MULTI DIMENSION
Sensing the Future

Application Note

AN-020001
Version1.0

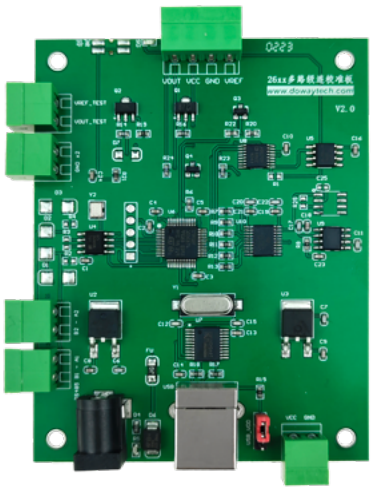
TMR265x Calibration Kit

Host PC Software Installation and TMR265x Calibration Procedures

Chen Qian 2023-04-26

Abstract

The TMR265x linear magnetic sensor is a high-performance sensor that can be used for current sensing, gaussmeter, and linear displacement sensing. The integrated ASIC can compensate and calibrate parameters including sensitivity, offset, and temperature coefficients, and thus improving the TMR265x performance and consistency. The calibration kit is powered via external adaptor or through a USB port. It collects data using a 24-bit high precision analog-to-digital converter and communicates with the host PC using a USB to serial port, allowing the user calibrate cascaded to perform batch calibration.



Catalogue

1. Pin Configuration

The MDT26EV-A2 calibration kit can connect to the TMR265x sensor IC and read its output voltage through the V_{OUT} port. After software calculations, it communicates with the TMR265x sensor IC via communication protocol to complete parameters writing and burning.

The MDT26EV-A2 can be connected to a host PC through a serial port and allows for the completion of the entire calibration process according to the customer's needs using PC software.

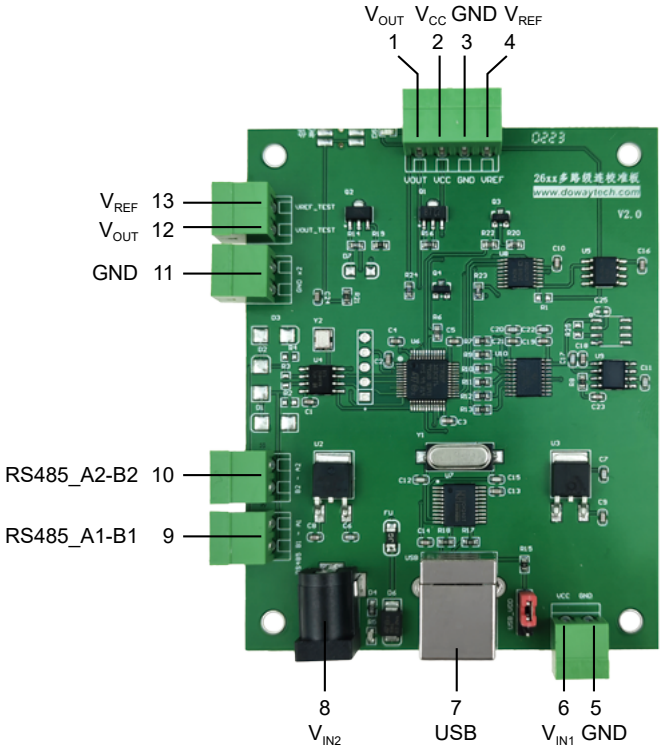


Figure 1. MDT26EV-A2 Calibration Kit

Note:

1. This calibration kit is a multi-channel cascading unit, which can be used as a single channel unit or cascaded unit with multiple channels.

2. The voltage sampling is completed using the on-board 24-bit ADC sampler and ports 9 ~ 13 do not need to be connected when the calibration kit used as a single channel.

3. Only one of the ports 5, 6, 7, or 8, can be selected to power the board. It is strictly prohibited to the power the board from multiple ports simultaneously.

