User Manual

Using Allegro ASEK-30 with ACS70311 Samples Programmer

DESCRIPTION

Allegro provides tools to assist in the evaluation of its sensor products. This document provides information to establish the interface between the supported programming tools and the ACS70311 current sensor. Simple instructions are included to help users begin to use the hardware and software support tools.

EVALUATION TOOLS

- Programmer:
  - ASEK-30 is the evaluation programmer that provides the interface between the sensor and software for essential communication and evaluation.

Figure 1: ASEK-30

- Accessories:
  - ASEK-30-INT-001 is the interface board that routes the required signals from the ASEK-30 to allow for easily accessible connections.

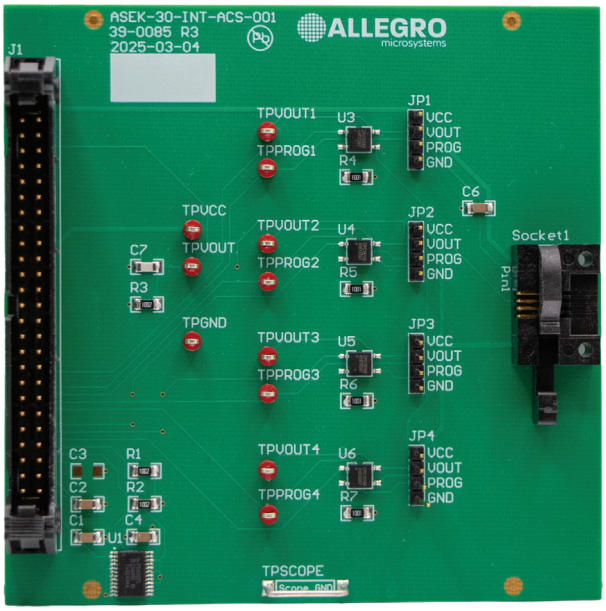

Figure 2: ASEK-30-INT-001

EVALUATION TOOLS

- Product datasheets are available on the product web page:
  - ACS70310 and ACS70311: https://www.allegromicro.com/en/products/sense/current-sensor-ics/sip-package-zero-to-thousand-amp-sensor-ics/acs70310
- Firmware loading document: Available for download from the Allegro software portal; registration is required.

ACQUIRING SOFTWARE

1. Register for software on the Allegro Software Portal: https://registration.allegromicro.com/login.
2. Ensure that the ASEK-30 in use has the most recent firmware downloaded. Refer to the ASEK-30 firmware web page (https://registration.allegromicro.com/parts/ASEK-30), including the ASEK-30 quick guide in the "Support Files" section.
3. After registering and logging in to the software portal, the dashboard page is shown. Choose the "Find a Part" button highlighted in Figure 3.

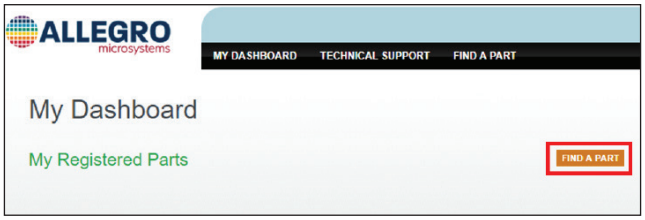

Figure 3: Find a Part Button Allows User to Register for Specific Devices

4. Click the find a part button to navigate to the available parts and software page.
5. In the select by part number search bar (see Figure 4), search for ACS70311

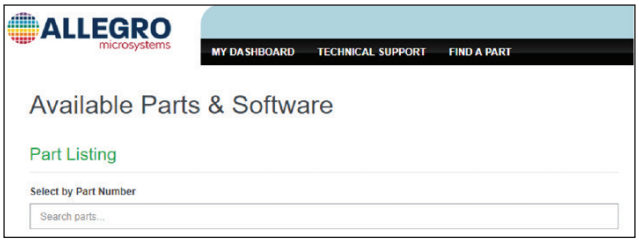

Figure 4: Select by Part Number on the Available Parts and Software Page

6. Click the view button located next to the ACS70311 search result, as shown outlined in Figure 5.

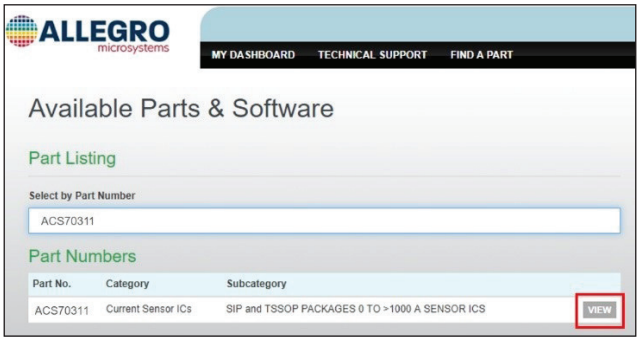

Figure 5: View Button Located Next to Desired Search Result

7. Click the download button next to the first result to open the programming application ZIP file, as highlighted in red in Figure 6.

