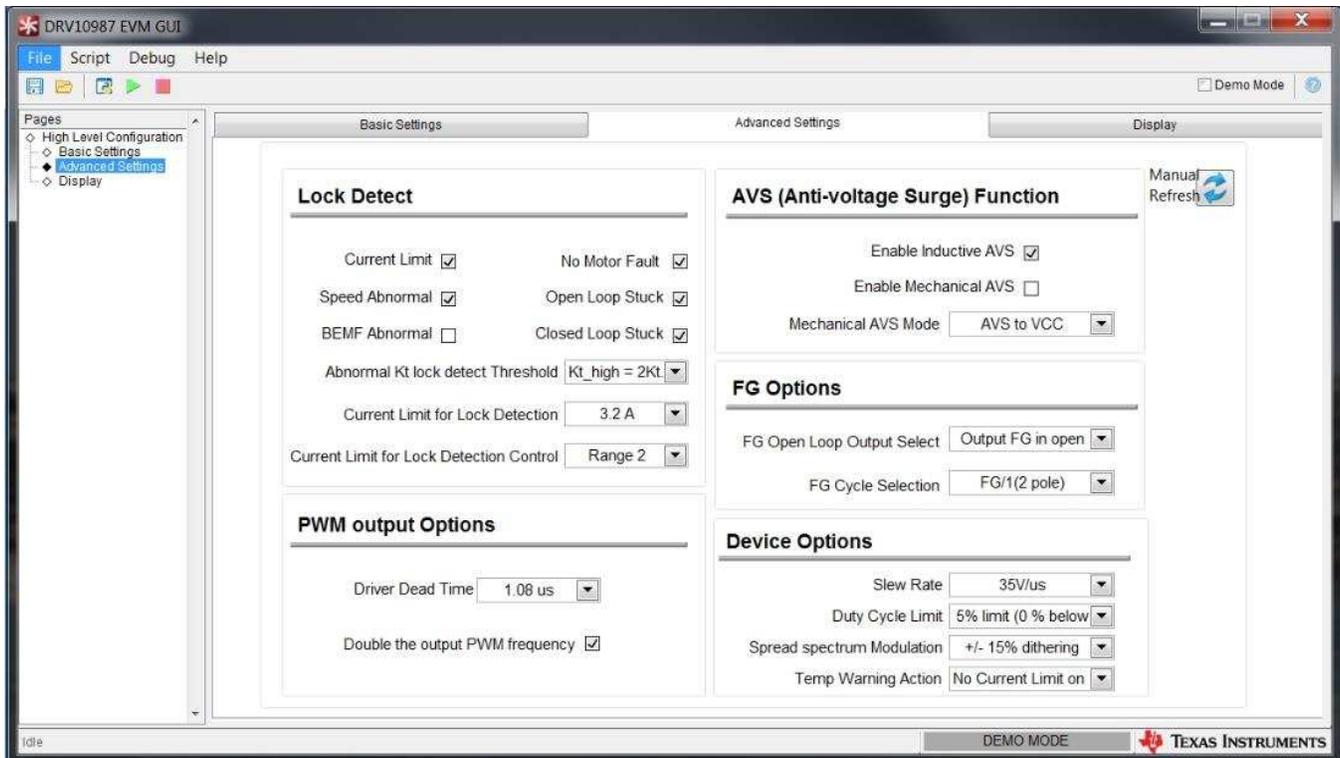


Figure 6. DRV10987 GUI Advanced Settings

4.2.4.2 Display

The *Display* tab monitors the device status and motor parameters.

The left section of the *Display* tab (also called *Display*) shows all motor parameters. The parameters can be refreshed manually, or automatically every second.

NOTE: Auto refresh may slow communication with the device.

The right section of the *Display* tab shows the device status. An active fault condition lights the red indication.

Control the motor speed from the GUI with the speed control options in the bottom section of the *Display* tab. To control the motor speed using the GUI, check the OverRide bit and set the motor speed from 0 to 511 decimal. To disable Motor Operation, check the Disable Motor Operation bit.

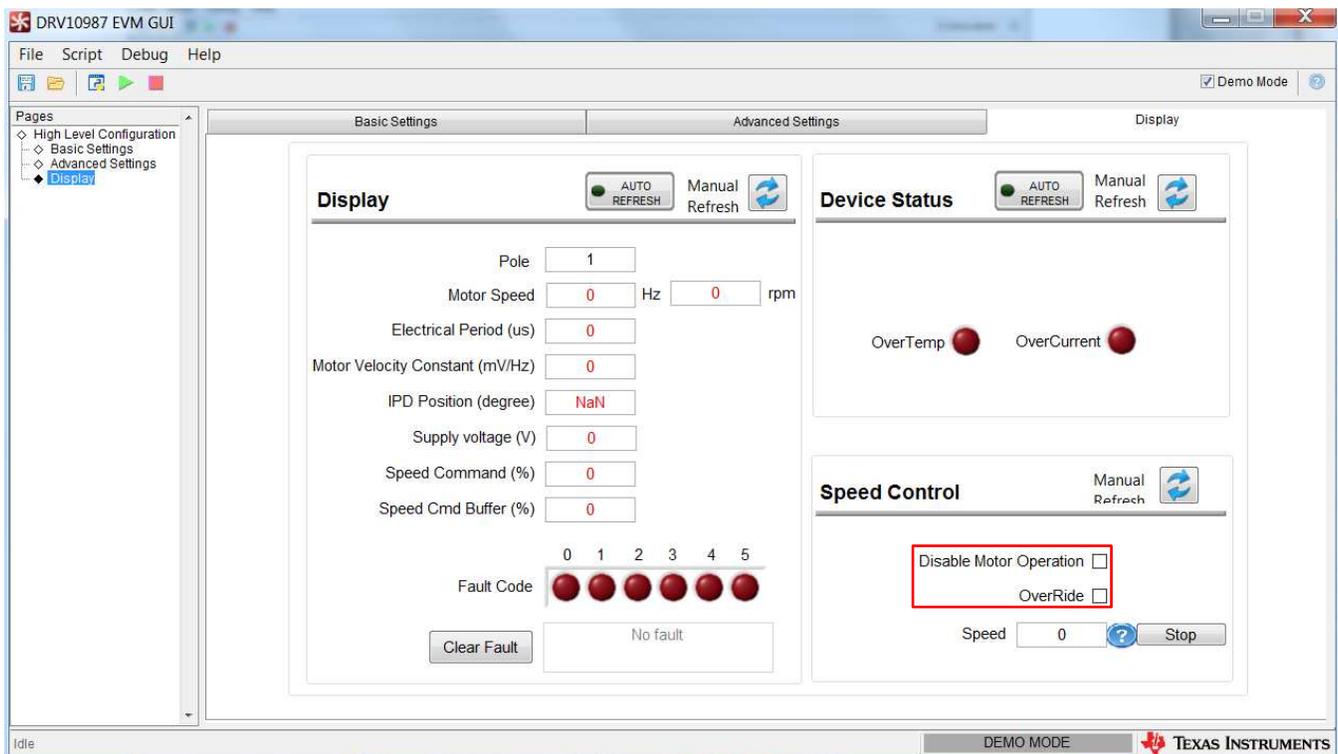


Figure 7. DRV10987 GUI Display Settings

5 Out-of-the-Box Quick-Start Guide

This section assumes that the user has already downloaded the DRV10987 application GUI as mentioned in [Appendix A](#).

Perform the following procedure to confirm proper operation of the EVM kit:

- Step 1. Do not connect the motor phases and ensure that jumper J2 is set to *Analog*.
- Step 2. Set the speed input to 0 by rotating the potentiometer R2 fully counterclockwise.
- Step 3. Connect the motor phases of the user motor to connector P1. Phase sequence is not important as it only determines the direction of rotation.
- Step 4. Connect the USB2ANY board to the computer using the supplied USB cable.
- Step 5. Connect the 10-pin ribbon cable header to J4 on the USB2ANY board and J3 on the DRV10987 EVMs.
- Step 6. Connect a power supply to VCC (pin1) and GND (pin 5) of connector P1.



WARNING
Caution Hot surface. Contact may cause burns. Do not touch.

- Step 7. Power on the EVM VCC by applying 12 V to 24 V depending on the application..

CAUTION
 With VCC, never exceed 28 V on the DRV10987 EVMs during motor operation.

- Step 8. Launch the DRV109XXEVM.exe application on the computer (see [Appendix A](#)).
- Step 9. Select the appropriate device configuration as shown in [Figure 8](#).
- Step 10. Click the OK button.

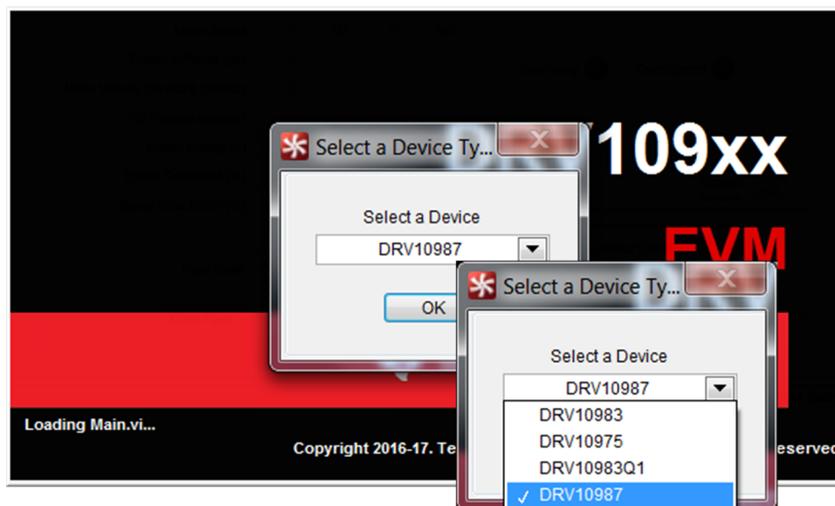


Figure 8. Initial GUI Screen

- If no hardware is connected, or if a hardware connection problem occurs, the GUI

displays the error message as shown in [Figure 9](#). Confirm the hardware connection. Retry the initialization or click the *Demo Mode* button to operate in demo mode.

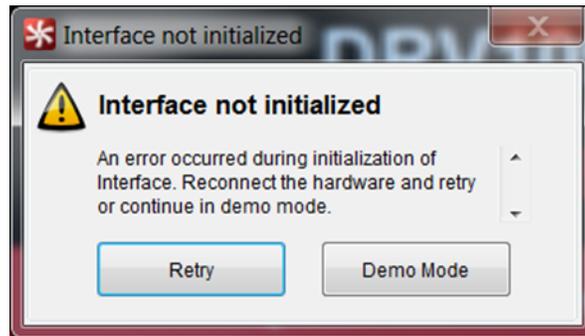


Figure 9. Initial GUI Screen

- If the *Demo Mode* button was clicked, the GUI displays the *Basic Settings* as shown in [Figure 10](#). Click the *Demo Mode* checkbox to deselect the demo mode communication and proceed to [step 11](#).
- If the *Retry* button was selected, the GUI displays the screen as shown in [Figure 11](#) directly after [step 10](#).