Port Number	Name	Function
1	V_{OUT}	Connect to TMR265x V_{OUT}
2	V_{CC}	Connect to TMR265x V_{CC}
3	GND	Connect to TMR265x GND
4	V_{REF}	Connect to TMR265x V_{REF}
5	GND	MDT26EV-A2 ground
6	V_{IN1}	MDT26EV-A2 supply voltage
7	USB	MDT26EV-A2 USB port
8	V_{IN2}	MDT26EV-A2 9V adaptor port
9	RS485_A1-B1	MDT26EV-A2 RS485 communication interface 1
10	RS485_A2-B2	MDT26EV-A2 RS485 communication interface 2
11	GND	External test GND
12	V_{OUT}	External test V_{OUT}
13	V_{REF}	External test V_{REF}

2. Functional Block Diagram

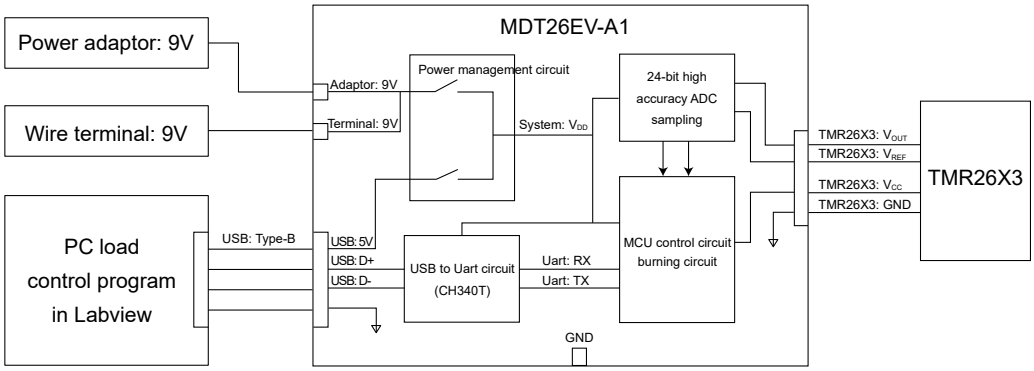


Figure 2. MDT26EV-A2 functional block diagram

2.1 Multiple power supply options are available, with a total of 3 options: USB port (5V), wire terminal (9V), and power adaptor interface (9V).

Note that the 9V power supply from the power adaptor and the wire terminal cannot be connected to the USB 5V power supply at the same time. The power supply option is selected by using jumpers, as shown in the following figure:

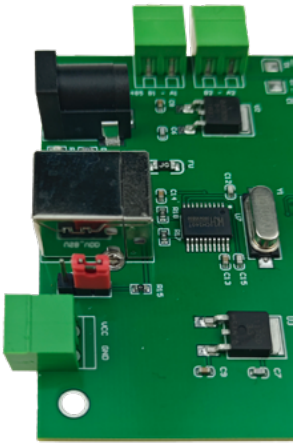


Figure 3.1 5V USB port

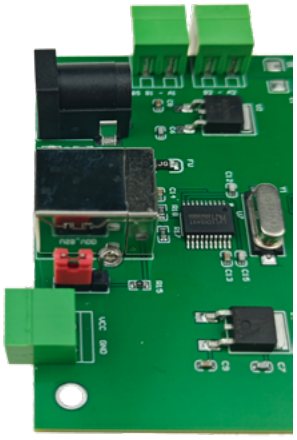


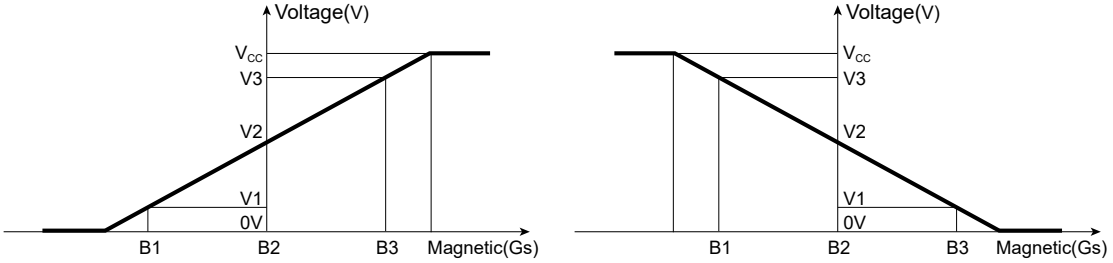
Figure 3.2 9V wire terminal

2.2 The module is equipped with a built-in 24-bit high-precision ADC for sampling the output signal of the TMR265x and performing closed-loop sampling control calibration with the internal control circuit.