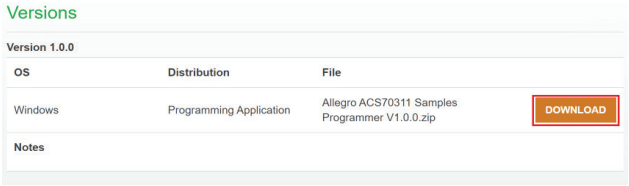

Figure 6: Download Button Opens Programming Application

8. Open and extract the downloaded ZIP file, and save it to a known location.
9. Open the extracted ZIP file, and open the Allegro ACS70311 Samples Programmer V# folder, where "#" is the version number of the software.
10. Open the Allegro ACS70311 Samples Programmer application file (EXE file extension) to open the samples programmer, as shown in Figure 7.

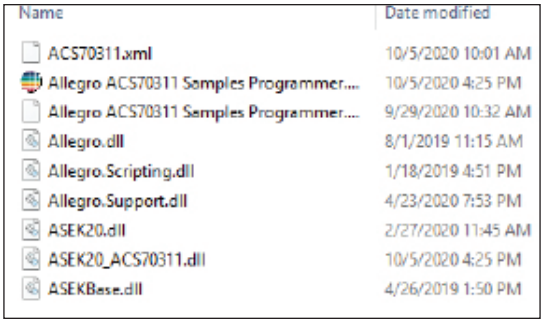

Figure 7: Application File

Getting Started with Hardware

1. Connect one end of the USB communications cable to the USB port of a personal computer.
2. Connect the other end of the USB communications cable to the USB port on the ASEK-30 chassis (the front panel of the ASEK-30 is shown in Figure 10).
3. Connect a ribbon cable to the J1 connector located to the left- of the printed "1" in "J1".
4. Connect the other end of the ribbon cable to the PRIMARY HEADER port on the ASEK-30 chassis.
5. Connect the DC power supply/cable to the 5 V port on the ASEK-30 chassis.
6. Plug the DC power supply into a 110/220 AC 60/50 Hz outlet with the appropriate power adapter.
7. Place the device under test in the socket board with the proper orientation.
8. Toggle the ASEK-30 ON-OFF switch to the ON position. The power LED on the ASEK illuminates to indicate the ASEK-30 is in the power-on state.

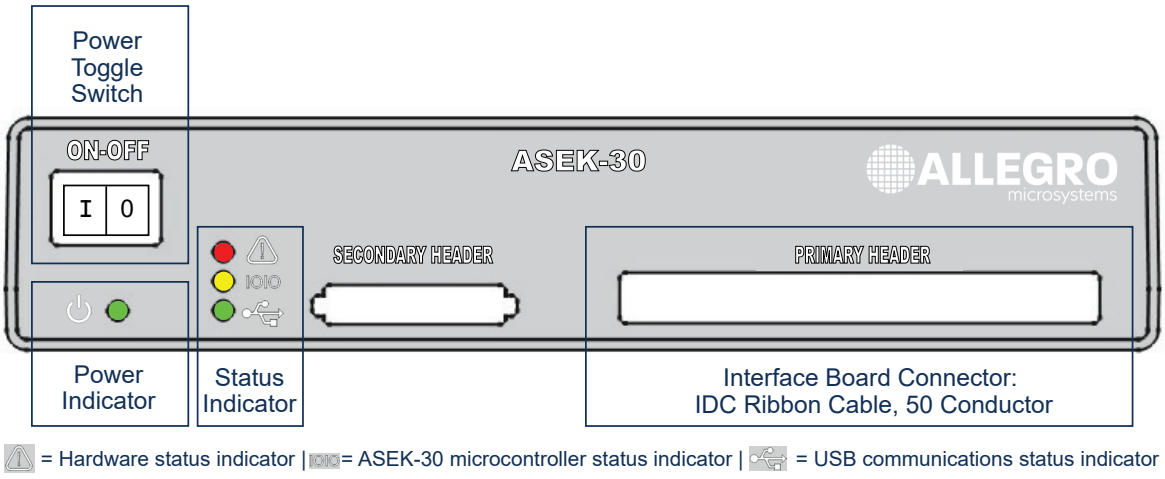

Figure 8: ASEK-30 Front Panel

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Getting Started with Software

Allegro sensor evaluation kit (ASEK) software is available for download from the Allegro Software Portal; registration is required. The ASEK-30 is a USB device. It is typically identified by the PC when connected and powered. The USB communication status LED indicator illuminates to indicate communication between the PC and the ASEK-30. Verify that the device is in communication with the PC as follows:

1. Open the device manager.
2. Locate the ASEK30 WINUSB device in the universal serial bus devices menu.
3. Open the properties menu of the ASEK30 WINUSB device.
4. Verify that the device status dialog box indicates that the device is working properly (see Figure 9).