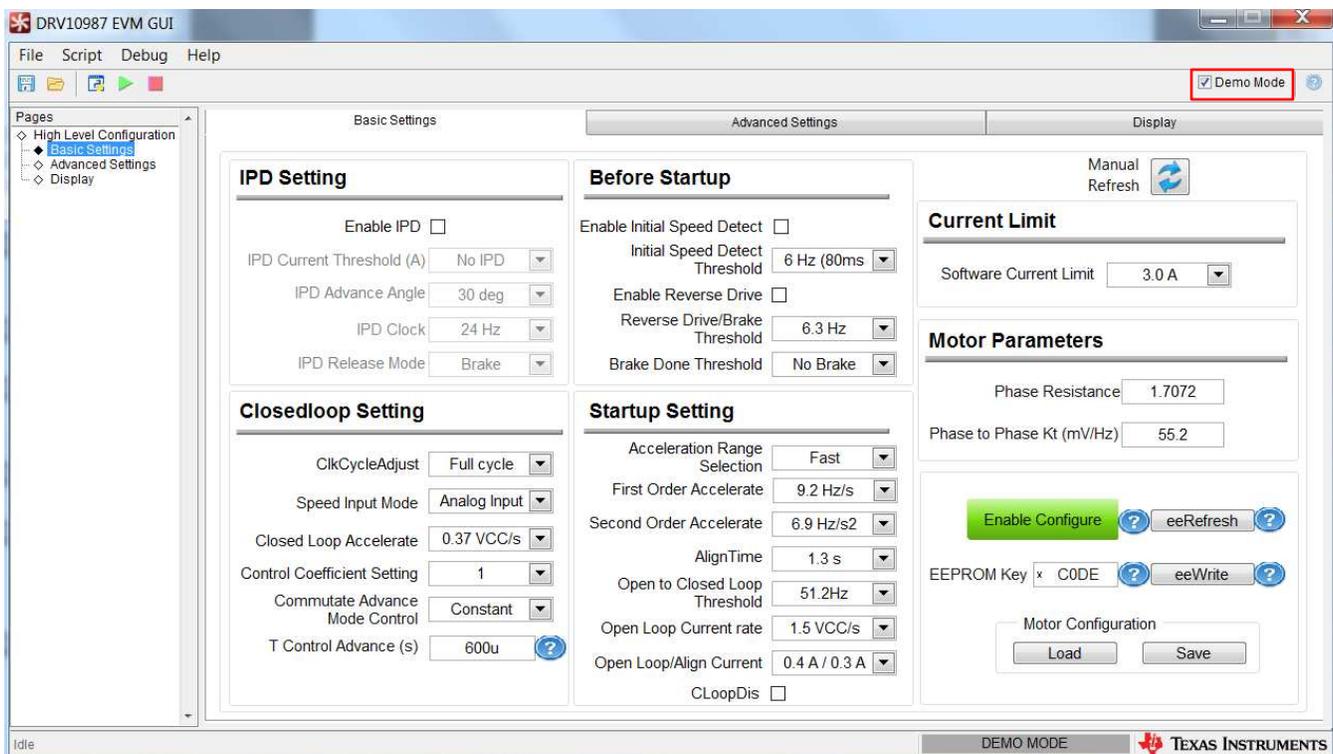


Figure 10. GUI in Demo Mode

Step 11. The status bar displays *HARDWARE CONNECTED* and the bar turns green, indicating that the GUI is communicating with the device. Click the *Enable Configure* to change this button from the red to green (see [Figure 11](#)).

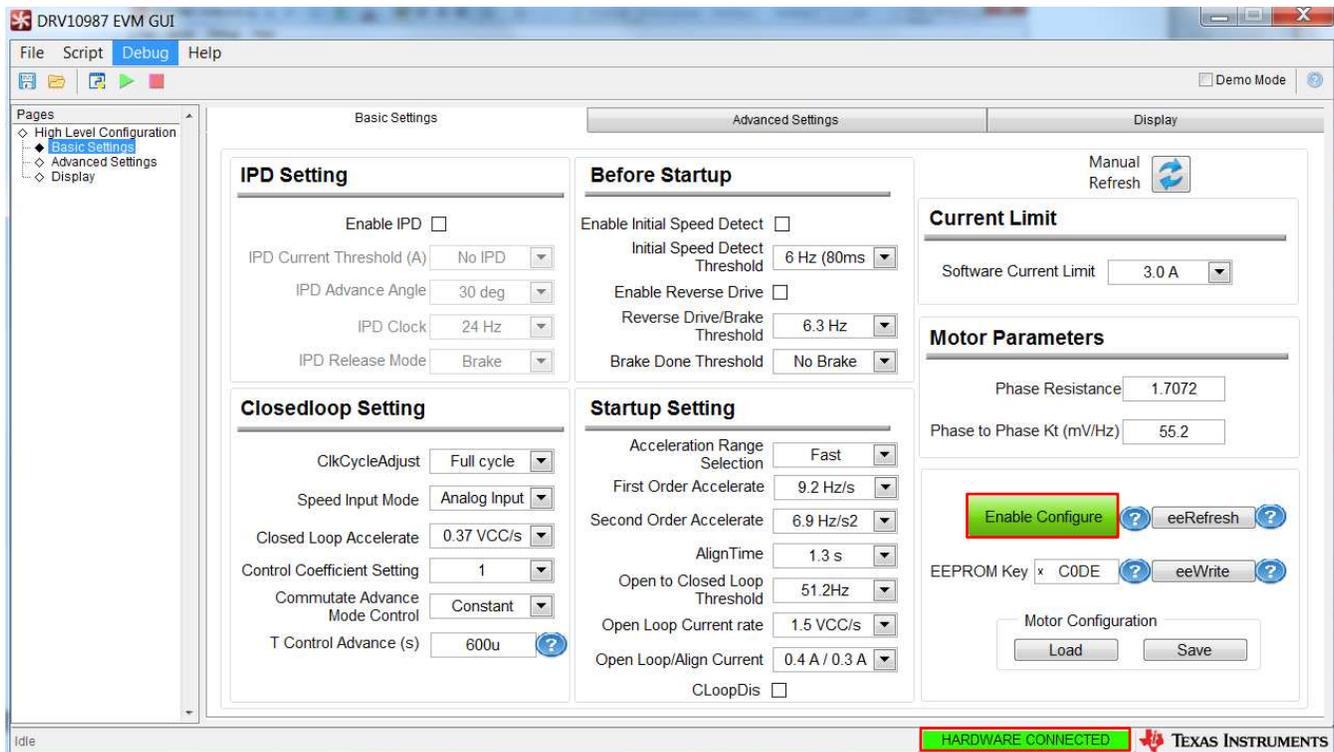


Figure 11. Enable Configure

Step 12. The *Display* tab provides fault code information.

CAUTION

Do not short motor phases to VCC at connector P1, specifically P1-2 (Wphase) to P1-1(VCC) because EVM is in power-on condition.

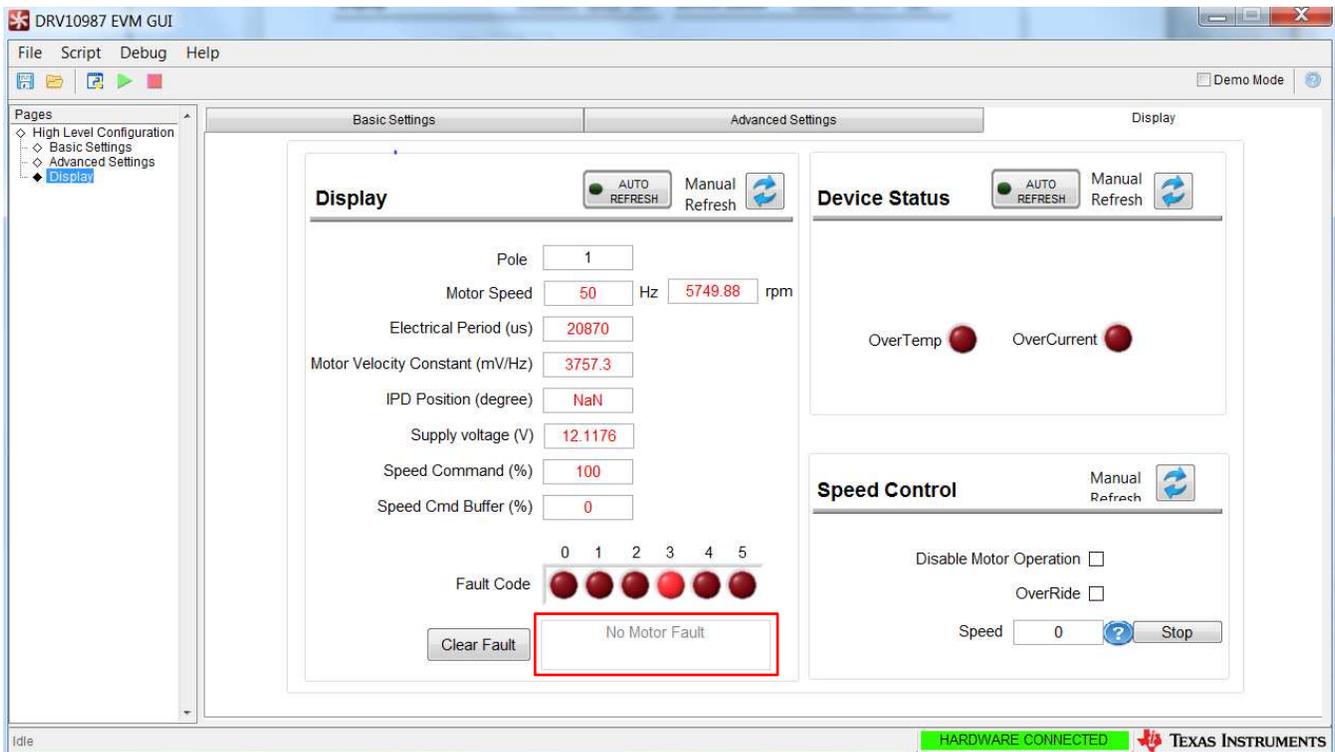


Figure 12. Fault Code Information

In PWM input mode, the motor speed increase as increasing PWM duty cycle, and the motor speed decrease as decreasing PWM duty cycle. In analog input mode, the motor speed increases as the pot R2 is turned clockwise, and decreases as the pot R2 is turned counter clockwise. For DRV10987 Sleep mode device, check the Disable Motor Operation bit, connect the motor phases of the user motor to connector P1, load, or change desired parameter information, then uncheck the Disable Motor Operation bit.

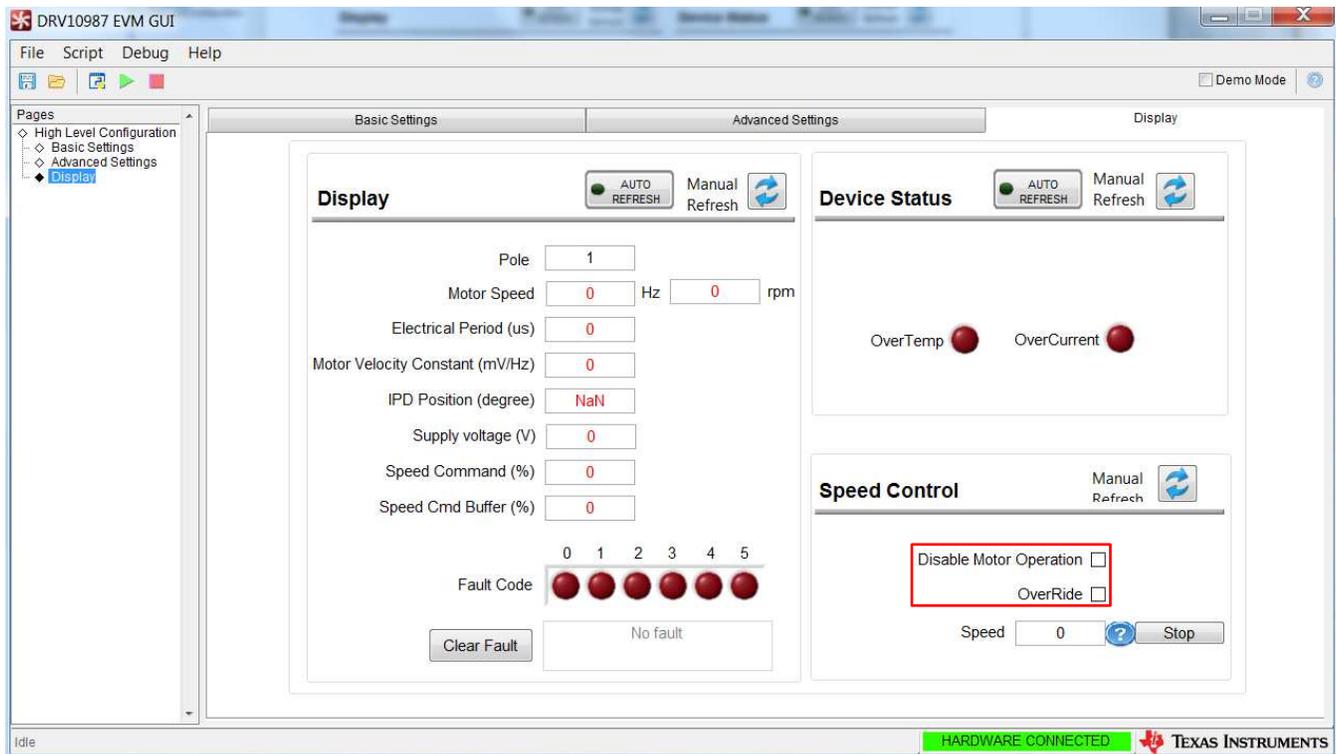


Figure 13. Disabled Motor Operation Selected

- Step 13. Change the motor direction by connecting or removing jumper J1.
- Step 14. Switch to the *Display* tab and select the *OverRide* checkbox to override the PWM speed control.

