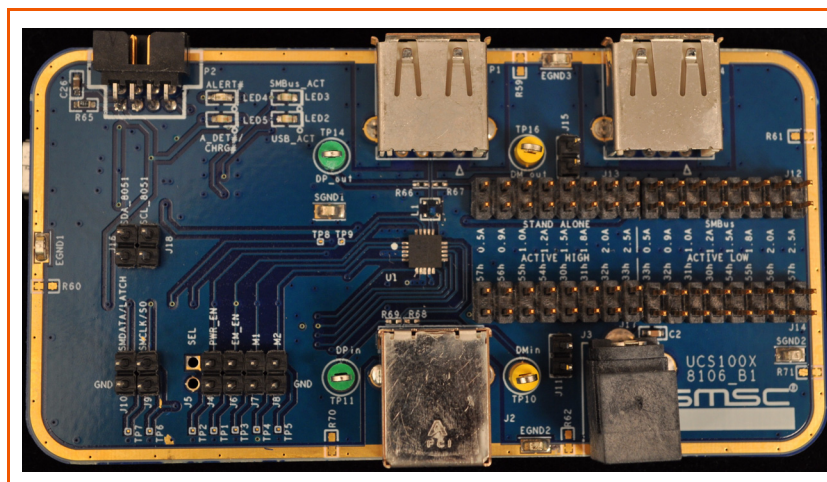


UCS1002 EVB User Manual



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Chapter 1 Overview

This document provides a description of the software and hardware used to evaluate the features of the UCS1002. There is one EVB, UCS100x, which is populated with either a UCS1001 or a UCS1002.

1.1 References

The following documents should be referenced when using this manual:

- UCS1002 Datasheet
- SCH-8106 UCS100x Evaluation Board Schematic
- EVB Bill of Material

1.2 UCS1002 Evaluation System

The evaluation system has several components, as shown in [Figure 1.1](#):

- Customer-provided Windows PC
- SMSC UCS100X graphical user interface (GUI) software (based on National Instruments LabVIEW software) and SMSC USB Bridge Driver
- SMSC UCS100x Evaluation Board
- USB Cable for GUI communications (Standard-A plug to mini-B plug)
- 5V power source (VS)
- Customer-provided portable device and OEM USB charging cable (with Standard-A plug at EVB end)

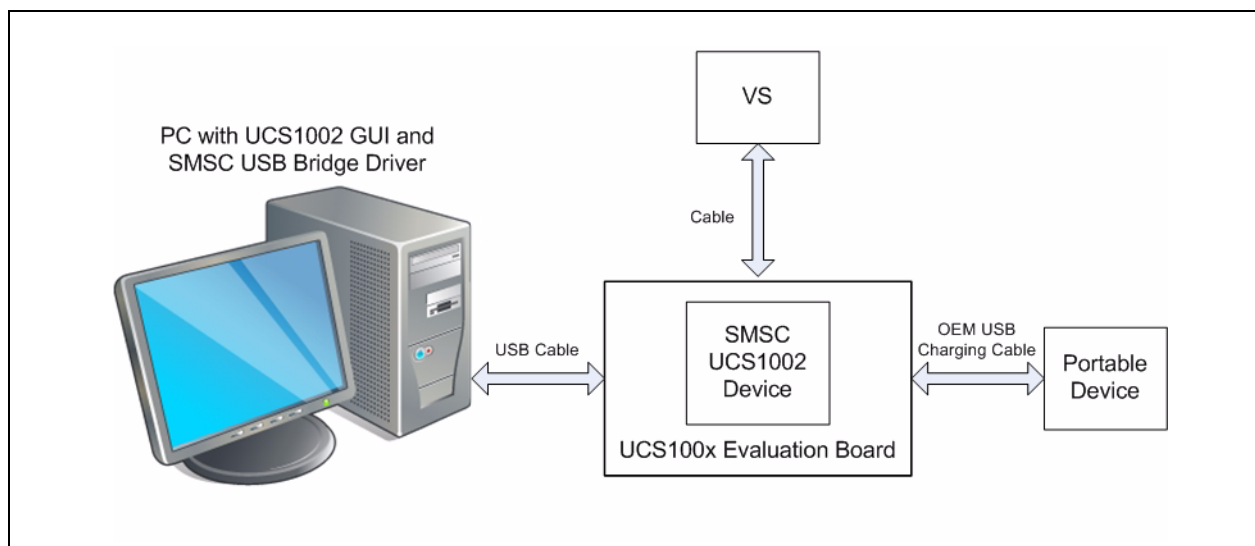


Figure 1.1 UCS100X Evaluation System

1.2.1 Block Diagram

A block diagram of the UCS1002 EVB is shown in [Figure 1.2](#) below.