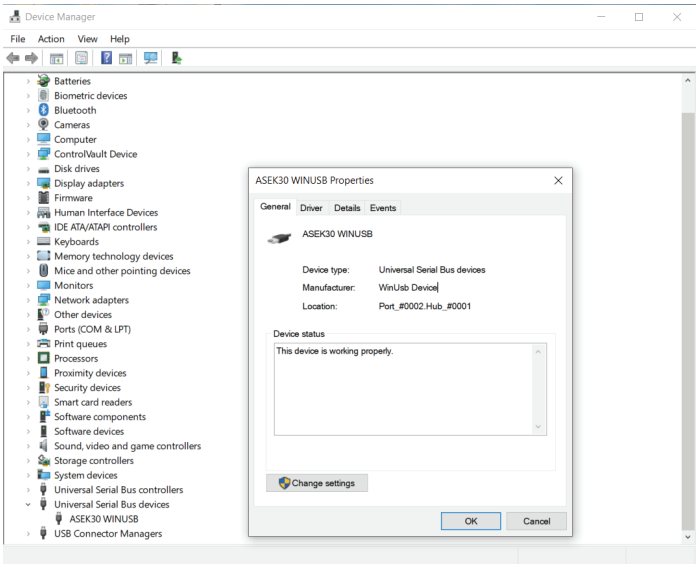

Figure 9: Verify Device Communication with PC

Connecting to the ASEK-30

When the programmer opens, a window appears as shown in Figure 10.

To connect the ASEK-30, select the setup option, then select the communication setup option. The dialog box in Figure 11 appears. In the COM port drop-down menu options, click the correct COM port number. If the COM port is unknown, perform the following:

1. Unplug the USB cable from the ASEK-30.
2. Click the refresh button (outlined in blue in Figure 11, top right.) in the communication setup dialog window
3. Click on the COM port drop-down menu.
4. Note which ports are listed in the menu.
5. Plug the USB cable into the ASEK-30.
6. Click the refresh button.
7. Click the COM port pop-up menu.
8. Note the COM port listed in the menu that was not previously listed in the menu; this is the port connected to the ASEK-30.
9. Select the port connected to the ASEK-30.

Once the correct COM port is selected and the ASEK-30 is connected to the PC, use the information displayed next to the communication panel to verify the status of the ASEK-30:

- Active status indicates the ASEK-30 is powered and is responding.
- Inactive status indicates the ASEK-30 is not responding or is not in the powered-on state. If this is the case, click the refresh button and ensure the ASEK-30 chassis is plugged into the PC and the chassis is in the powered-on state.

To exit the dialog box, click the OK button.

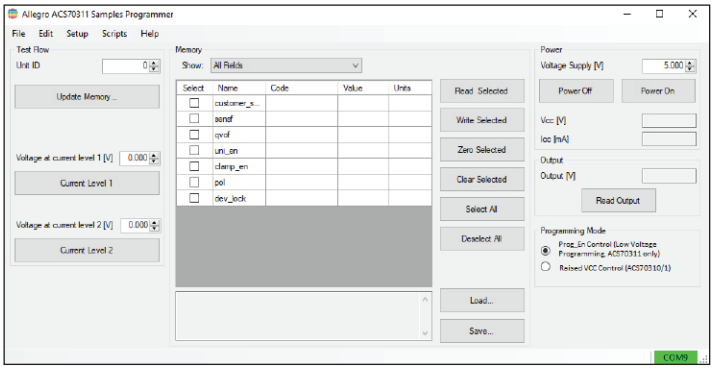

Figure 10: ACS70311 Programmer Application

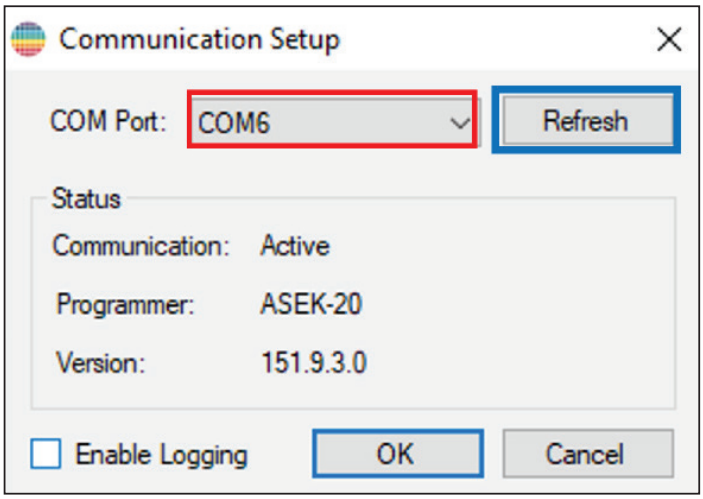

Figure 11: Communication Setup Dialog Box

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Status Bar

The status of communication with the ASEK is indicated in the status bar located on the bottom right of the GUI, as outlined in red in Figure 12:

- If the status bar display is red (not shown), the communication is not active
- If the status bar display is green (shown), the application is communicating with the ASEK.

The COM port that is currently set is overlaid on the colored rectangle. To open the communication setup dialog window, click on the status bar.

Figure 12: Status Bar on Bottom Right of GUI

Power-On and Power-Off of the Part

To power-on the part using the ASEK-30, click the power on button located in the right of the power panel in the programmer, outlined in red in Figure 13.

Once the part is in the powered-on state, the fields for V_{CC} [V] and I_{CC} [mA] become populated with the measured values. Verify that voltage is as desired and that device power consumption is approximately 13 mA (maximum of 15 mA).