2.3 The module is connected to a computer via a standard USB Type-B interface cable, and a control program developed based on LabView is used to perform calibration according to the calibration procedure.

2.4 The CH340T chip is used to convert TTL output to serial port. Users need to install the CH340T serial port driver program before connecting to the computer.

2.5 A 3-point calibration method is used as follow. The V_{OUT} output voltage V1, V2 and V3, when applying the target magnetic field B1, B2 and B3 correspondingly, as shown in the figure below:



Curve 1: Forward voltage output

Curve 2: Reserve voltage output

Figure 4. Output voltage versus magnetic field

2.5.1 Magnetic field B2 is generally the ambient magnetic field of 0 Gs. B1 and B3 are recommended to be set symmetrically with respect to B2, where V2 = (V3 + V1) / 2. |B1| = |B2| ≤ 500 Gs. Magnetic fields B1, B2 and B3 should be provided by customers on demand and do not need to be marked in software.

2.5.2 The voltage V2 is generally half of the supply voltage: V_{CC} / 2, and V1 and V3 are recommended to be set symmetrically with respect to V2, where V3 - V2 = V2 - V1. V1 = 10% * V_{CC} , V2 = 90% * V_{CC} .

2.5.3 The TMR26x3 can be configured to operate at 3.3 V or 5.0 V.

2.6 TMR26x3 can achieve temperature compensation and supports multi point temperature calibration. TMR26x3 supports up to 3 sets of temperature points calibration, where the temperature points are set according to a linear change.

3. Software Installation

3.1 Install CH340T driver.

3.2 Install LabVIEW runtime environment, then open "Volume" in "LabVIEW Runtime Environment". Double-click the "setup.exe" file in the folder and click on “Next” without making any changes until the installation is complete.