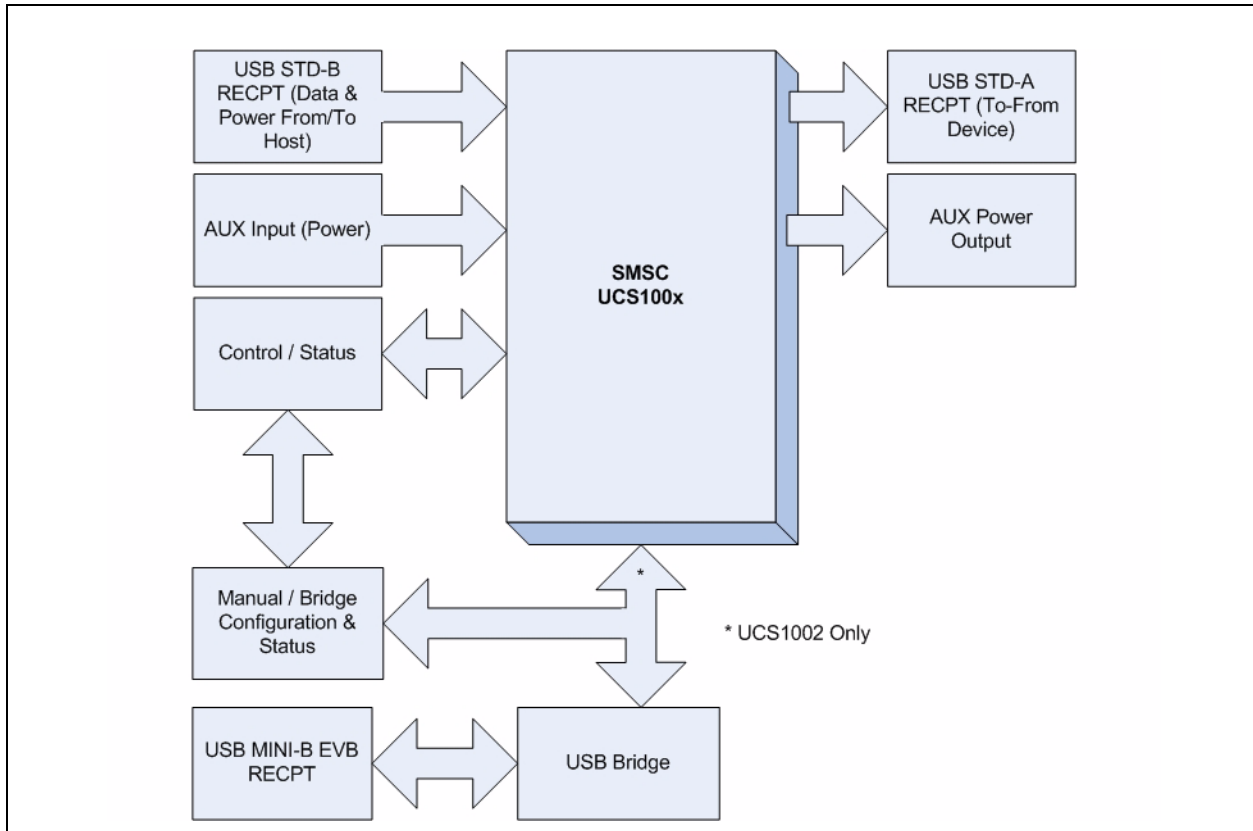


Figure 1.2 UCS1002 EVB Block Diagram

1.2.2 Connectors on the EVB

Figure 1.3 shows the top of an EVB and highlights some components.