To read the output of the ACS70311, click the read output button, outlined in green in Figure 13. Verify that the output [V] cell displays a reasonable number—approximately 2.5 V with zero external field applied if testing a bidirectional part with 5 V typical V_{CC} (or 0.5 V with zero external field applied if testing a unidirectional device).

To power-off the part, click the power-off button, outlined in blue in Figure 14 (to the left of the power-on button). When the power-off button is clicked, I_{CC} reduces to ≈ 0 mA.

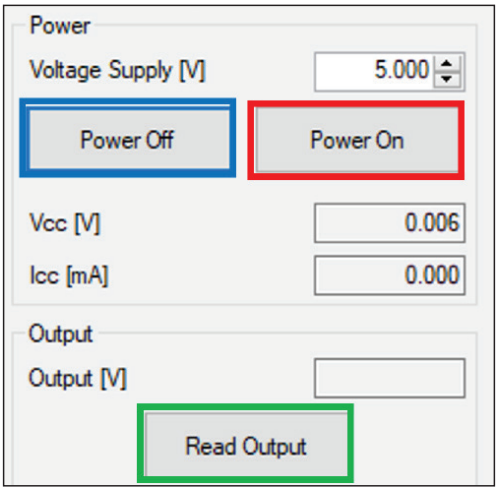

Figure 13: Buttons for Power On, Power Off, and Read Output

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Reading and Writing to the Part

Before reading and writing to the part, the part must be connected and powered on using the programmer GUI.

Before experimenting with programming, it is recommended for the user to save the memory to a tabular file. This allows the user to return the device to its original factory-programmed state, if necessary. See the Saving and Loading Memory Files section.

To read a field: In the select panel, select the checkbox located to the left of the desired register name, then click the read selected button (see Figure 14, outlined in red).

To write to a field: In the select panel, select the checkbox located to the left of the desired register name, change the value of the code field to the desired value and click enter, then click the write selected button (see Figure 14, outlined in blue).

To verify that the field was written to the device, perform the following:

- Click the clear selected button. This causes the values in the code and value cells to disappear.
- Click the read selected button. This causes the values that were written in the code and value cells to reappear and allows the user to verify that the values are written to the part correctly.

Each option on the programmer menu is briefly defined as follows:

- **Read Selected**: Reads the value of the selected field.
- **Write Selected**: Writes the entered value to the part.
- **Zero Selected**: Zeroes the selected field but does not write zero to the device unless the write selected option is selected.
- **Clear Selected**: Hides and clears the value of the selected field but does not change the value.
- **Select All**: Selects all fields.
- **Deselect All**: Deselects any and all selected fields.

Note that, when the name of a selected field is clicked, the definition of the field is displayed to the user (see Figure 15). Hovering over a field with the PC cursor displays the address of that field (see Figure 16).

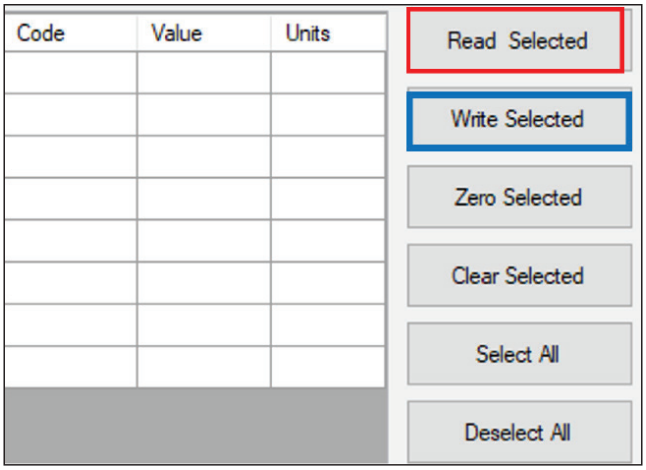

Figure 14: GUI Buttons—Read Selected and Write Selected

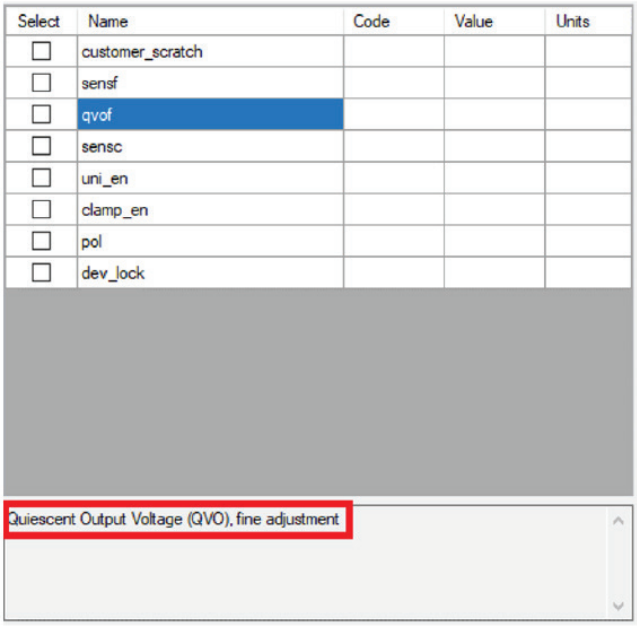

Figure 15: In-GUI Field Definitions—Click Desired Field for Definition

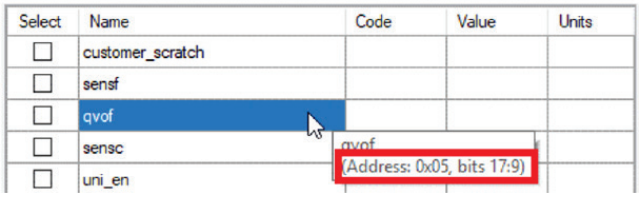

Figure 16: In-GUI Register Addresses—Hover Over Field for Address

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Accessing the Register Diagram

To access the register diagram, hover over “Help” on the menu bar. Select “ACS70311 Register Diagram”. This opens a dialog window as shown in Figure 17.