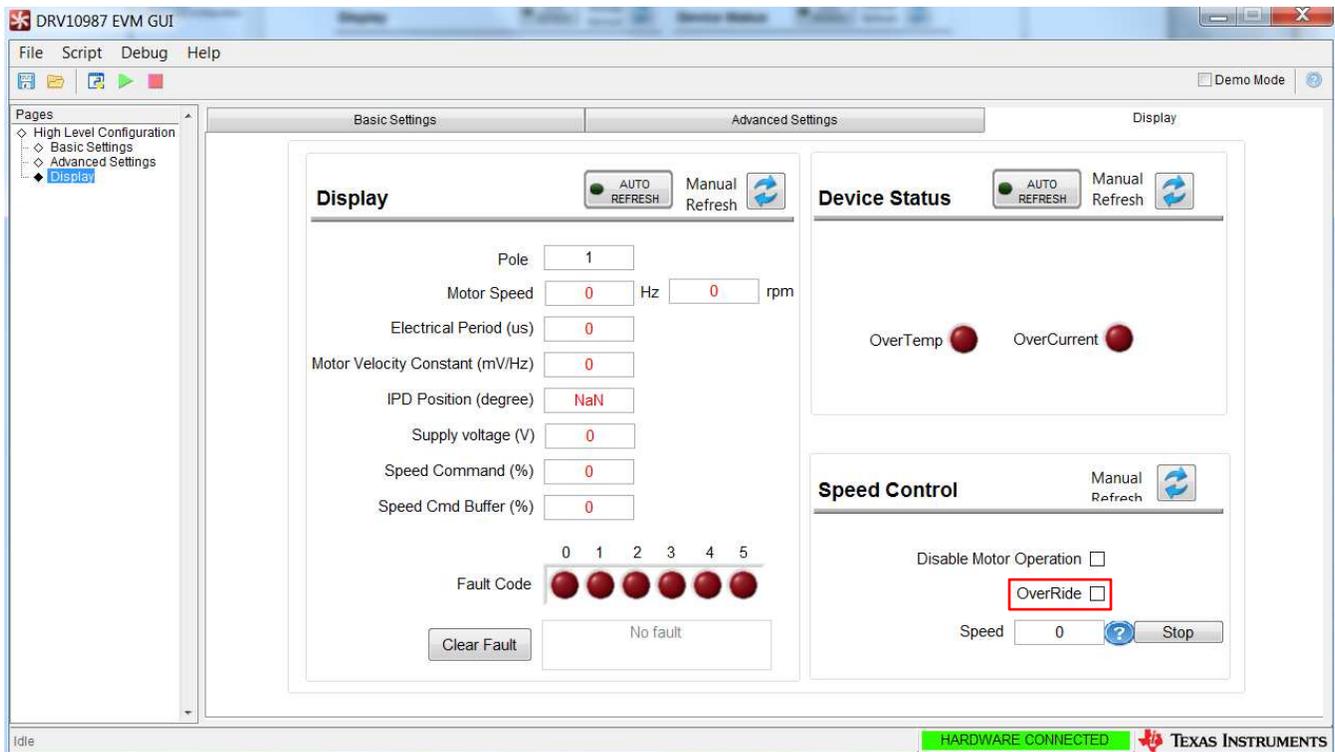


Figure 14. OverRide Selected

- Step 15. Enter values from 0 (stopped) to 511 (full speed) in the *Speed* text box to control the speed.
- Step 16. When complete, enter a value of 0 in the *Speed* text box and deselect the *OverRide* checkbox.

6 Power-On Sequence and Connection With User Specific Motor

When the supplied motor is evaluated, a user motor can be evaluated. The DRV10987 EVMs are shipped with default EEPROM settings for all registers, which may or may not be suitable to operate the target motor. To connect the user motor to the EVM, follow the steps listed in [Section 5](#) to avoid any damage to the EVM.

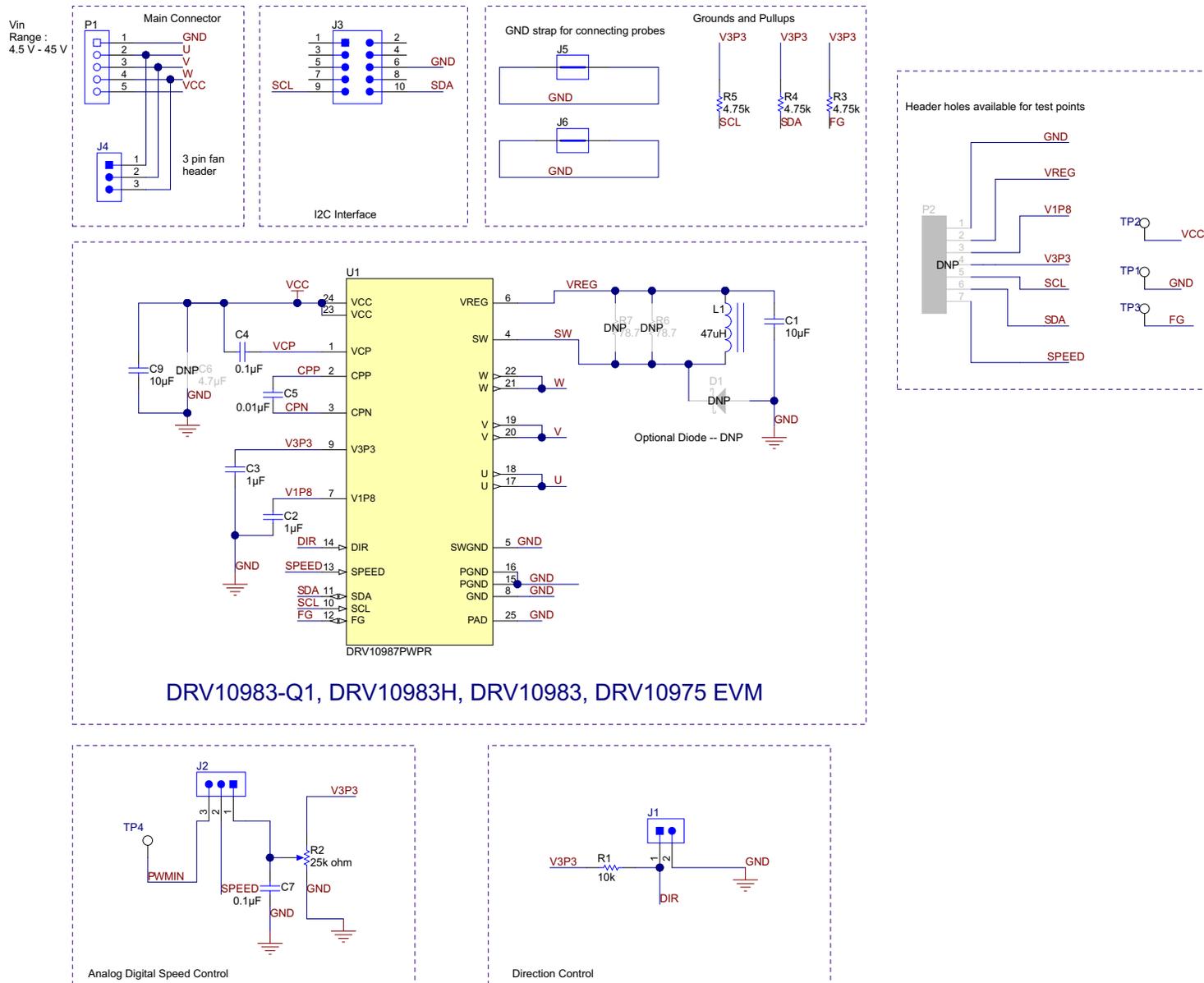
To successfully tune a user motor, refer to the [DRV10987 Tuning Guide](#).

7 Schematic and Bill of Materials

This section contains the DRV10987 schematic and bill of materials (BOM).

7.1 Schematic

[Figure 15](#) shows the DRV10987 schematic.



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Figure 15. DRV10987 Schematic

7.2 Bill of Materials (BOM)

Table 6 lists the DRV10987 EVM bill of materials.

Table 6. DRV10987 Bill of Materials

Designator	Description	Manufacturer	Part Number	Quantity
!PCB ⁽¹⁾	Printed Circuit Board	TI	DRV10987	1
C1	CAP, CERM, 10uF, 10V, +/-20%, X5R, 0603	TDK	C1608X5R1A106M	1
C2, C3	CAP, CERM, 1uF, 25V, +/-10%, X5R, 0603	TDK	C1608X5R1E105K080AC	2
C4, C7	CAP, CERM, 0.1uF, 50V, +/-10%, X7R, 0603	AVX	06035C104KAT2A	2
C5	CAP CERM, 10000PF, 50V X7R 0603	AVX	06035C103KAT2A	1
C9	CAP, CERM, 10uF, 50V, +/-10%, X5R, 1206	TDK	C2012X5R1H475K125AB	1
H9, H10, H11, H12	Bumpon, Hemisphere, 0.44 X 0.20, Clear	3M	SJ-5303 (CLEAR)	4
J1	Header, 100mil, 2x1, Tin plated, TH	Molex	90120-0122	1
J2, J4	Header, 100mil, 3x1, Tin plated, TH	Sullins Connector Solutions	PEC03SAAN	2
J3	Header (shrouded), 100mil, 5x2, Gold, TH	TE Connectivity	5103308-1	1
J5, J6	1mm Uninsulated Shorting Plug, 10.16mm spacing, TH	Harwin	D3082-05	1
L1	Inductor, Shielded Drum Core, Ferrite, 47uH, 1.15A, 0.216 ohm, SMD	Coiltronics	DR74-470-R	1
P1	Terminal Block, 5.08 mm, 5x1, Brass, TH	On-Shore Technology	ED120/5DS	1
R3, R4, R5	RES, 4.75k ohm, 1%, 0.1W, 0603	Vishay-Dale	CRCW06034K75FKEA	3
R2	Trimmer, 25k ohm, 0.15W, TH	CTS Electrocomponents	296XD253B1N	1
R1	RES, 10k ohm, 5%, 0.1W, 0603	Vishay-Dale	CRCW060310K0JNEA	1
SH-J1, SH-J2	Shunt, 100mil, Gold plated, Black	3M	969102-0000-DA	2
TP1, TP2, TP4	Test Point, Compact, SMT	Keystone	5016	3
TP3	Test Point, Compact, SMT	Keystone	5016	1
U1	12- to 24-V, Three-Phase, Sensorless BLDC Motor Driver, PWP0024B (TSSOP-24)	Texas Instruments	DRV10987SPWPR	1

⁽¹⁾ U1 part number is DRV10987.

GUI Installation and Overview

This appendix section explains the location and the procedure for installing the software.

NOTE: Ensure that no USB connections are made to the EVM until the installation is completed.

A.1 System Requirements

The system requirements are as follows:

- Supported OS: Microsoft® Windows® XP, Windows 7 (32 bit, 64 bit)
- Recommended RAM memory: 4GB or higher
- Recommended CPU operating speed: 3.3 GHz or higher

A.2 Installation Procedure

The following procedure describes how to install the DRV109xxEVM GUI. The installer also installs Python 2.7, USB2ANY SDK along with the GUI installation.