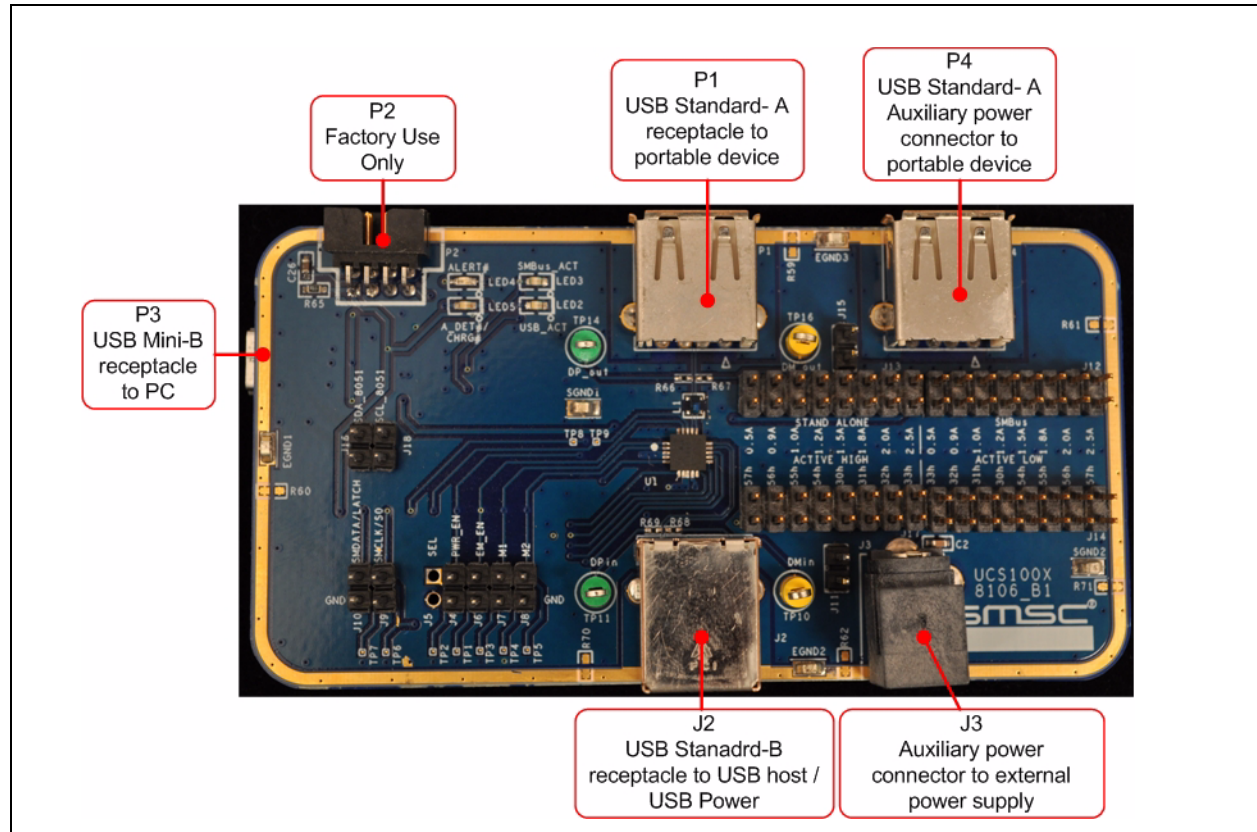


Figure 1.3 EVB Top View - Connectors

- **U1**
Populated with the UCS1002 device (pin 1 upper left).
- **J2 - Right-Angle USB Standard-B Receptacle**
This connects the EVB to the USB host (and also provides 5V power to the UCS100x device VS pins if J11 is installed).
- **J3 - Right-Angle Power Supply**
This connects directly to the UCS100x VS input pins.
- **P1 - Right-Angle USB Standard-A Receptacle**
This connects the EVB to the portable device.
- **P2 - Right-Angle Receptacle for Factory Use Only**
This is a programming port for the 8051 micro controller.
- **P3 - Right-Angle USB Mini-B Receptacle.**
This connects the EVB to the PC with the GUI software (UCS1002 only). It also provides 5V power to the EVB and +3.3V to the VDD pin on the UCS100X device.
- **P4 - Right-Angle USB Standard-A Receptacle**
This connects directly to the UCS100x VBUS output pins. No data connection present.

1.2.3 LEDs on the EVB

Figure 1.4 shows the top of an EVB and highlights the LEDs.