3.2.1 Extract the compressed file as shown in Figure 5.1.

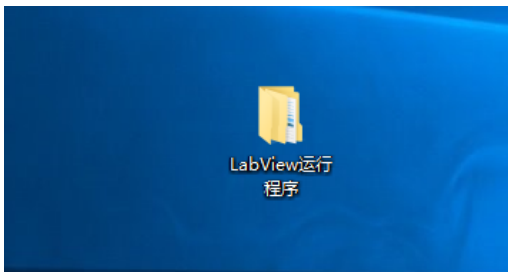


Figure 5.1 Installation folder

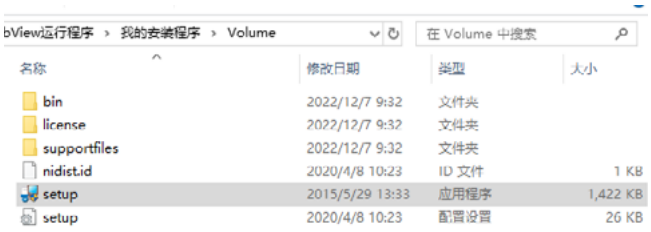


Figure 5.2 LabVIEW setup wizard

3.2.2 Find the setup.exe in the folder as shown in Figure 5-2.

3.2.3 Double click on the setup.exe to run the installation program and click “Next” as shown in Figure 5.3.

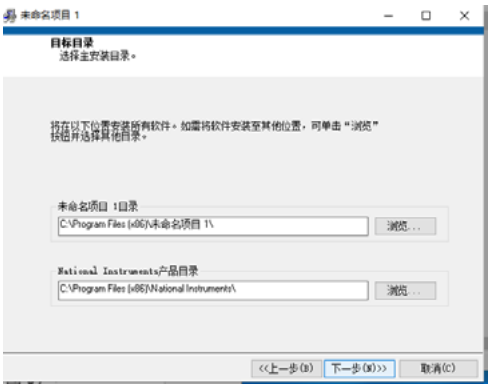


Figure 5.3 Set-up wizard

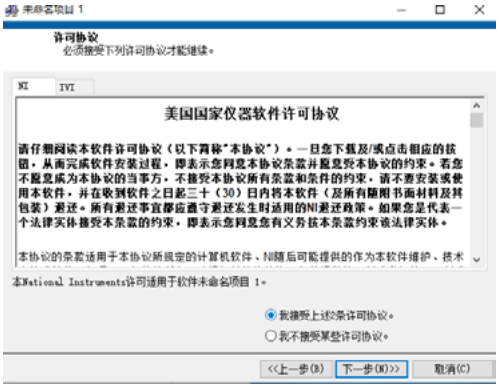


Figure 5.4 Set-up wizard

3.2.4 Select "I accept the terms in the license agreements" for both agreements and click "Next", as shown in Figure 5.4.