1. Double click on the Setup_DRV109xx_EVM.exe from the *DRV109xx* folder as shown in [Figure 16](#).

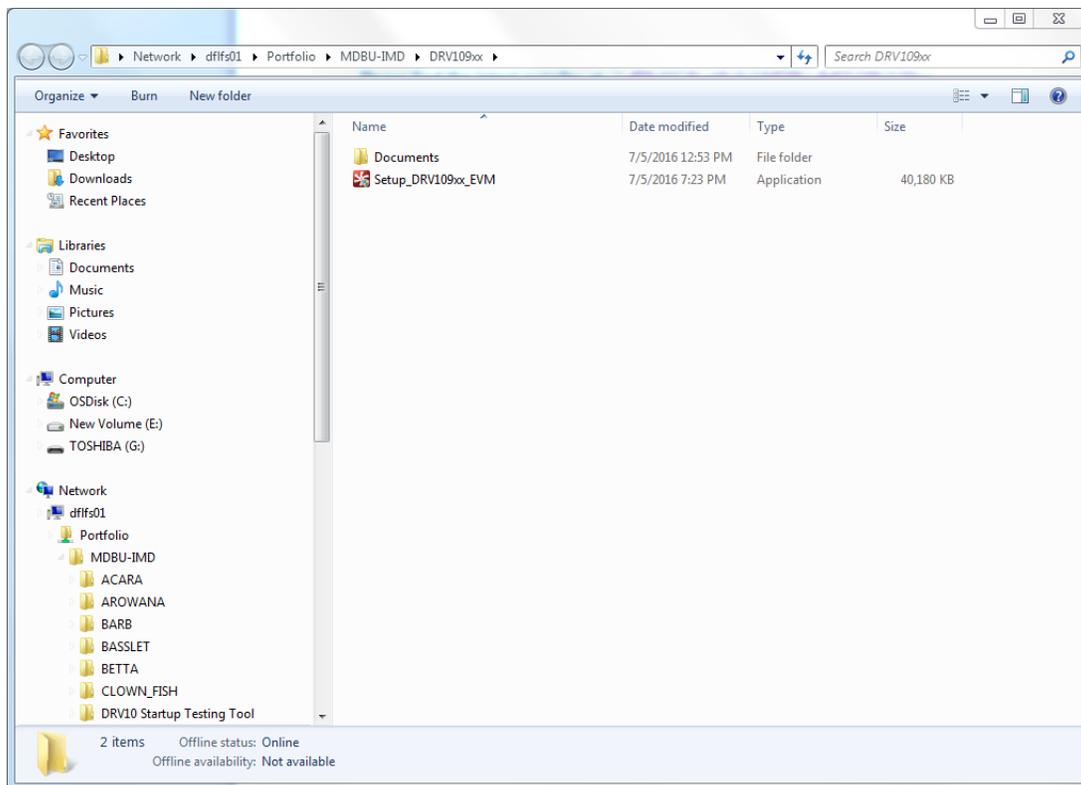


Figure 16. Setup_DRV109xx_EVM.exe from the Volume Folder

- The *Setup* window is displayed as shown in [Figure 17](#). Click the *Next >* button to begin the setup wizard.

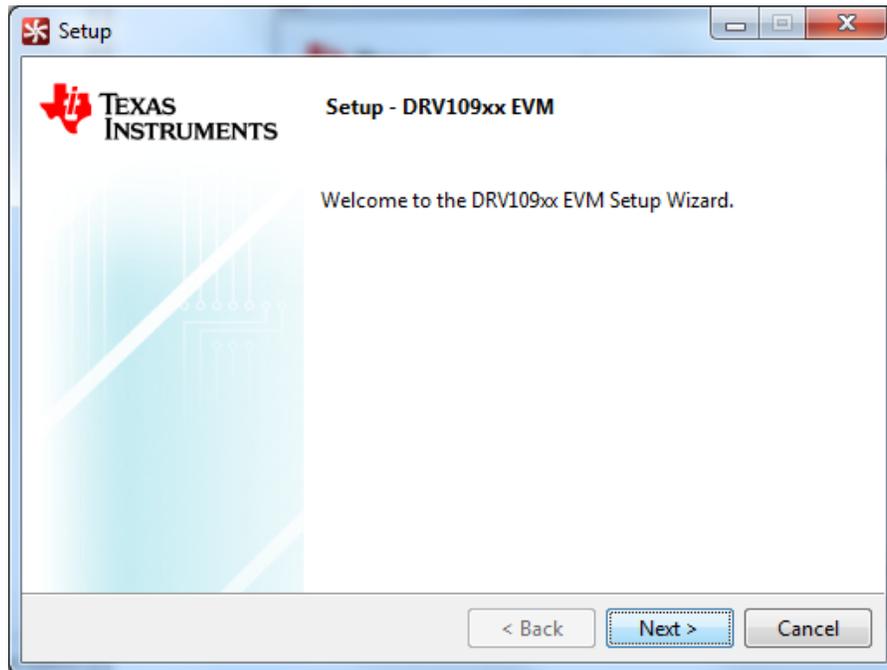


Figure 17. GUI Installation Initialization

- The license agreement is displayed next as shown in [Figure 18](#). Read through the agreement carefully and select the *I accept the agreement* radio button and then click the *Next >* button to proceed to the next step.



Figure 18. License Agreement

4. Set the destination directories for the GUI installation and click the *Next >* as shown in [Figure 19](#). TI recommends to keep the default values as provided in the installer.

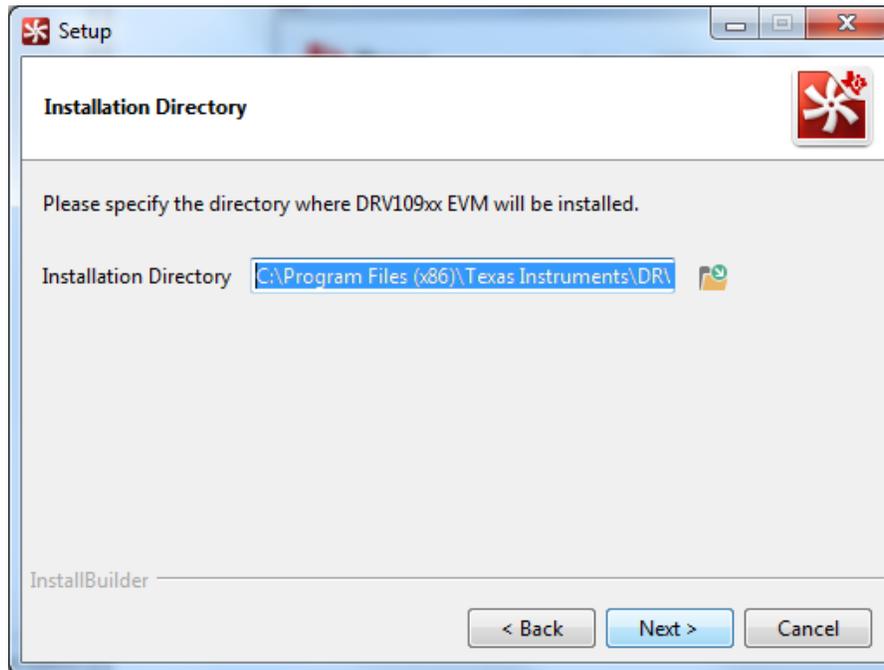


Figure 19. GUI Destination Directory

5. The *Ready to Install* window appears next as shown in [Figure 20](#). Click the *Next >* to begin installation.

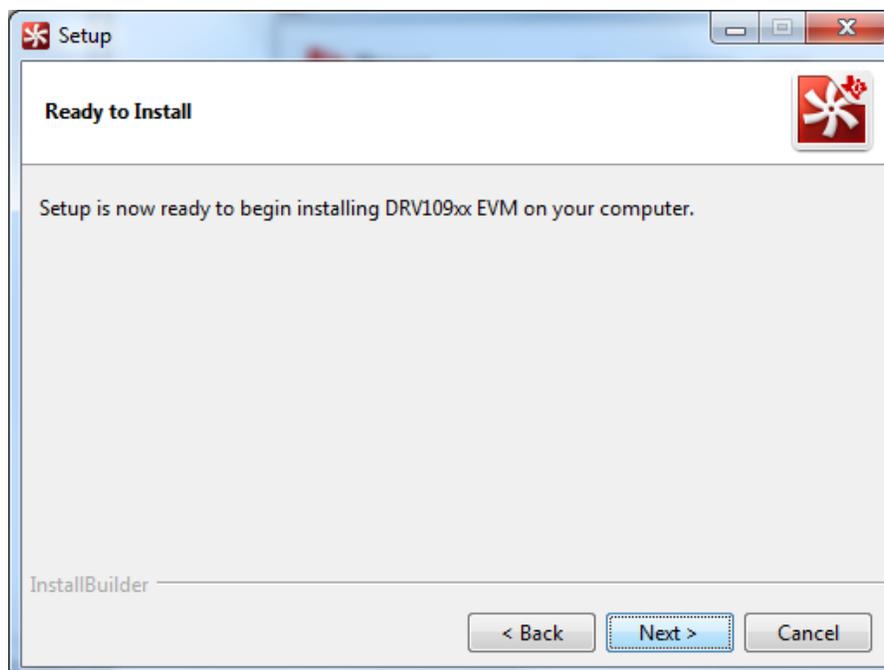


Figure 20. GUI Start Installation

- The installer begins self-extraction and proceeds with the installation as shown in [Figure 21](#).

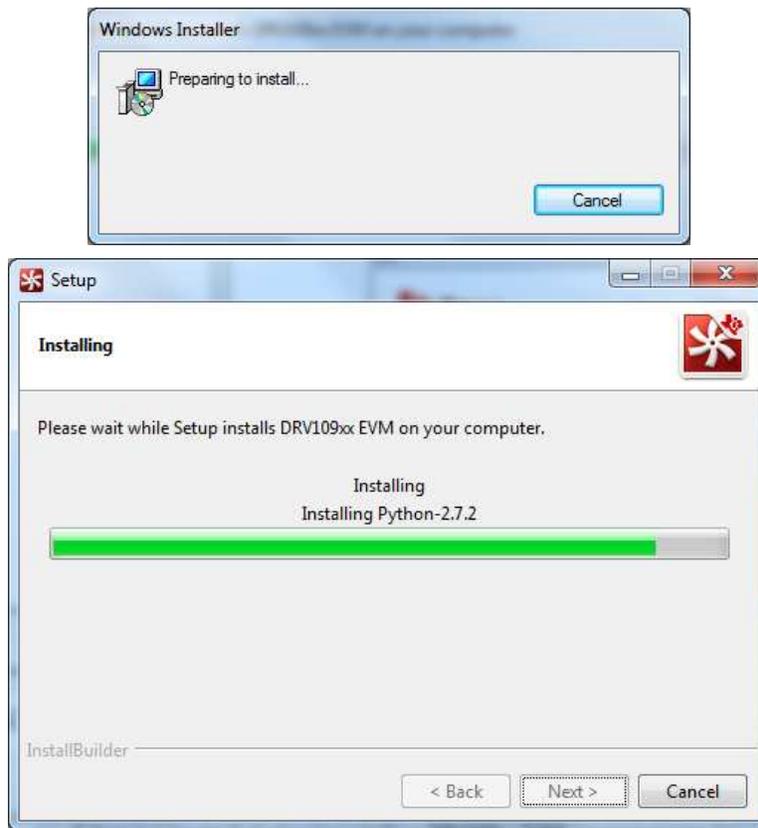


Figure 21. GUI Installation in Progress

- After the installation of the GUI, the Python installation initiates. When Python is installed, a the window shown in [Figure 22](#) is displayed. Click the *Finish* button to proceed with the USB2ANY installation.



Figure 22. Python Installation Complete

- The setup window for the USB2ANY installation is displayed as shown in [Figure 23](#). Click the *Next >* button to proceed with the initialization.

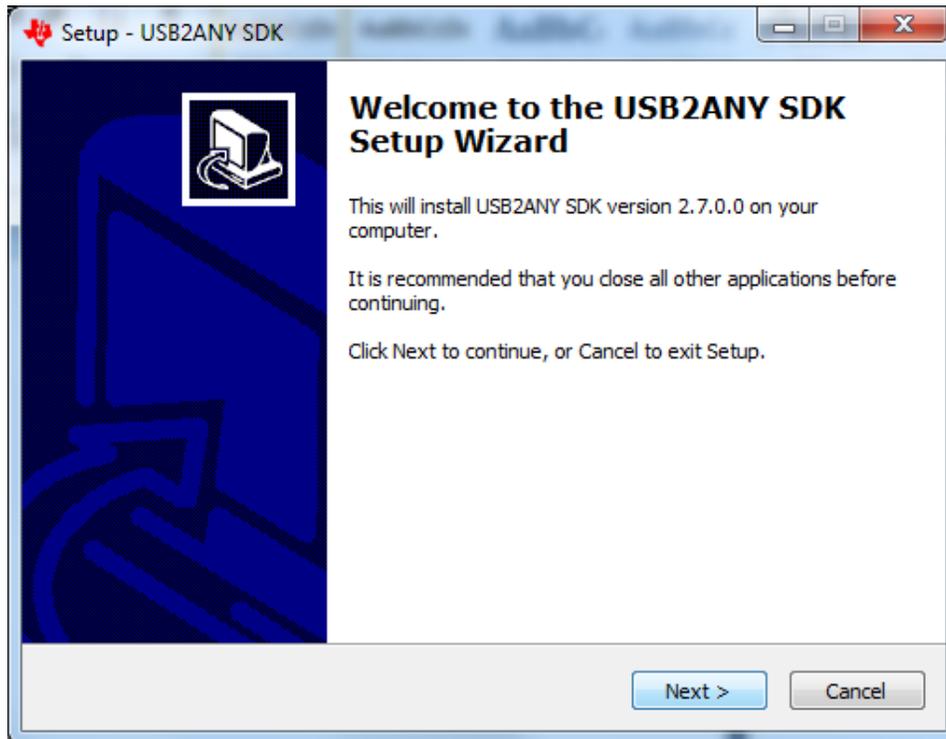


Figure 23. USB2ANY Installation Initialization

- The license agreement is displayed next as shown in [Figure 24](#). Read through the agreement carefully and select the *I accept the agreement* radio button and then click the *Next >* button to proceed.