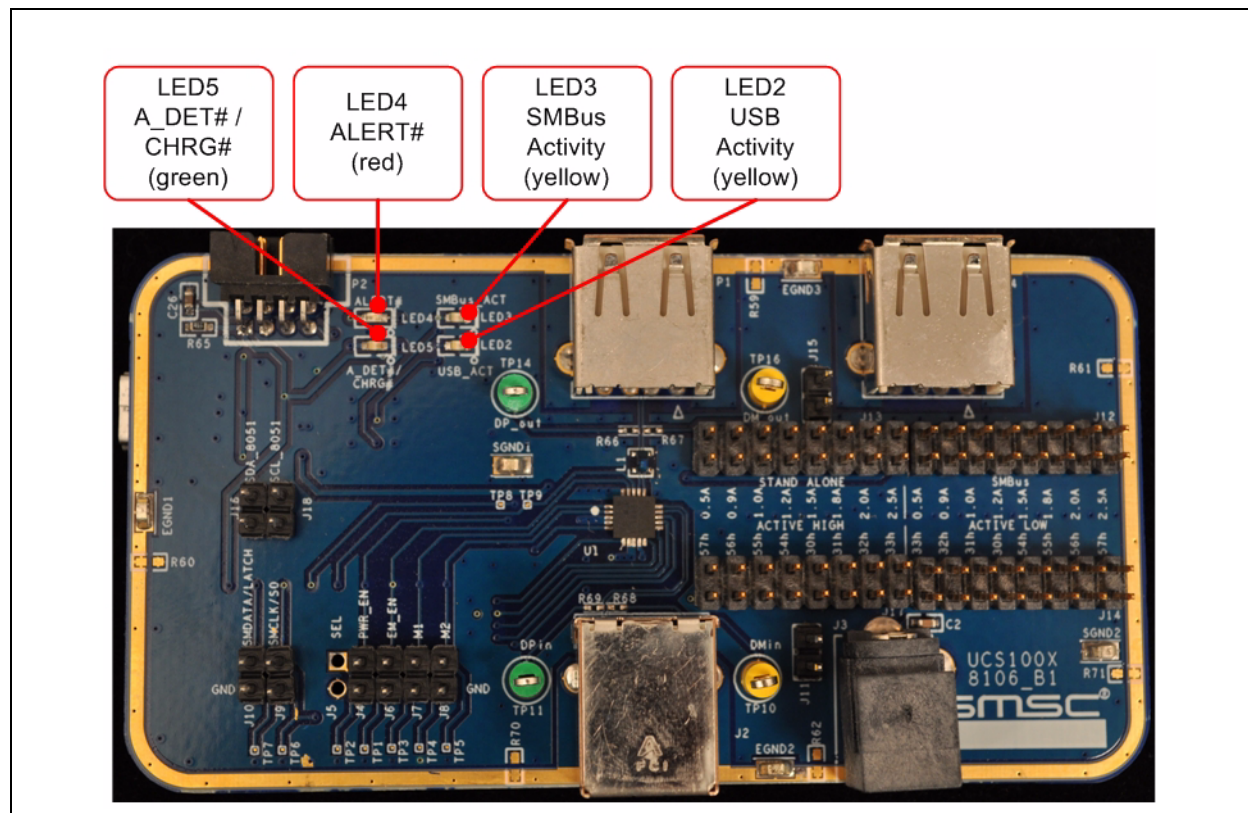
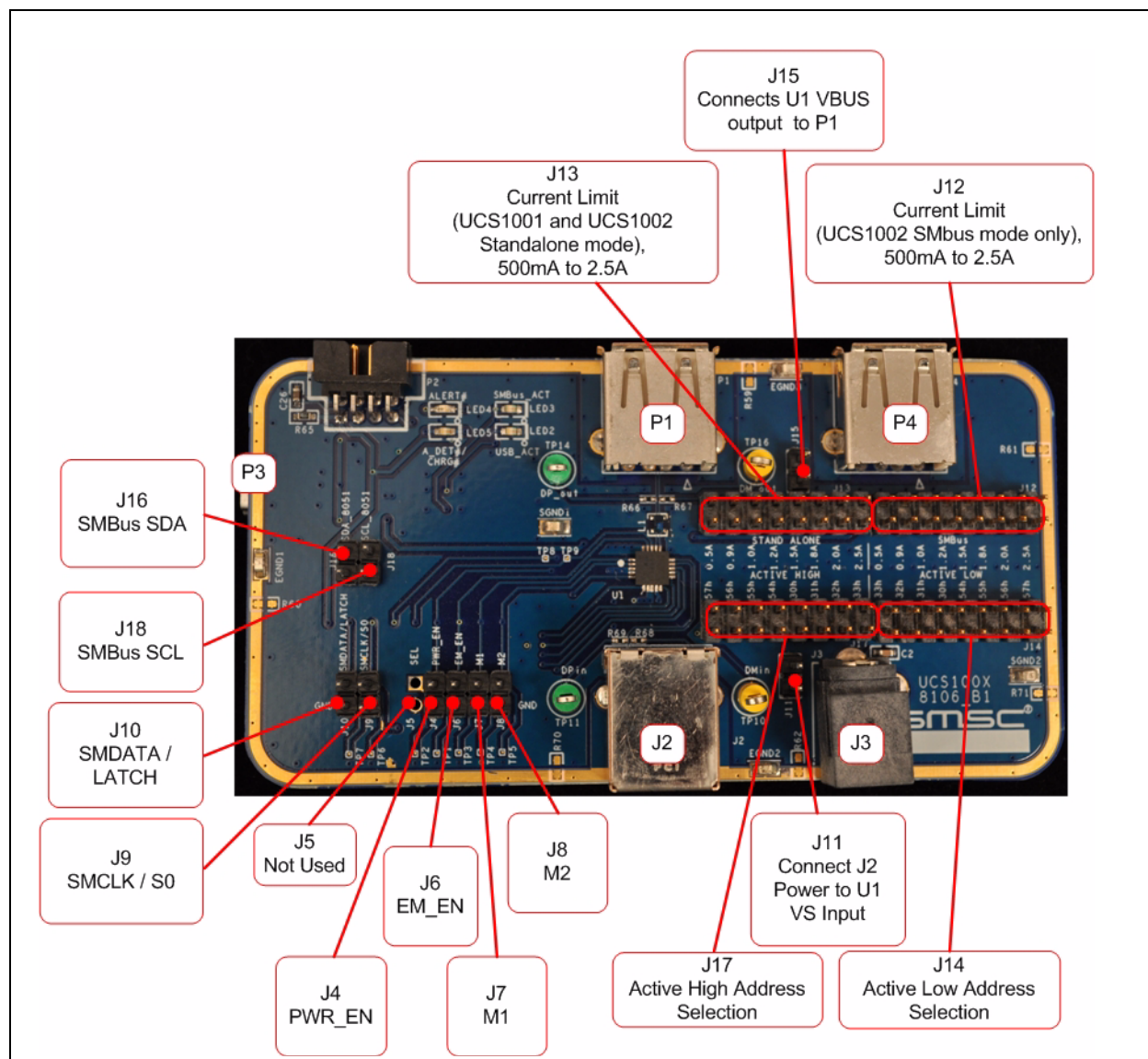