3.2.5 Click on “Next” as shown in Figure 5.5 and Figure 5.6.

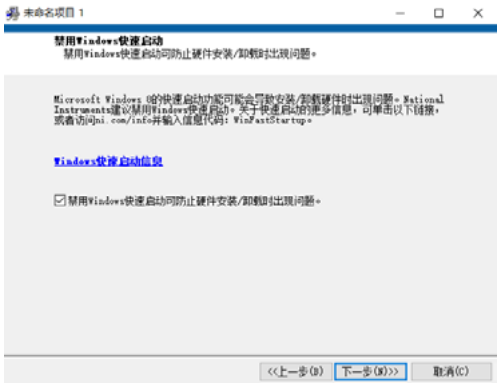


Figure 5.5 Set-up wizard

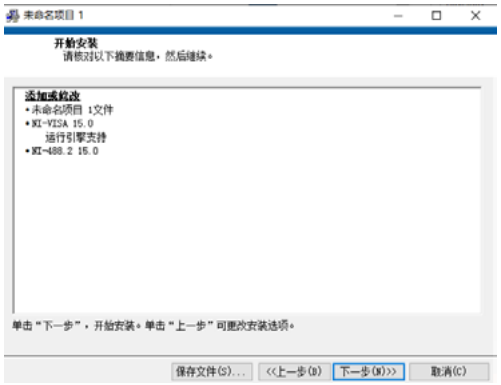


Figure 5.6 Set-up wizard

3.2.6 Wait for installation to complete, and then click on “Next” as shown in Figure 5.8.

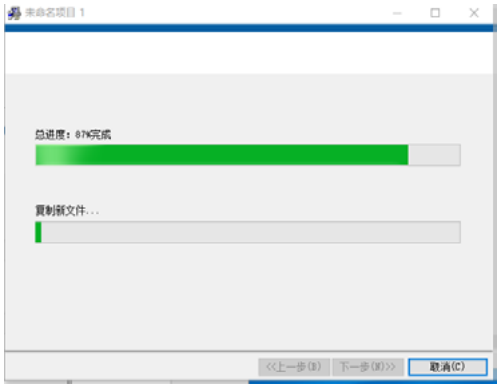


Figure 5.7 Set-up wizard

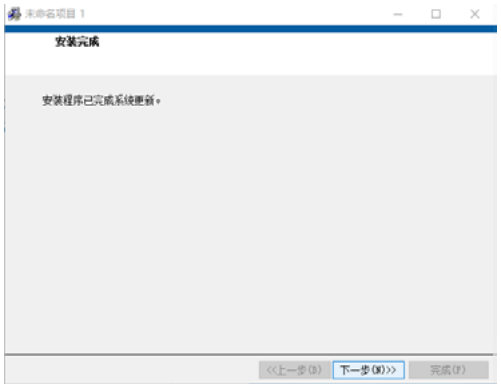


Figure 5.8 Set-up wizard

3.2.7 Restart PC to complete installation as shown in Figure 5.9.

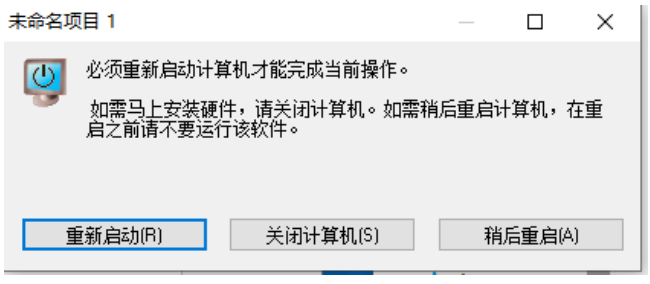


Figure 5.9 Set-up wizard

4. Software Interface

After installing CH340T driver and LabVIEW runtime environment, open calibration software “MDT26EV-A2” to find interface shown in Figure 6.

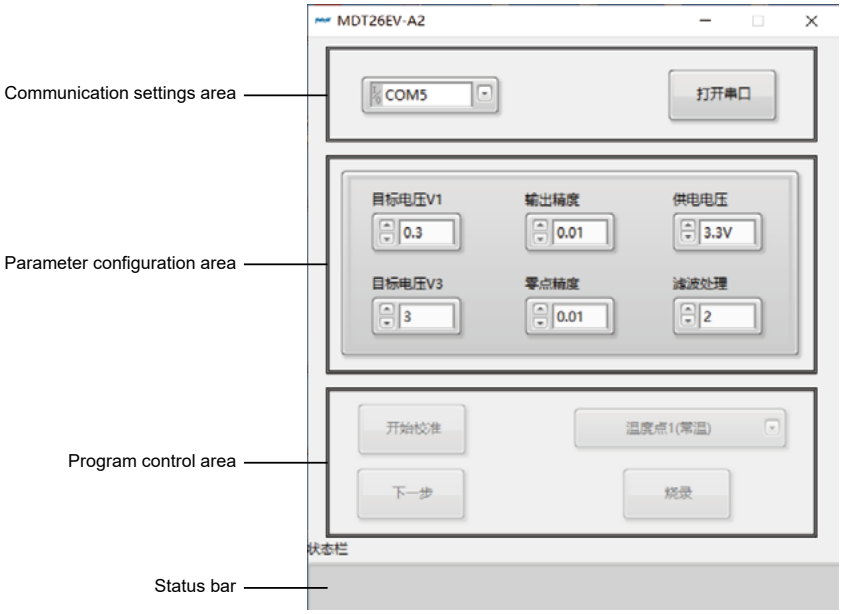


Figure 6. MDT26EV-A2 calibration software interface

4.1 Communication settings area: Select the communication port and click "Open Port".

4.2 Parameter configuration area: Configure the parameters to be calibrated for TMR265x as per requirements.

4.3 Program control area: Follow the steps in “5. Calibration Procedure”.

4.4 Status bar: Calibration prompt area, indicating the corresponding operations.

Software functions: Basic parameter setting, single temperature point calibration, multi-temperature point calibration.

5. Calibration Procedure

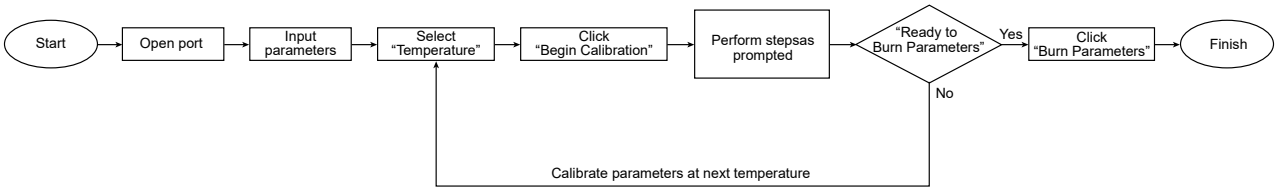


Figure 7. Calibration procedure

5.1 TMR265x parameters can be configured according to steps outlined in Figure 7.

5.2 Manual calibration requires manual input of the external magnetic field B1, B2, B3.

5.3 Testing feedback may require multiple iterations before successful parameter configuration.

5.4 Temperature points can be set for calibration. If multiple temperature points calibration is necessary, they must be calibrated in order.