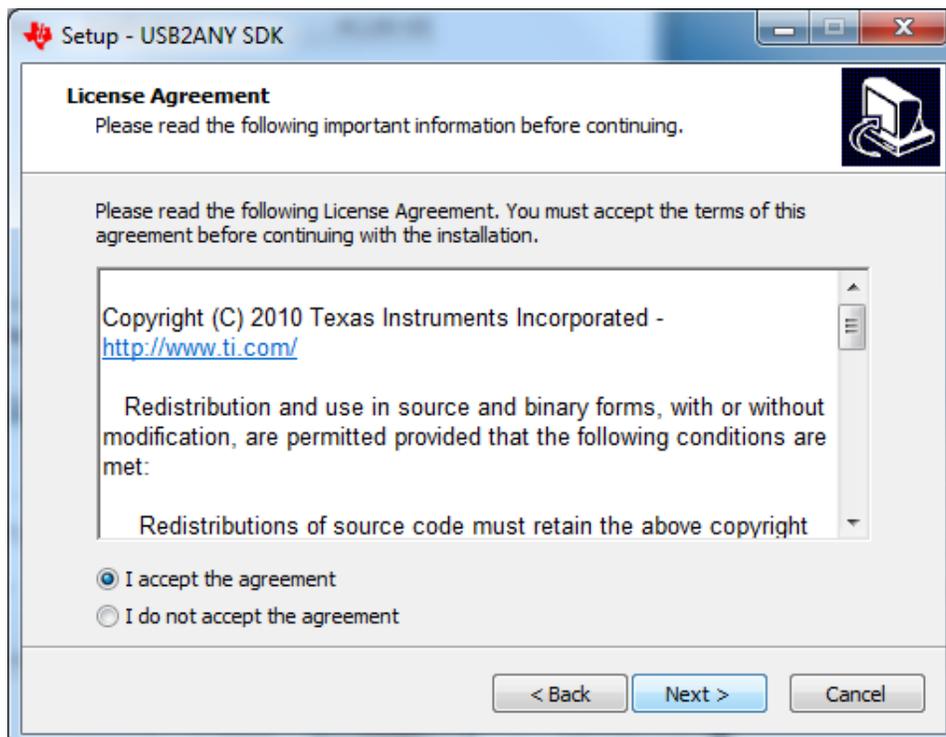


Figure 24. USB2ANY License Agreement

- Set the destination directories for the USB2ANY installation and click the *Next >* as shown in [Figure 25](#).

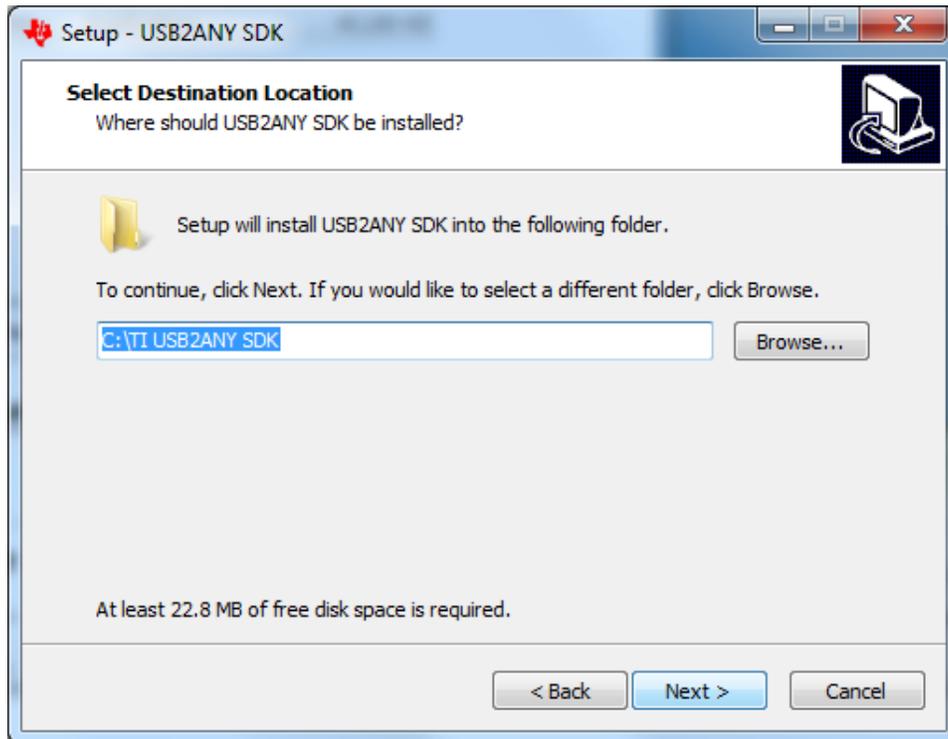


Figure 25. USB2ANY Destination Directory

- The *Ready to Install* window is displayed next as shown in [Figure 26](#). Click the *Install* button to begin the USB2ANY installation.

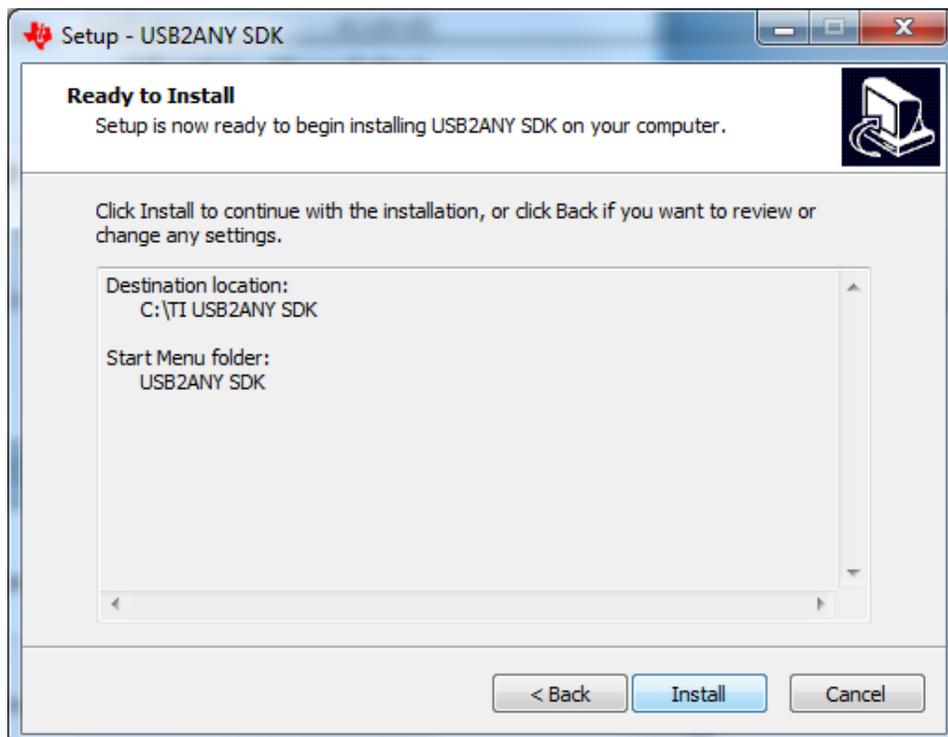


Figure 26. USB2ANY Start Installation

12. The installer begins self-extraction and proceeds with the installation.
13. When the USB2ANY installation is complete, the window shown in [Figure 27](#) is displayed, indicating the completion of the USB2ANY installation. Click the *Finish* button.



Figure 27. USB2ANY Installation Complete

NOTE: The DRV10987 GUI requires the LabVIEW Run-Time Engine 2010 to be installed before the GUI is executed.

The DRV10987 GUI installer does not include the LabVIEW Run-Time Engine. Go to <http://www.ni.com/download/labview-run-time-engine-2014/4887/en/> to download the National Instruments LabVIEW Run-Time Engine.

A.3 GUI Overview

The DRV10987 GUI was developed to communicate with the device to configure different registers within the device, and to understand the response based on the configurations. The following sections describe some of the specific features of the GUI, but do not explain the configurations of the controls and indicators.

Screen captures of the DRV10987 GUI are provided to explain the various features of the GUI. The same images apply to the DRV10975 devices unless otherwise specified.

A.3.1 Components of the GUI

The device GUI contains three pages (or tabs):

- *Basic Settings*
- *Advanced Settings*
- *Display*

A.3.1.1 Basic Settings

Figure 28 shows the *Basic Settings* tab of the GUI.

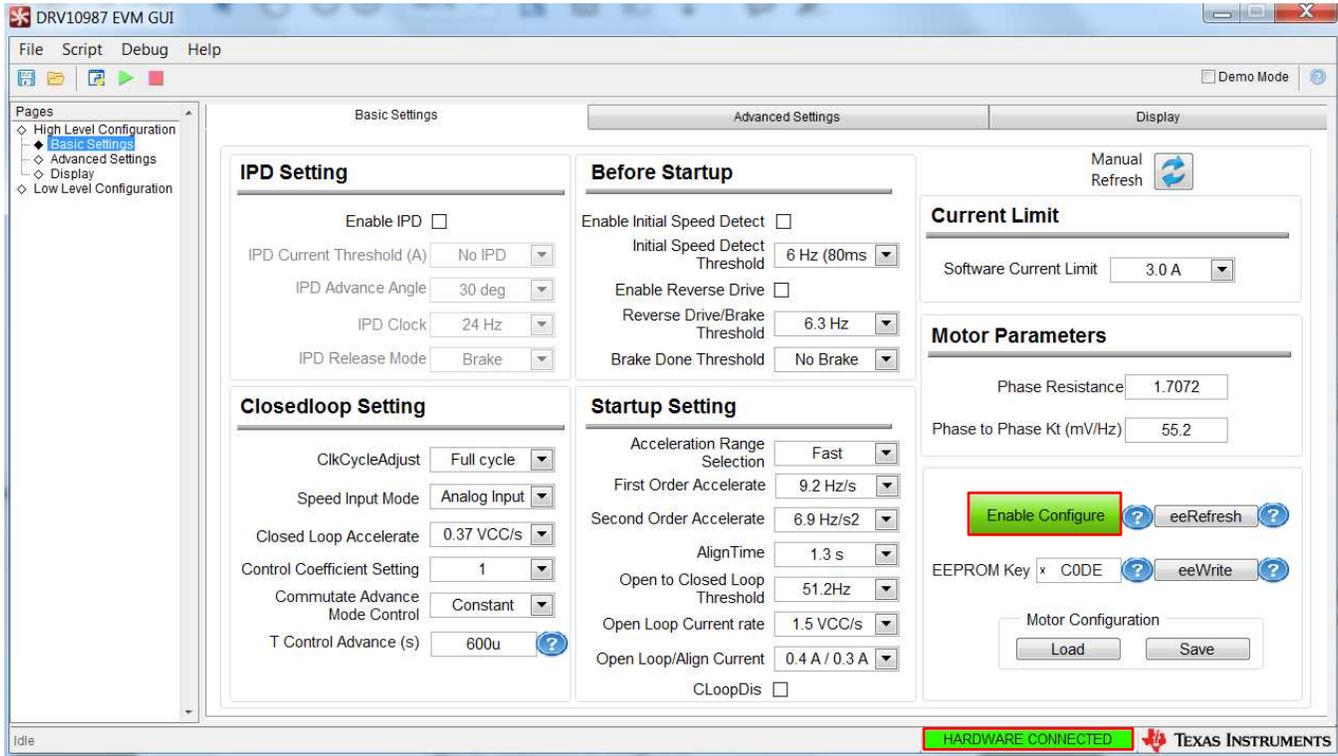


Figure 28. Basic Settings Page

A.3.1.1.1 Enable Configure

The controls in the *Basic Settings* tab and *Advanced Settings* tab are only enabled if the *Enable Configure* button is selected. This button specifies the data use between the registers and EEPROM. Click on the button to select the data use. If the *Enable Configure* button is enabled (the control turns green in color), the register data is used, or else (the control turns red) the EEPROM data is used.

A.3.1.1.2 Enable IPD

Clicking the *Enable IPD* checkbox enables and disables the controls related to IPD settings. If this control is disabled, a value 0 is written to the IPD current threshold. If the control is enabled, a value 1 is written to IPD current threshold field.