Figure 1.4 EVB Top View - LEDs

- LED2 - USB Activity
When lit, this yellow LED means 5V power is applied to the USB bridge IC.
- LED3 - SMBus Activity
When flashing, this yellow LED indicates SMBus communication activity.
- LED4 - ALERT#
When lit, this red LED indicates an alert signal is active.
- LED5 - A_DET# / CHRG#
When lit, this green LED indicates a device is attached for the UCS1002.

1.2.4 Jumpers on the EVB

Figure 1.5 shows the top of an EVB and highlights the jumpers.



- J8 - M2
When installed, this jumper will force a low at the M2 pin.
- J9 - SMCLK/S0
This jumper is applicable to the UCS1002 EVB only. It must be left off for SMBus communications to be enabled.
If the UCS1002 is in stand-alone mode (as selected by using J13 instead of J12), detect power state will be enabled without the jumper installed.
- J10 - SMDATA/LATCH
For the UCS1002 with SMBus communications, this jumper must be left out.
For UCS1002 in stand-alone mode (as selected by using J13 instead of J12), this jumper will enable the “auto-retry” fault handler if installed, and the “Latch” fault handler if left out.
- J11 - VS Input Selection
This jumper connects the 5V pin of connector J2 to the UCS1001 or UCS1002 VS power input pins. It MUST be left out if external power supply is connected to J3.
- J12 - Current Limit
Current Limit (UCS1002 in SMBus mode only). This jumper selects the current limit. This is used with the UCS1002 only.
- J13 - Current Limit Stand-alone.
Current Limit. This jumper selects the current limit. This is used with the UCS1001 and the UCS1002 when it's in stand-alone mode.
- J14 - Active Low Address
Active Low Address Selection. See datasheet for details. Only 1 jumper between J14 and J17 can be selected at a time.
- J15 - VBus Output
This jumper connects the 5V pin of connector P1 to the UCS1001 or UCS1002 VBUS power output pins. It should be left off if power is to be drawn only from auxiliary power output connector P4.
- J17 - Active High Address
Active High Address Selection. See datasheet for details. Only 1 jumper between J14 and J17 can be selected at a time.

1.2.5 Data Test Points on the EVB

Figure 1.6 shows the top of an EVB and highlights the USB data line test points.