6. Calibration Example

Example: Perform single temperature calibration at room temperature. The TMR265x is powered at 3.3 V, with output range of 0.3 V to 3.0 V, in the magnetic field range of ±100 Gs.

6.1 Open the Serial Port: Select the corresponding communication port from the drop-down menu and click the "Open Serial Port" button as shown in Figure 8.1.

Figure 8.1 To begin calibration

Figure 8.2 Input parameters

6.2 Configure basic parameters of sensor: Configure parameters and Temperature points. Units are in volts.

Target voltage V1 and V2: represent the output voltage range. Here is 0.3 V to 3.0 V.

Output accuracy: target voltage output accuracy. For instance, if desired accuracy is V3-V1 = (3.0V - 0.3V) ±0.01 V, output accuracy should be configured to 0.01.

Zero accuracy: zero output accuracy range. For instance, if desired zero accuracy is V1 = 1.65 V ± 0.01 V, zero accuracy should be configured to 0.01.

Supply voltage: set the IC supply voltage to either 3.3V or 5.0V based on circuit.

Filter processing: This parameter represents the sampling filtering level, with a default level of 2.

6.3 After setting parameters, select "Temperature 1 (room temperature)" as shown in Figure 8.3. Then, click the "Start Calibration" button and follow the instructions in the "Status Bar" and click on "Next". For multiple temperatures, calibration must be performed in order.

Figure 8.3 Begin calibration at temperature 1

Figure 8.4 Prompts during calibration

6.4 If an error occurs during calibration, click the "Cancel Calibration" button shown in Figure 8.5. Select the current temperature in program control area and repeat step 6.3.

Figure 8.5 To cancel calibration

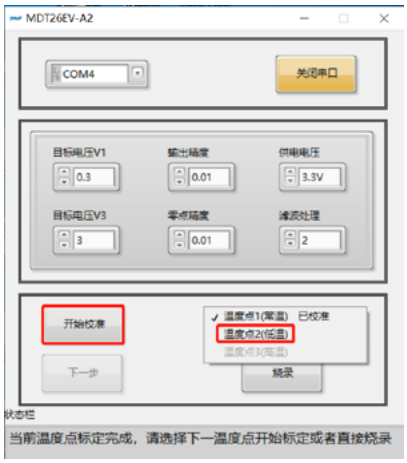


Figure 8.6 To calibrate at additional temperature

6.5 Upon successful calibration, the status bar will display "Current temperature calibration completed. Calibrate at next temperature or burn current parameters".

6.5.1 To calibrate at next temperature, select the next temperature in the program control area. As the calibration board can detect current temperature, the temperature does not need to be manually inputted. Repeat steps 6.3 through 6.5 at new temperature as shown in Figure 8.6.

6.5.2 To burn current parameters, click "Burn" as shown in Figure 8.7 and click "Yes". Status bar will display "OTP Success" as shown in Figure 8.8 once parameters are burned to TMR265x and the calibration process is completed.

Figure 8.7 To burn parameter

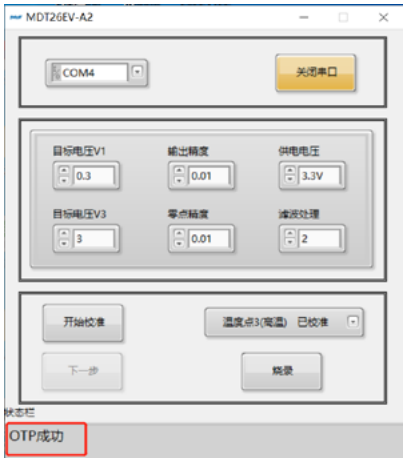


Figure 8.8 Calibration complete

Recycling

The product(s) in this document need to be handed over to a qualified solid waste management services company for recycling in accordance with relevant regulations on waste classification after the end of the product(s) life.

MULTIDIMENSION
MultiDimension Technology Co., Ltd.
No.2 Guangdong Road, Zhangjiagang Free Trade Zone, Jiangsu, China
Web：www.dowaytech.com/en E-mail：info@dowaytech.com