A.3.1.1.3 eeWrite

The *eeWrite* button programs to the EEPROM. When this control is clicked, a prompt message asks for confirmation of the voltage level (see Figure 29). The *eeWrite* field is written only if the *EEPROM Key* field is set to *CODE*, and the power supply voltage level is confirmed.

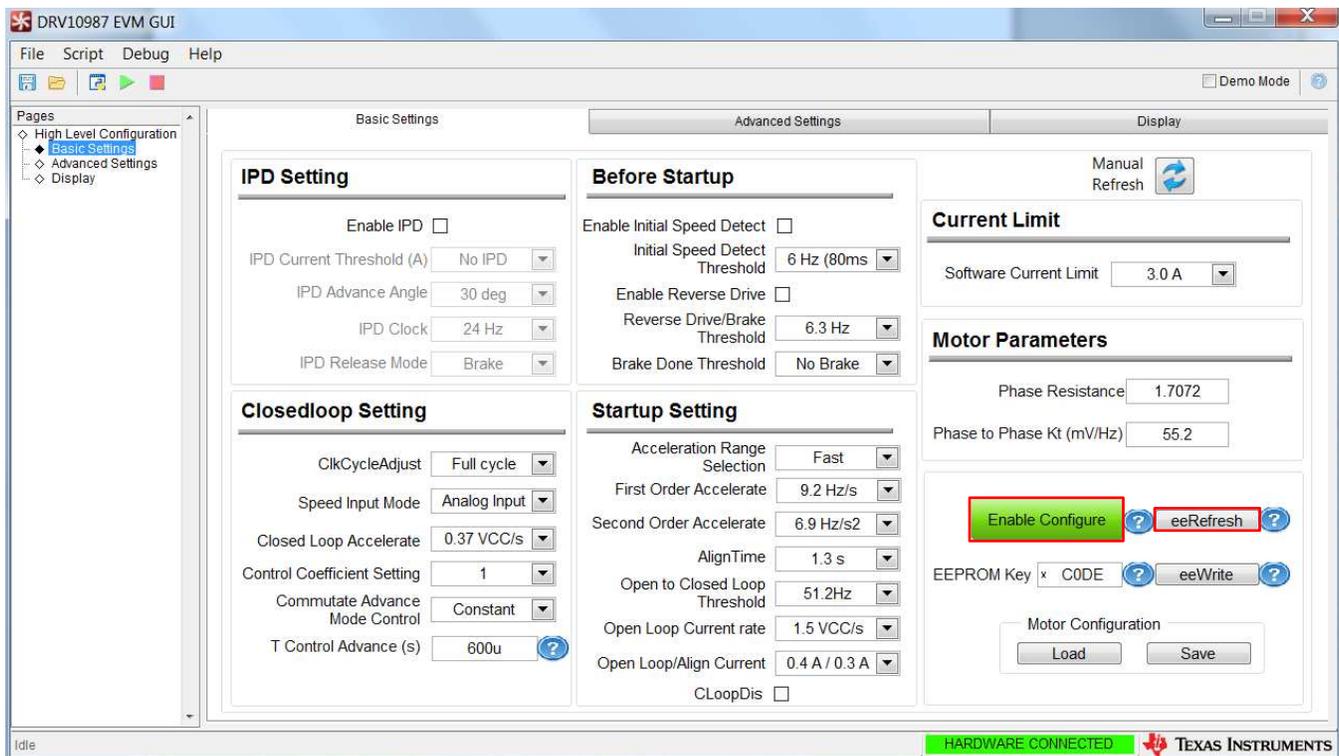


Figure 29. Confirmation on Voltage Level

A.3.1.1.4 eeRefresh

The *eeRefresh* button refreshes the controls in the *Basic Settings* tab, which reads the latest value of the corresponding fields from the registers and updates the controls.

A.3.1.1.5 Manual Refresh

The *Manual Refresh* button refreshes the controls in the *Motor Parameters* section, which reads the latest value of the corresponding fields from the registers and updates the controls. The function of this button is same in every section.

A.3.1.1.6 Save Motor Configuration

The *Save Motor Configuration* button saves the current motor configuration to a file that is later loaded into the GUI using the *Load* button. The button saves the last read values of the registers. Perform a manual refresh operation before saving the configurations into a file.

A.3.1.1.7 Load Motor Configuration

The *Load Motor Configuration* button loads the configuration file saved earlier, to bring the device to a known state.

A.3.1.1.8 Help Icon

Move the mouse over the blue help icon to display a brief description for the control, as shown in [Figure 30](#).



Figure 30. Help Icon

A.3.1.2 Advanced Settings

The *Advanced Settings* tab contains controls to handle the frequency overflow, Current Limit for Lock Detection, FG motor pole option, and so forth (see [Figure 31](#)).

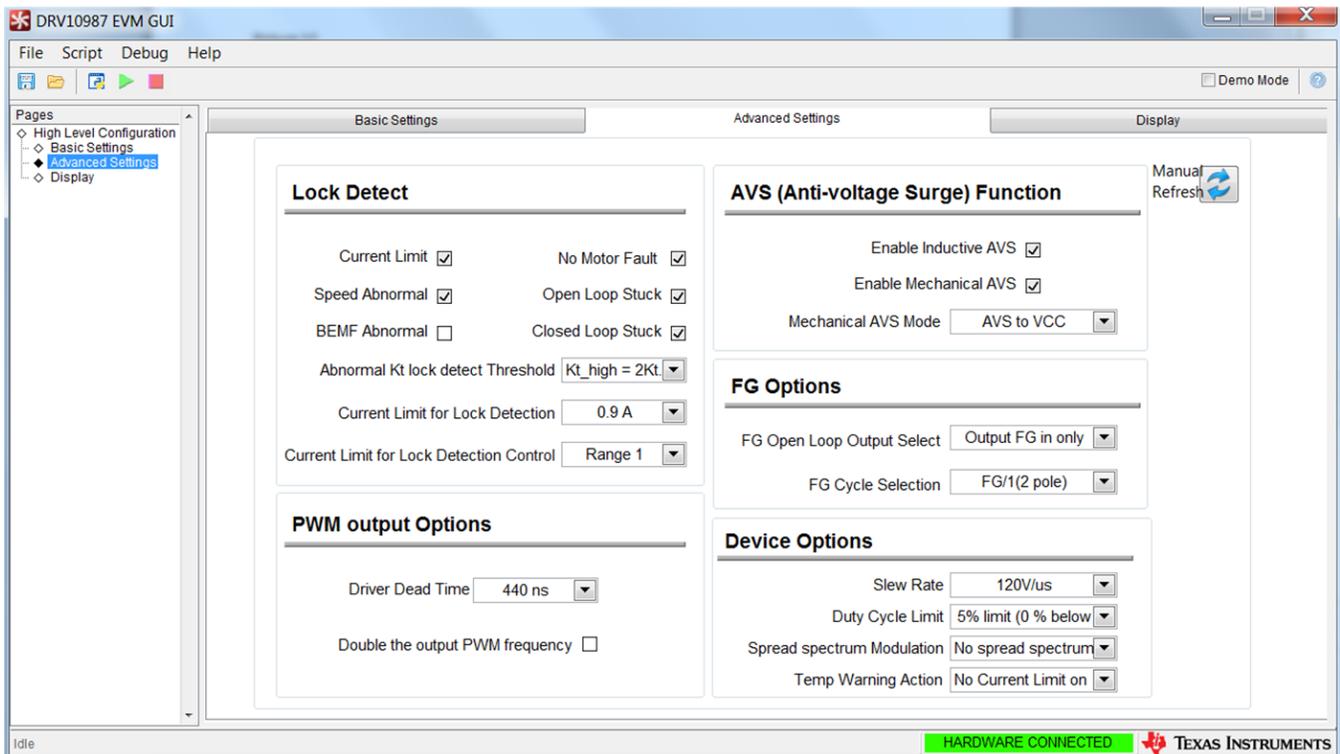


Figure 31. Advanced Settings

A.3.1.3 Display

The *Display* tab (see [Figure 32](#)) contains controls to handle the motor speed, indicates the status of the device, and displays the value of motor attributes such as motor speed, current, and IPD position.

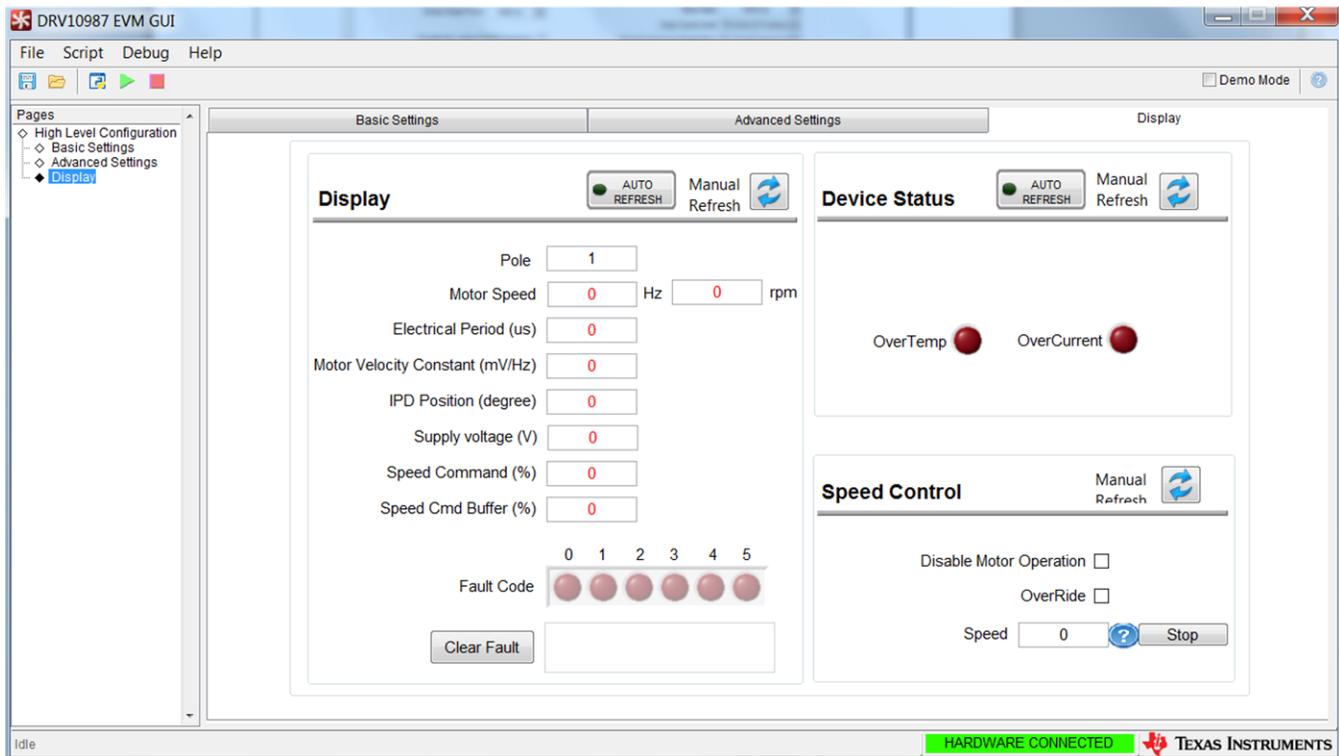


Figure 32. Display

A.3.1.3.1 Auto Refresh

The *Auto Refresh* button periodically refreshes the controls of the motor parameters, which read the latest value of the corresponding fields from the registers and update the controls. The rate of auto refresh is specified in the configuration file found parallel to the application. The function of this button is same in every section.

A.3.1.3.2 Pole

The number entered into the *Pole* text field is used to calculate the RPM in the *Display* section, given by the formula in [Equation 1](#).

If motor speed (Hz) ≥ 2 , motor speed (rpm) = (1 000 000 / electrical period [μ s]) \times 120/pole. Else, motor speed (rpm) = motor speed (Hz) \times 120/pole.

The default value of this control is 1. (1)

A.3.1.3.3 Stop

The *Stop* button writes the speed control with a value of 0.

A.3.1.3.4 About

The *About* window provides the details like the GUI version, supported OS, and the firmware version of the USB2ANY.