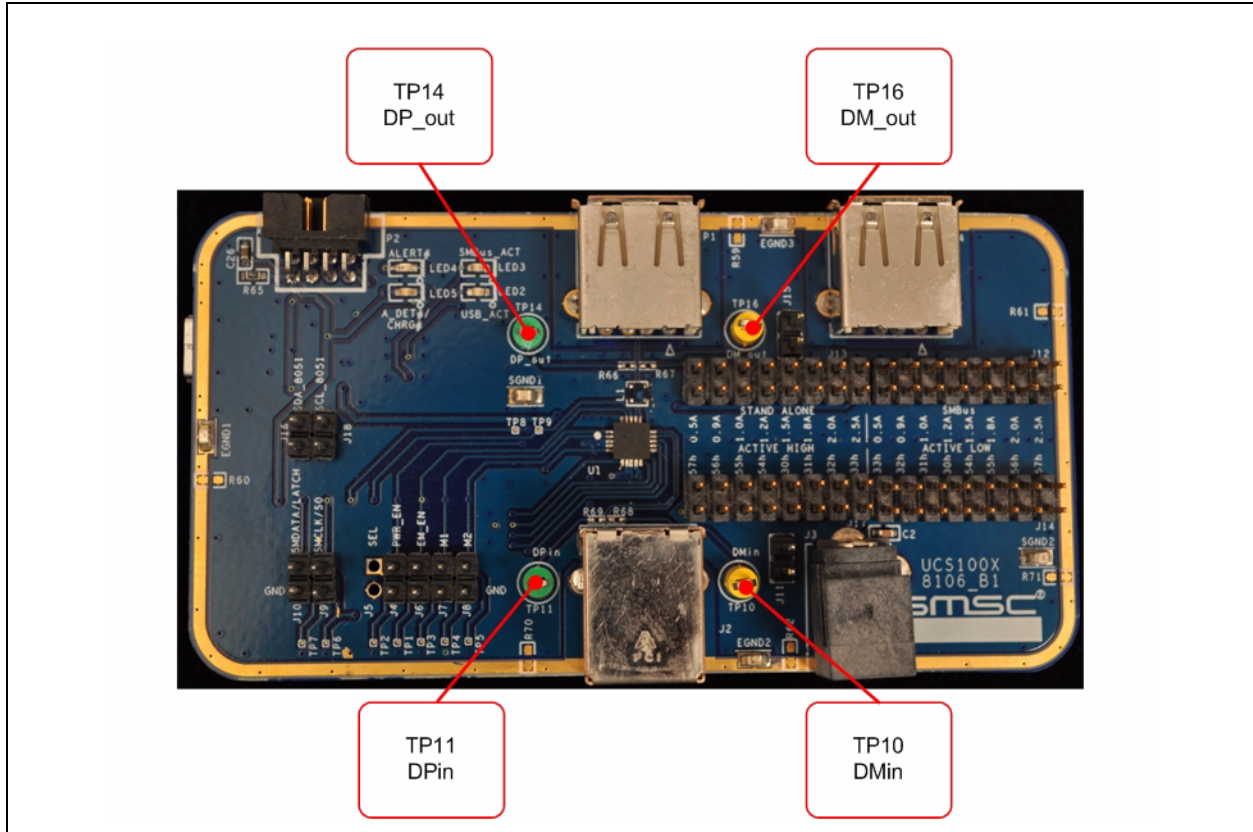


Figure 1.6 EVB Top View - Data Test Points

- TP10 - DMin
This test point connects to the DMin data line through a 1M Ohm series resistor.
- TP11 - DPin
This test point connects to the DPin data line through a 1M Ohm series resistor.
- TP14 - DP_out
This test point connects to the DP_out data line through a 1M Ohm series resistor.
- TP16 - DM_out
This test point connects to the DM_out data line through a 1M Ohm series resistor.

1.2.6 Ground Test Points on the EVB

Figure 1.7 shows the top of an EVB and highlights the ground test points.

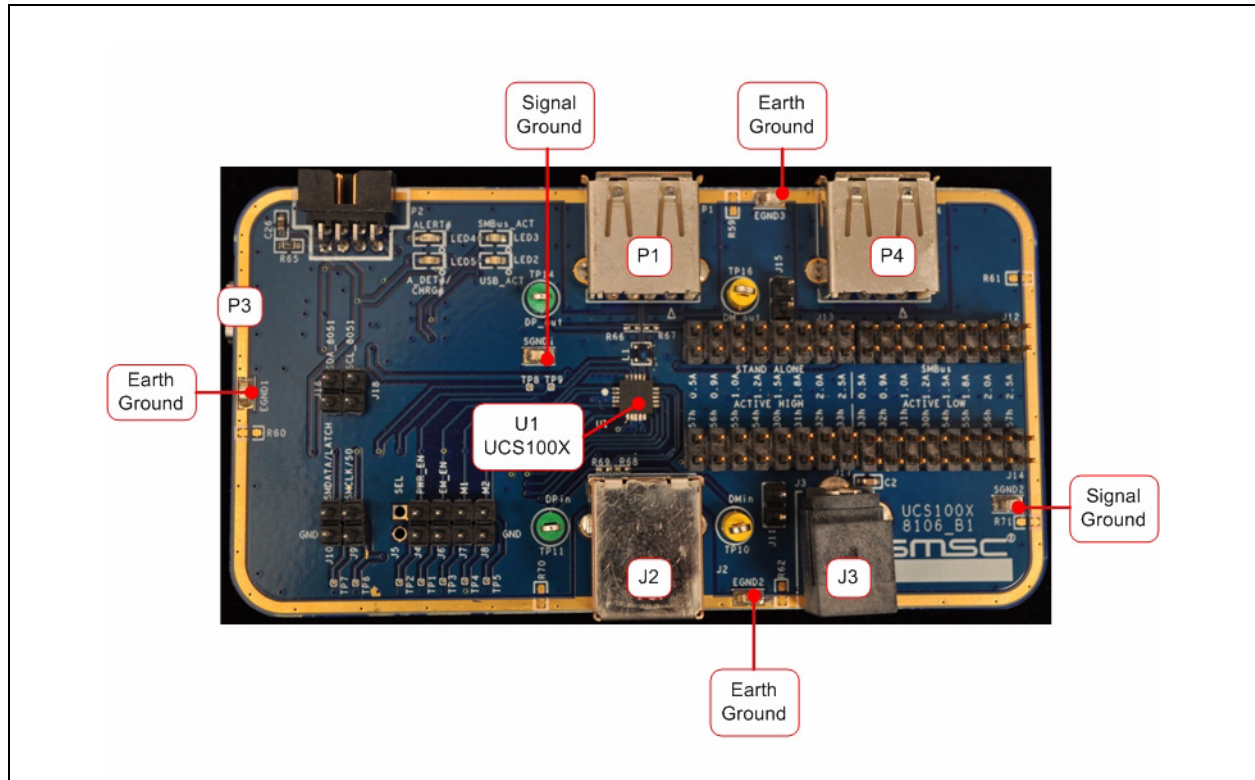


Figure 1.7 EVB Top View - Ground Test Points

- **Signal Ground**
This test point connects to the signal ground of the EVB. This is the ground reference for the UCS100X.
- **Earth Ground**
This test point connects to the earth ground of the EVB. This ground is connected to the signal ground at one location via a 0 ohm resistor.
- **U1 - UCS100X**
This part will be populated with either the UCS1002, UCS1001-1, or the UCS1001-2.