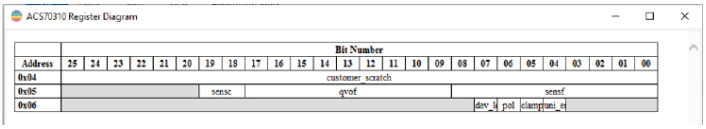

Figure 17: ACS70311 Register Diagram

Manchester Programming Protocol

Select setup, then device setup. The dialog menu in Figure 18 appears. In this menu, the user can change various characteristics of the Manchester programming protocol used by the ASEK-30. To restore these settings to the default settings, click the restore defaults button, outlined in red in Figure 18. For more information about the device-specific Manchester parameters, see the ACS70310 or ACS70311 device datasheet.

Each Manchester option is briefly defined as follows:

- **Program Enable [V]**: Used to set the voltage for the program enable operation.
- **Serial Pulse High Level [V]**: Used to set the voltage for the high level of the Manchester signal.
- **Serial Pulse Low Level [V]**: Used to set the voltage for the low level of the Manchester signal.
- **Slew Rate [V/µs]**: Used to set the speed of the Manchester signal for transitions from one voltage to another.
- **Speed [kb/s]**: Used to set the bit rate for communication with the ASEK.
- **Threshold [V]**: Used to set the threshold for determining the difference between a 1 and a 0 when performing a register read.
- **Initial Commands**: Used for commands that must be sent to the ASEK-30 when it is being initialized.

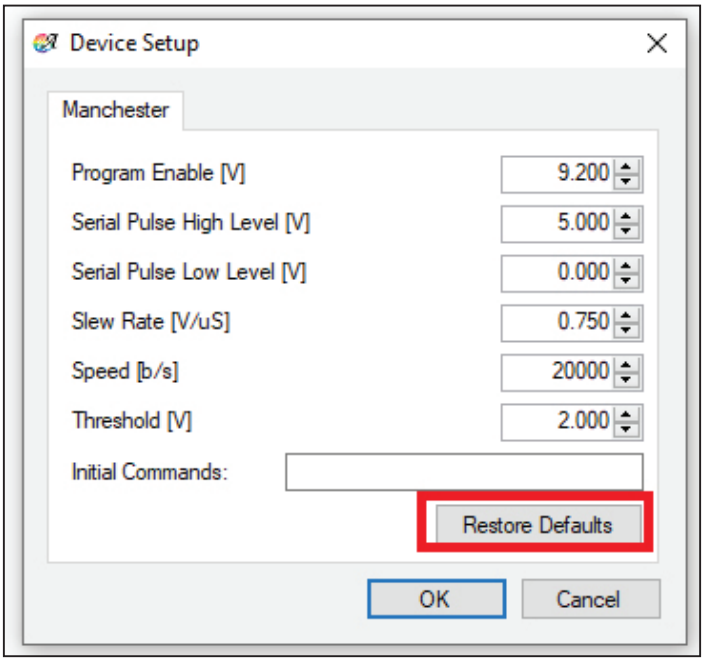

Figure 18: Device Setup Menu—Restore Defaults

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Programming Methods Overview

The ACS70311 uses a bidirectional communication on VOUT. The ACS70311 implements two programming methods: PROG_EN control (low-voltage programming) and raised V_{CC} conrol. While the ACS70310 only implements raised V_{CC} control, the ACS70311 implements both methods. For an ACS70311 programming diagram, see Figure 19. The programming method can be selected when the device is in the off state. The programming mode is user-selectable using the features located on the right side of the programmer (see Figure 20). Two programming methods with the ACS70311 on the bench are shown in Figure 21.

RAISED V_{CC} CONTROL (ACS70310/1)

When the voltage on the VCC pin increases to greater than the programming threshold, the device enters programming mode.

Note that the ACS70311 does not initiate communication; it responds to commands from the external controller. For a write command, the ACS70311 does not provide an acknowledgment. For a read command, the ACS70311 responds by transmitting the requested data. To initialize any communication, V_{CC} should be increased to a level greater than V_{prgL} (6.5 V) and less than V_{prgH} (9.2 V). At this time, VOUT is disabled and acts as an input.

PROG_EN CONTROL (LOW-VOLTAGE PROGRAMMING, ACS70311 ONLY)

If the voltage on the programming-enable (PROG_EN) pin exceeds V_{prgH}(PROG_EN), the ACS70311 enters programming-enable mode. The lower threshold of the programming-enable pin allows for communication with the ACS70311 without the need to generate signals in excess of 5 V.