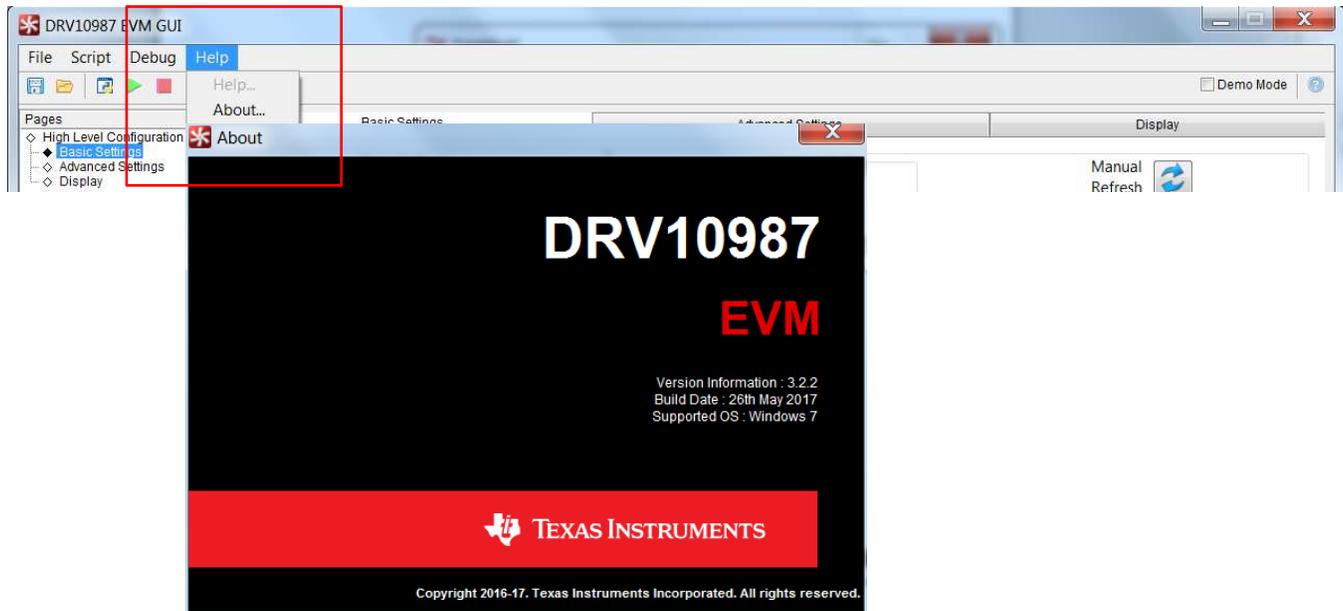


Figure 33. About Page

A.3.2 Menu Options

A.3.2.1 File

The *File* menu contains the *Exit* option as shown in [Figure 34](#). The *Exit* option stops the execution of the DRV10987 EVM GUI.

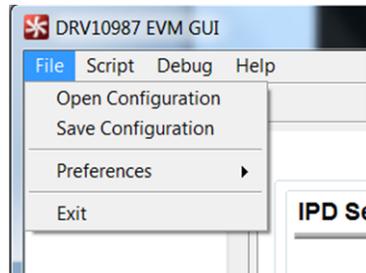


Figure 34. File Menu

A.3.2.2 Script

Scripting automates the device operations and reduces the time consumption in repeating similar operations.

Scripting is helpful in situations where performing a particular device function requires setting 10 to 15 registers on the device to a particular value. In these circumstances, scripts can be recorded and run whenever needed.

In DRV10987 EVM GUI, the scripting occurs using Python.

A.3.2.2.1 Recording and Running Scripts

Use the following steps to record and run the scripts:

- Step 1. Go to the *Script* menu in the DRV10987 EVM GUI and select the *Launch Script* option to start recording or click the *Launch Script Window* button as shown in [Figure 35](#).

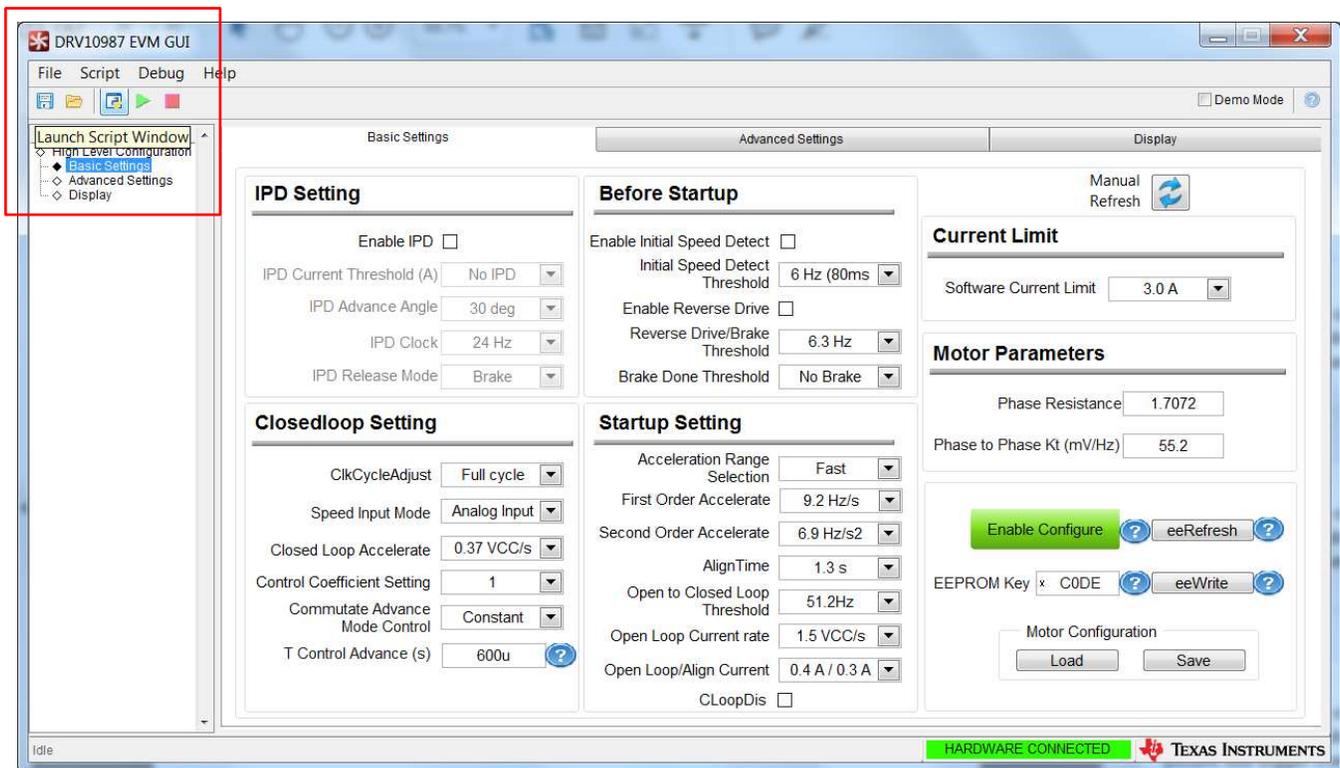


Figure 35. Script Menu

An untitled, empty Python window opens in the Idle IDE (see [Figure 36](#)).

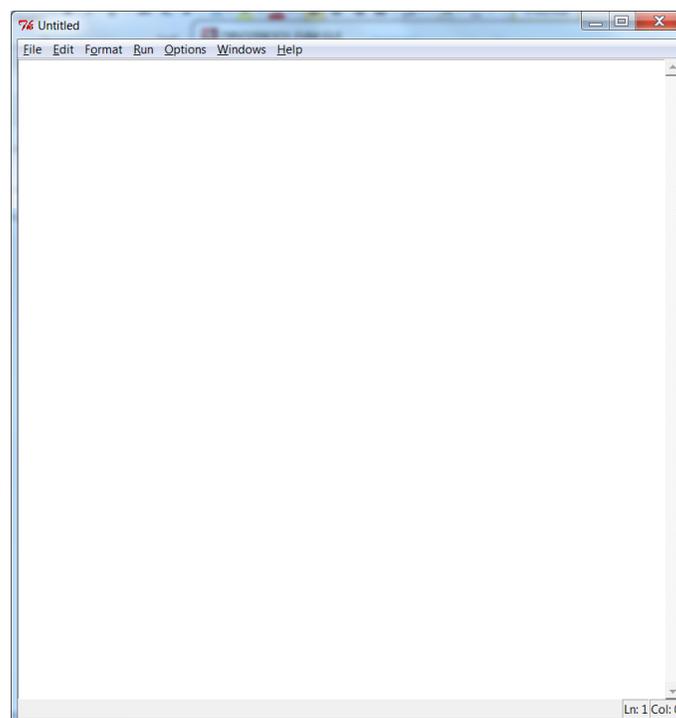


Figure 36. Launch Macro

When the Idle IDE Python window appears, the *Start Recording* option is enabled under the *Script* menu. The *Start Recording* button is also available as shown in [Figure 37](#).

- Step 2. Select the *Launch Script Window* option again to open another untitled window. The window that was last opened is the active window.
- Step 3. In the GUI window, go to the *Scripts* menu and select the *Start Recording* option from the menu.

All actions performed on the GUI are recorded in the Idle IDE Python window. The recording function is indicated in the untitled Idle IDE Python window when the window flashes green, while the window is recording as shown in [Figure 37](#).

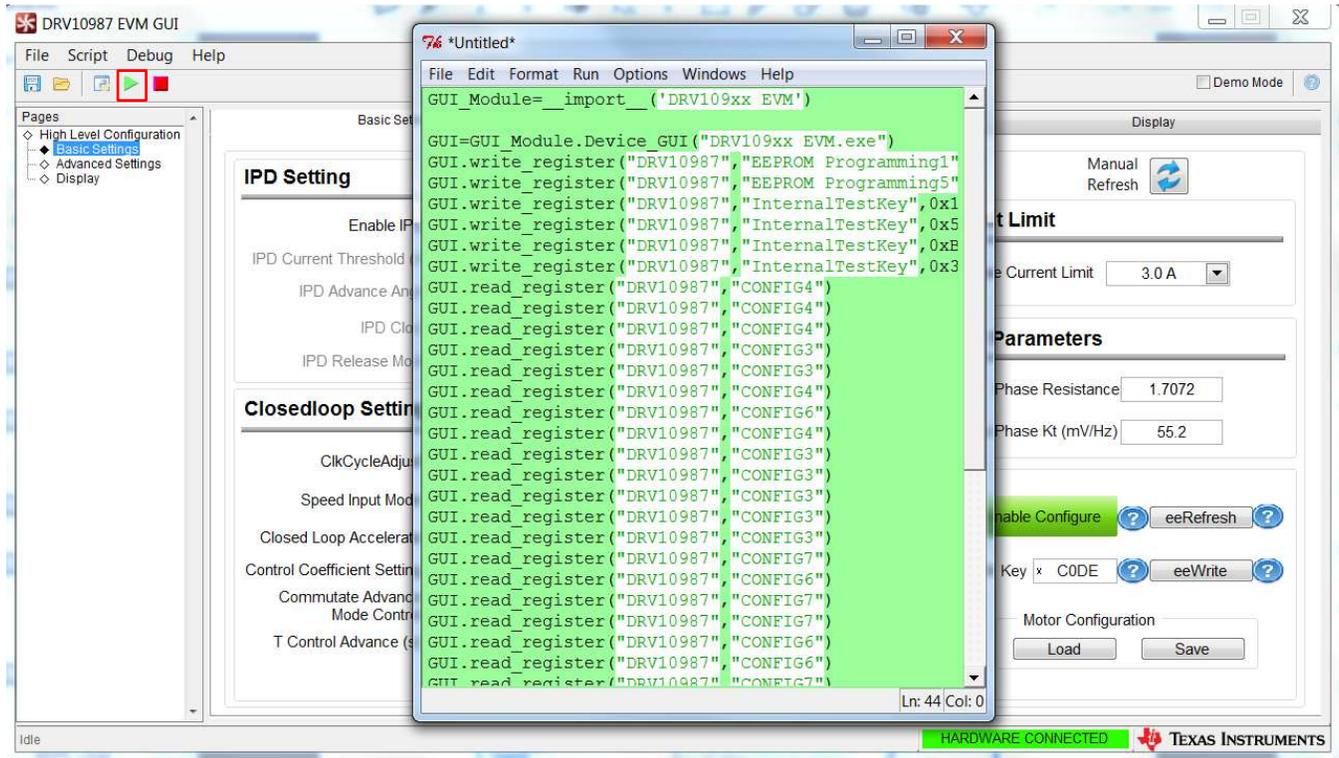


Figure 37. Start Recording

The Idle IDE Python window captures predefined actions only. While recording, no action, such as moving the cursor or entering data, has to be performed in the Idle IDE Python window. To stop recording, go to the *Script* menu in the DRV10987 EVM GUI and select the *Stop Recording* option from the menu or click the *Stop Recording* button as shown in [Figure 38](#).