Chapter 2 Software Installation

To begin using the UCS1002 Evaluation Board, software must be installed on a Windows-based computer with a USB port.

2.1 GUI Software Installation

Begin by inserting the CD provided with the EVB into the computer. Run the Setup.exe program located in the root directory of the CD. This steps through the UCS100X GUI installation, which takes less than a minute. [Figure 2.1](#) shows the initial installation screen, which displays briefly as the setup program loads.

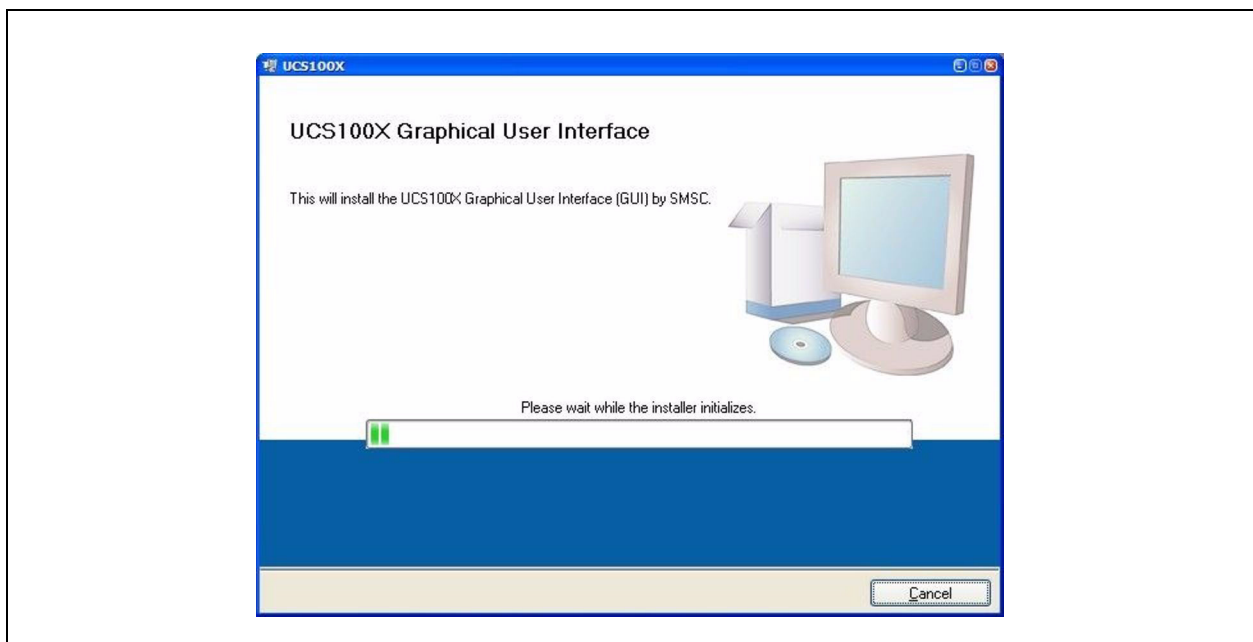


Figure 2.1 Software Installation Step 1

Click Next in the Destination Directory window, shown in [Figure 2.2](#). For proper operation, the files must be installed in the default locations. The default location for the software files is C:\Program Files\SMSC\UCS100X and for the LabVIEW software is C:\Program Files\National Instruments.