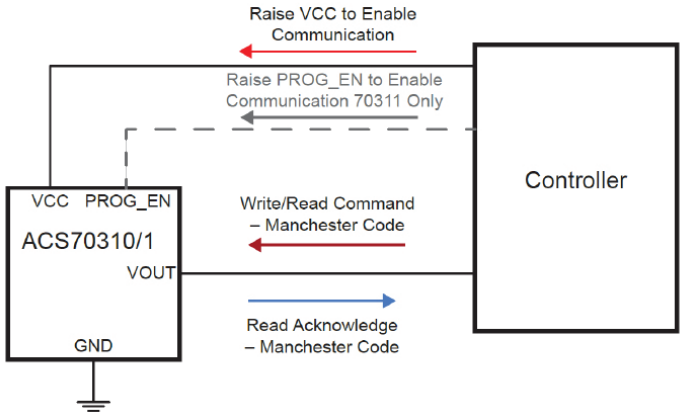

Figure 19: ACS70311 Programming Diagram

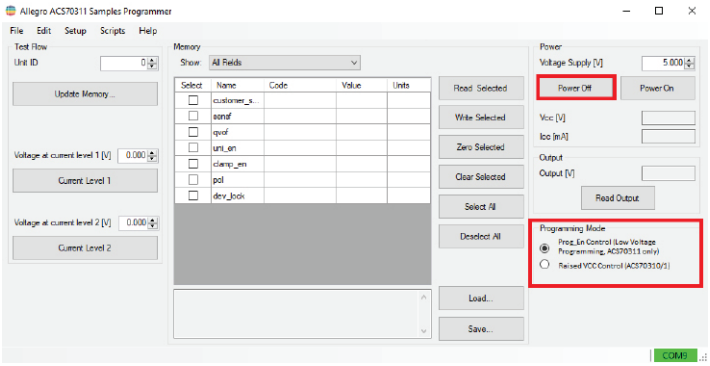

Figure 20: ACS70311 Programming Mode Selection

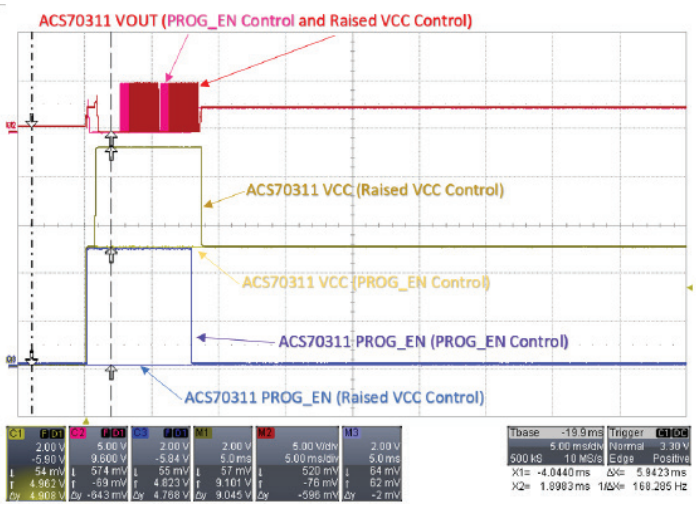

Figure 21: Oscilloscope Capture Showing Both ACS70311 Programming Methods

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Saving and Loading Memory Files

To save the memory as a tabular data file or text file, click the save button located in the bottom right side of the GUI (outlined in red in Figure 22). This action opens a file explorer where the user can save the memory data as a CSV file or TXT file. Before experimenting with programming, saving of the memory data is recommended. This save allows the user to return the device to its original factory-programmed state, if necessary. Alternatively, the memory can be saved by selecting the file menu, then selecting the save memory option.

To load a previously saved memory-data file, click the load button (see Figure 22, outlined in green). This action opens a file explorer where the user can navigate to a previously saved CSV or TXT file. Alternatively, a memory file can be loaded by selecting the file menu, then selecting the load memory option.

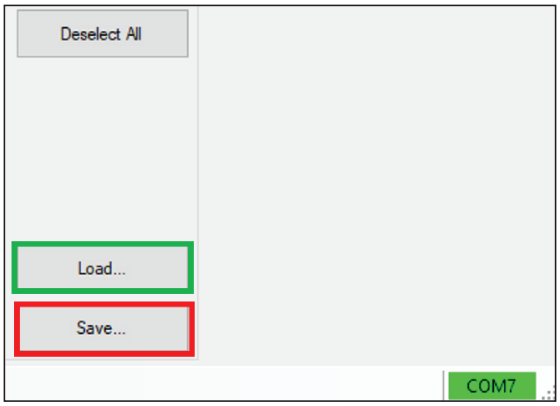

Figure 22: Load Button Loads Memory From Tabular File and Save Button Saves Memory To Tabular File

Two-Point Programming

The goal of two-point programming is to calculate and set device sensitivity using two known points. The user must know the values of the magnetic field and the desired voltage output at two levels. Two-point programming is performed as follows:

1. Prepare a test bench with the ACS70311 evaluation setup, a ferromagnetic core, and current-carrying conductor.
2. Enter a "Voltage at current level 1 [V]" target value, i.e. 1.5 V.
   A. Apply a known magnetic field, i.e. –500 G.
   B. Press the "Current Level 1" button.
   C. Remove the field once the GUI has finished processing.
3. Enter a "Voltage at current level 2 [V]" target value, i.e. 3.5 V.
   A. Apply the know magnetic field, i.e. 500 G.
   B. Press the Current Level 2" button.
   C. Remove the field once the GUI has finished processing.