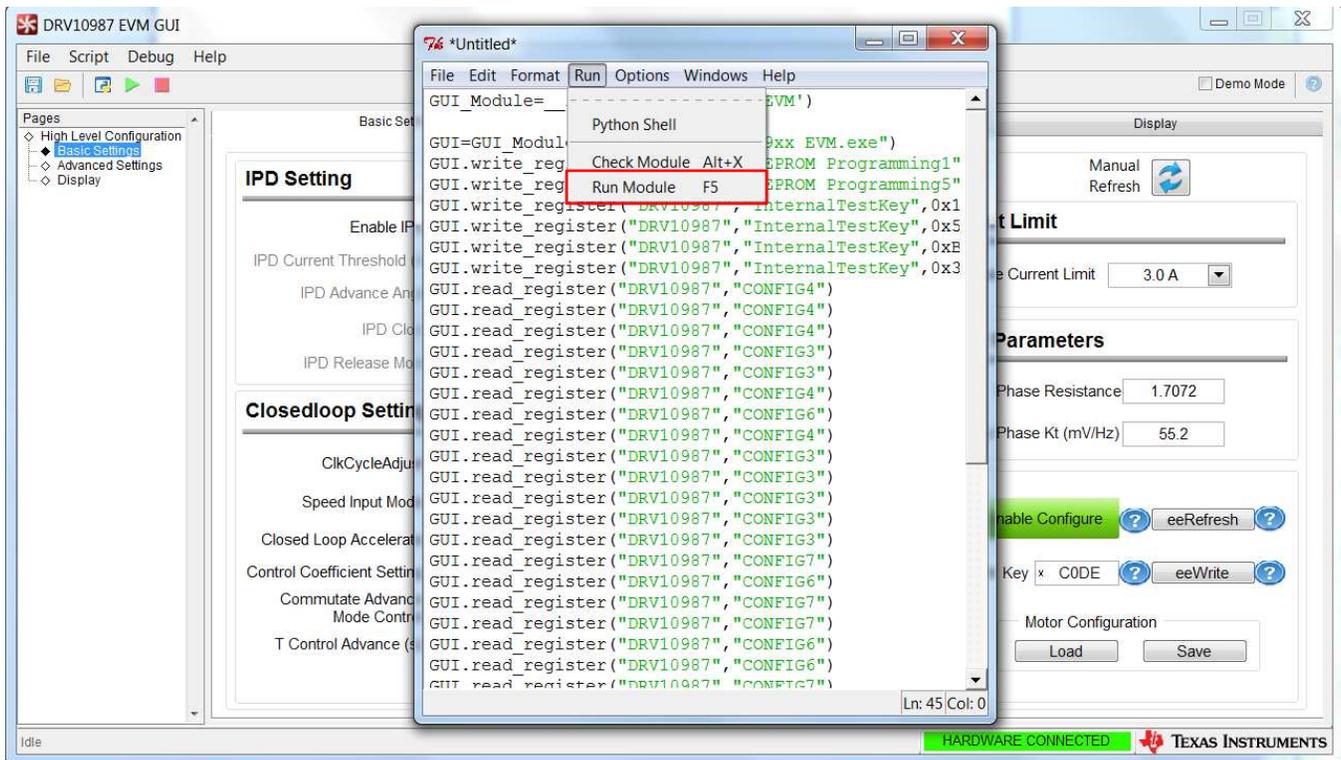


Figure 39. Run Macro

The script runs and displays the following message in the Idle IDE Python window: *Script completed successfully.*

To run a saved script, go to the *File* menu and select the *Open* option in the Idle IDE Python window. Select the file from the *Scripts* folder.

A.3.2.2.2 Debug

The debug option is used for the following operations:

Simulation — Selecting the *Demo* menu option runs the GUI in demo mode. Unselecting *Demo* mode runs the GUI in connected mode.

Debugging — The *Debug Log* menu option logs all user activities. If not selected, only the high-level operations are logged.

File logging — The *Log to File* menu option logs the GUI activities to a specified log file.

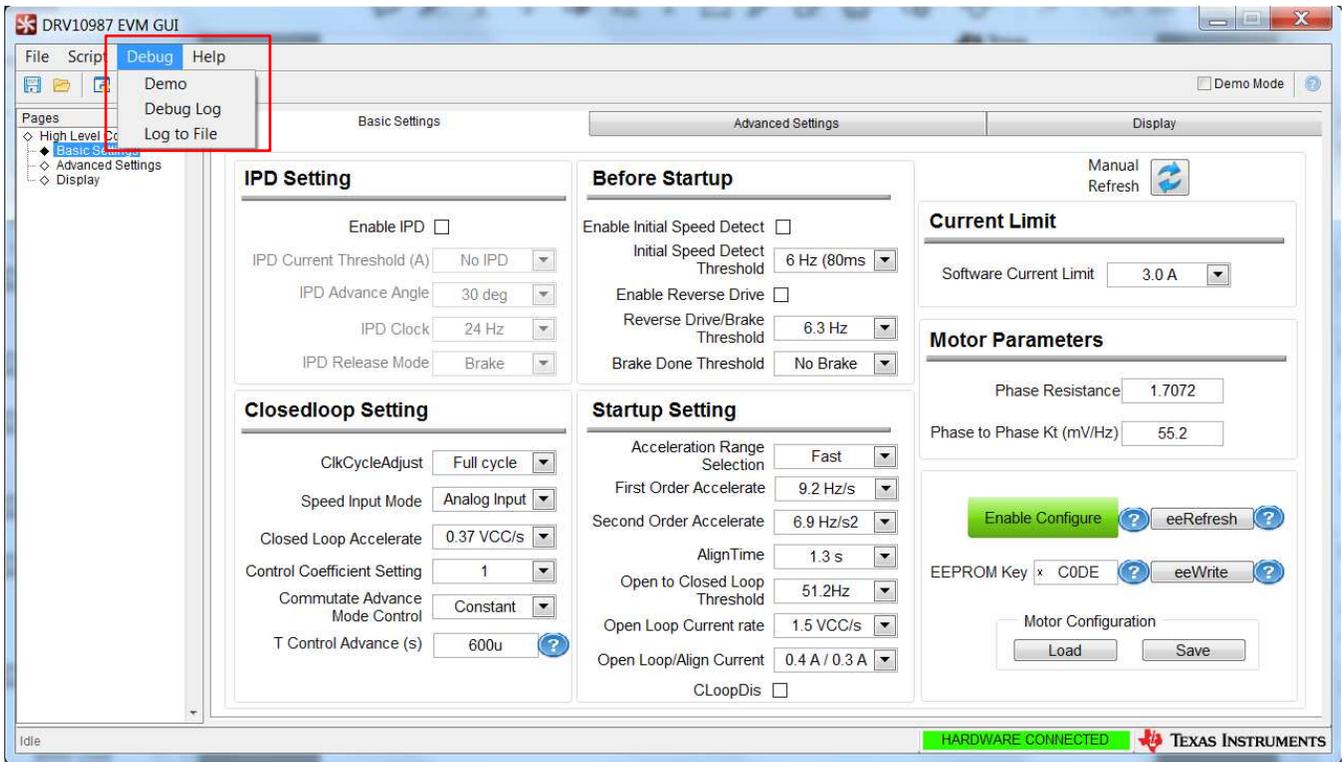


Figure 40. Debug Menu

GUI to DRV10987 Register Cross Reference

The DRV10987 register names and GUI names do not always match. [Table 7](#) provides a cross reference between the different names. The tab and section location of the register values in the GUI is also provided.

Table 7. GUI to DRV10987 Register Cross Reference

Registers			GUI		
Register Name	Address	Register Map	Tab	Section	GUI Name
CONFIG1	0x90	SSMConfig[1:0]	Advance	Device Options	Spread spectrum Modulation
		FGOLSel[1:0]	Advance	FG Options	FG Open Loop Output Select
		FGCycle[3:0]	Advance	FG Options	FG Cycle Selection
		ClkCycleAdjust	Basic	Closedloop Setting	ClkCycleAdjust
		RMSHift[2:0] RMValue[3:0]	Basic	Motor Parameters	Phase Resistance
CONFIG2	0x91	KtShift[2:0]KtValue[3:0]	Basic	Motor Parameters	Phase to Phase Kt (mV/Hz)
		CommAdvMode	Basic	Closedloop Setting	Commutate Advanced Mode Control
		TCtrlAdvShift[2:0]TCtrlAdvValue[3:0]	Basic	Closedloop setting	T Control Advanced (s)
CONFIG3	0x92	ISDThr[1:0]	Basic	Before Startup	Initial Speed Detect Threshold
		ISDEn	Basic	Before Startup	Enable Initial Speed Detect
		RvsDrEn	Basic	Before Startup	Enable Reserve Drive
		RvsDrThr[1:0]	Basic	Before Startup	Reserve Drive/Brake Threshold
		OpenLCurr[1:0]	Basic	Startup Setting	Open Loop / Align Current
		OpLCurrRt[2:0]	Basic	Startup Setting	Open Loop Current rate
		BrkDoneThr[2:0]	Basic	Before Startup	Break Done Threshold
CONFIG4	0x93	AccelRangeSel	Basic	Startup Setting	Acceleration Range Selection
		StAccel2[2:0]	Basic	Startup Setting	Second Order Accelerate
		StAccel[2:0]	Basic	Startup Setting	First Order Accelerate
		Op2ClsThr[4:0]	Basic	Startup Setting	Open to Closed Loop Threshold
		AlignTime[2:0]	Basic	Startup Setting	Align Time
CONFIG5	0x94	OTWarning_ILimit[1:0]	Advanced	Device Options	Temp Warning Action
		LockEn5	Advanced	Lock Detect	Closed Loop Stuck
		LockEn4	Advanced	Lock Detect	Open Loop Stuck
		LockEn3	Advanced	Lock Detect	No Motor Fault
		LockEn2	Advanced	Lock Detect	BEMF Abnormal
		LockEn1	Advanced	Lock Detect	Speed Abnormal
		LockEn0	Advanced	Lock Detect	Current Limit
		SwLimit[3:0]	Basic	Current lLimit	Software Current Limit
		HwLimit[2:0]	Advanced	Lock Detect	Current Limit for Lock Detection
IPDasHwLimit	Advanced	Lock Detect	HW Limit Control		

Table 7. GUI to DRV10987 Register Cross Reference (continued)

Registers			GUI		
Register Name	Address	Register Map	Tab	Section	GUI Name
CONFIG6	0x95	SpdCtrlMd	Basic	Closedloop Setting	Speed Input Mode
		PWMFreq	Advanced	PWM output Options	Double the output PWM frequency
		KtLckThr[1:0]	Advanced	Lock Detect	Abnormal Kt lock detect Threshold
		AvSlndEn	Advanced	AVS (Anti-voltage Surge) Function	Enable Inductive AVS
		AVSMEn	Advanced	AVS (Anti-voltage Surge) Function	Enable Mechanical AVS
		AVSMMd	Advanced	AVS (Anti-voltage Surge) Function	Mechanical AVS Mode
		IPDRlsMd	Basic	IPD Setting	IPD Release Mode
		CLoopDis	Basic	Startup Setting	CLoopDis
		ClsLpAccl[2:0]	Basic	Closedloop Setting	Closed loop Accelerate
		DutyCycleLimit[1:0]	Advanced	Device Options	Duty Cycle Limit
		SlewRate[1:0]	Advanced	Device Options	Slew Rate
CONFIG7	0x96	IPDAdvAg[1:0]	Basic	IPD Setting	IPD Advanced Angle
		IPDCurrThr[3:0]	Basic	IPD Setting	IPD Current Threshold (A)
		IPDClk[1:0]	Basic	IPD Setting	IPD Clock
		CtrlCoef[1:0]	Basic	Closedloop Setting	Control Coefficient Setting
		DeadTime[4:0]	Advanced	PWM output Options	Driver Dead Time
EEPROM Programming5	0x35	ShadowRegEn	Basic		Enable Configure
		eeWRnEn	Basic		eeWrite
		eeRefresh	Basic		eeRefresh
EEPROM Programming1	0x31	ENPROGKEY[15:0]	Basic		EEPROM Key
SpeedCtrl	0x30	OverRide	Display	Speed Control	OverRide
		SpeedCtrl[8:0]	Display	Speed Control	Speed
MTD_TEST1	0x60	SCORE_DIS	Display	Speed Control	Disable Motor Operation

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- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

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