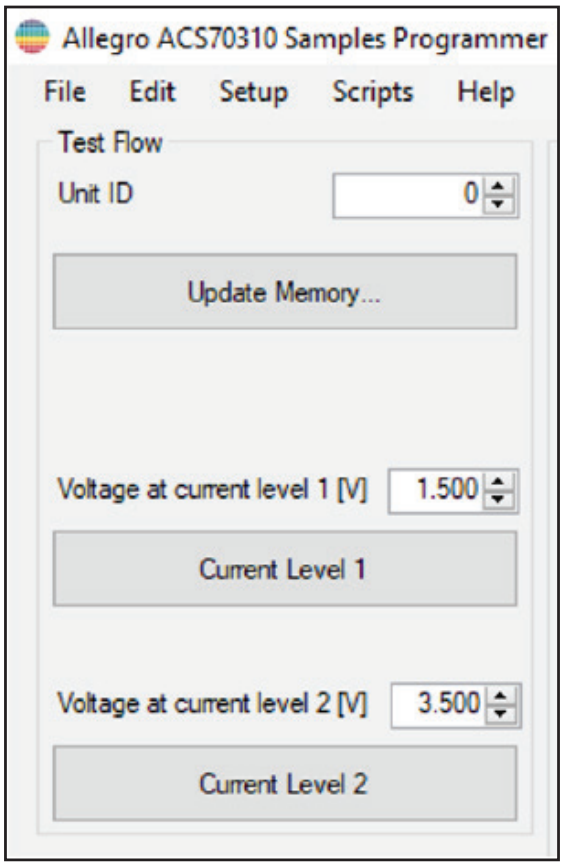

Figure 23: Set Level 1 and Level 2 to Desired Voltage Values

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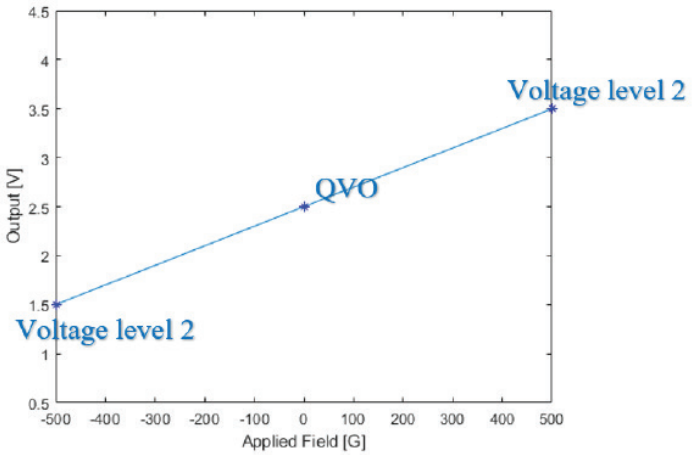

Figure 24: Calculation of Sensitivity Using Two Known Points

For this example, the GUI sets the device sensitivity to 2 mV/G and sets the SENSF register value accordingly. The device sensitivity is calculated as follows:

$$[3.5 – 1.5] \text{ V} \times 1000 / 500 \text{ G} = 2 \text{ mV/G}.$$

The GUI also sets the device offset to 2.5 V and sets the QVOF register accordingly. The user can now apply 500 G and read the output, which swings by 1 V, from 2.5 V to 3.5 V.

TIPS AND TRICKS FOR TWO-POINT PROGRAMMING

After two-point programming, the GUI writes the values for SENF and QVOF (the user does not have to select the write selected option).

The coarse gain value does not automatically update. For example, if the user inputs two voltage levels and field levels that equate to a 10 mV/G device sensitivity and the coarse gain value is currently set to 1, the GUI produces an error message because the device is unable to have a 10 mV/G sensitivity when coarse gain value is 1.

Sensitivity Programming Range [5]	$Sens_{PR}$	SENS_COARSE = 0	0.5	–	1.2	mV/G
		SENS_COARSE = 1	1.2	–	2.5	mV/G
		SENS_COARSE = 2	2.5	–	5.5	mV/G
		SENS_COARSE = 3	5.5	–	11.5	mV/G

Figure 25: Sensitivity Programming Range Showing SENS_COARSE Values for Each Sensitivity Range

If the user uses a positive field when setting a voltage level below QVO—i.e. the user sets the "Voltage at current level 1 [V]" to be 1.5 V and the applied magnetic field after pressing "Current level 1" is 500 G—the GUI produces an error message that instructs the user to flip the polarity bit (POL).

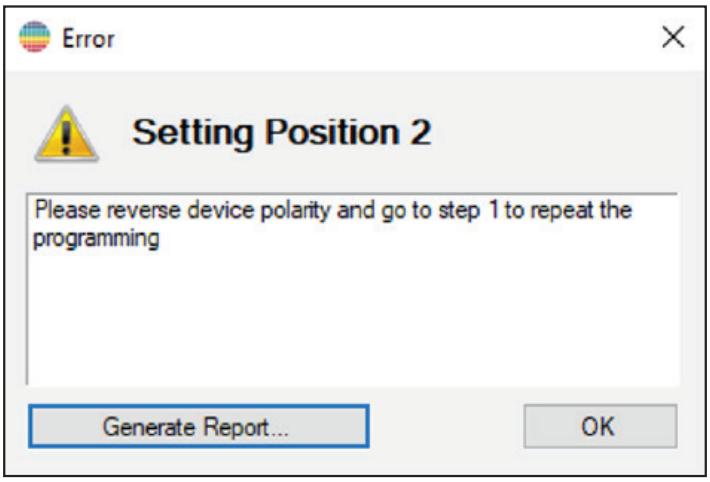

Figure 26: Error Message Instructs User To Reverse the Polarity Bit

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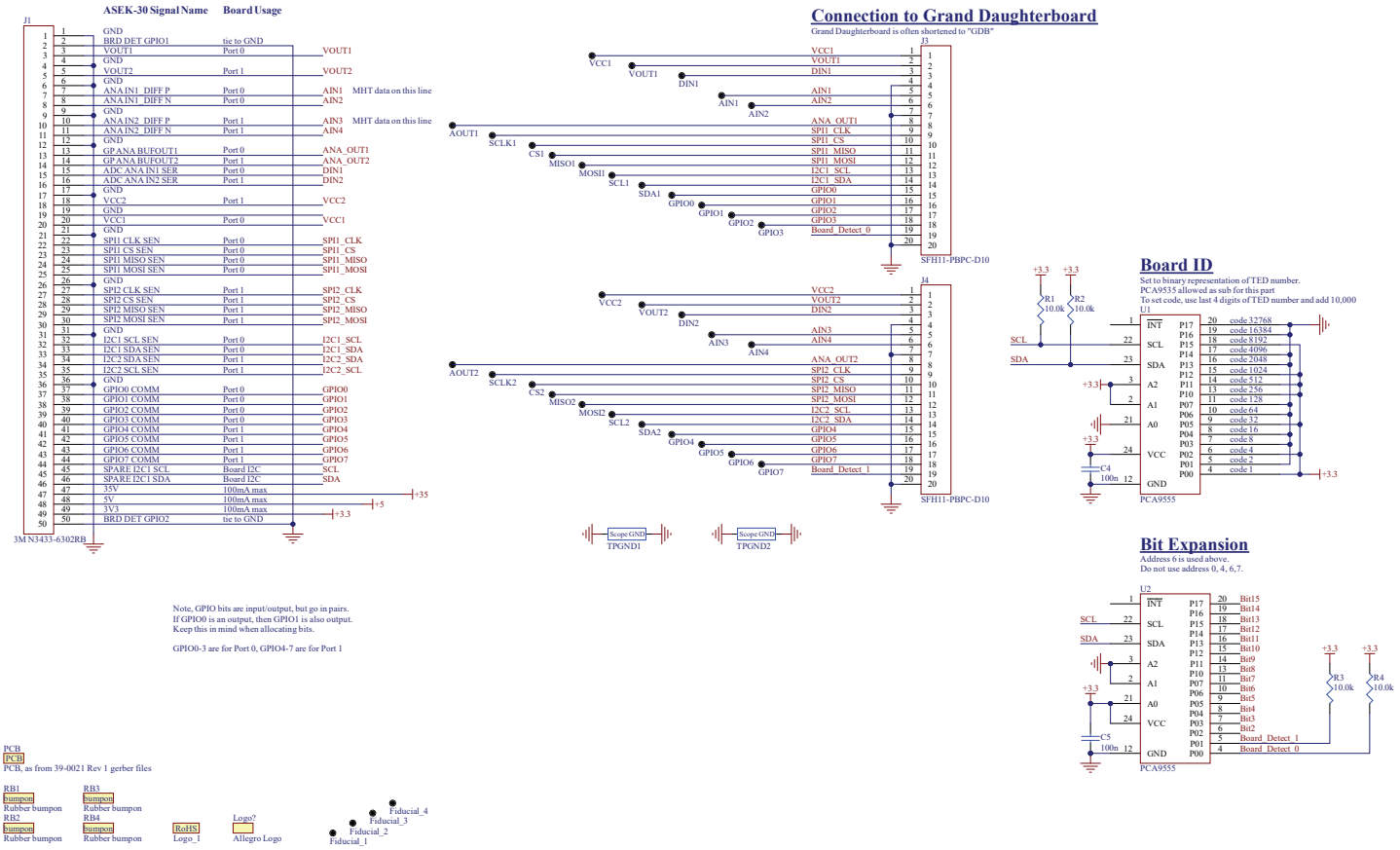
INTERFACE BOARD SCHEMATIC



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Revision History

Number	Date	Description
–	July 8, 2025	Initial release

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