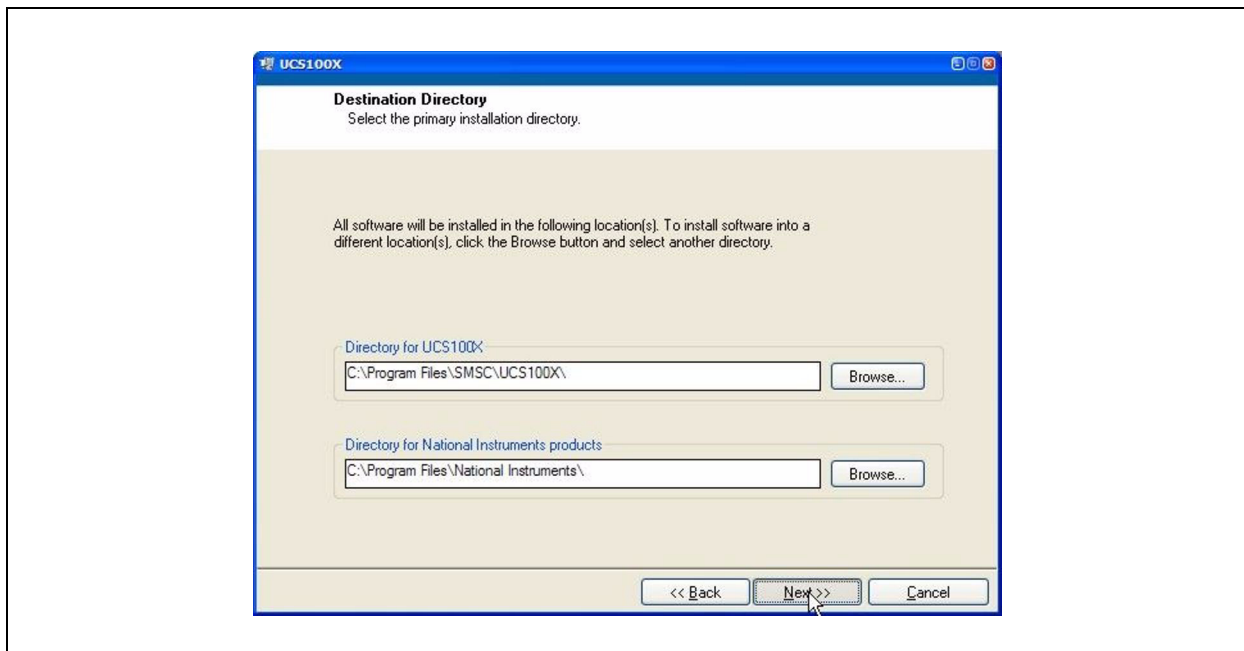


Figure 2.2 Software Installation Step 2

In order to use this SMSC software, the license agreement must be accepted (see [Figure 2.3](#)).

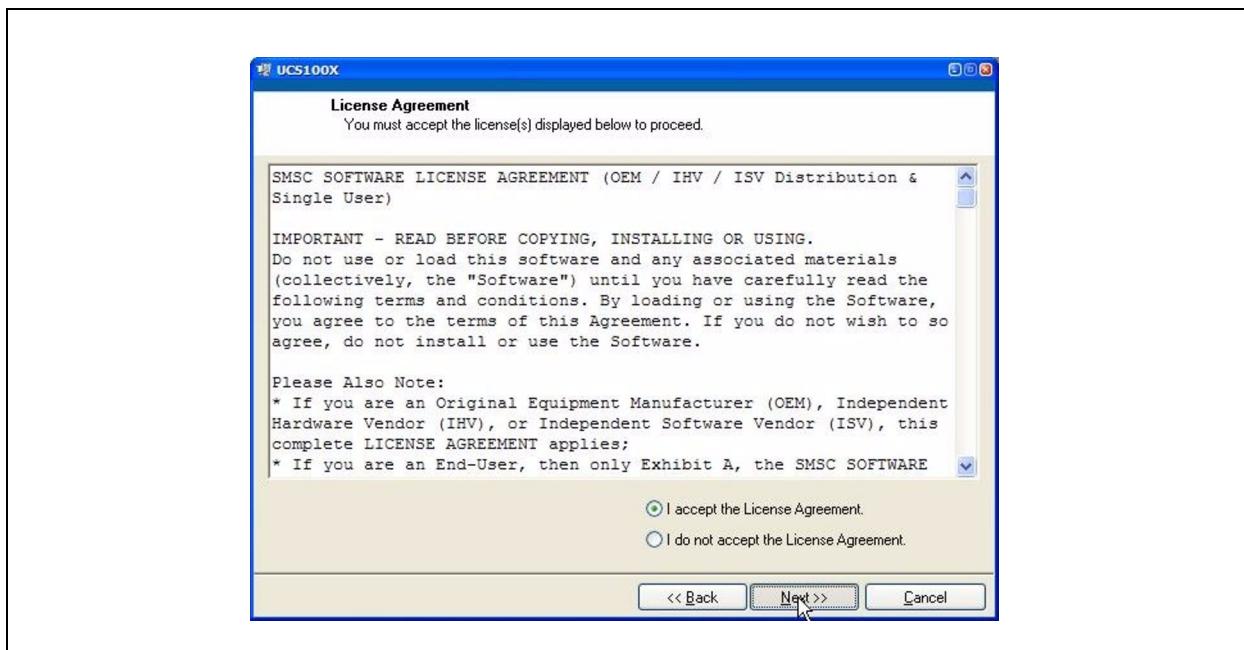


Figure 2.3 Software Installation Step 3

In order to use the LabVIEW software, the license agreement must be accepted (see [Figure 2.4](#)).

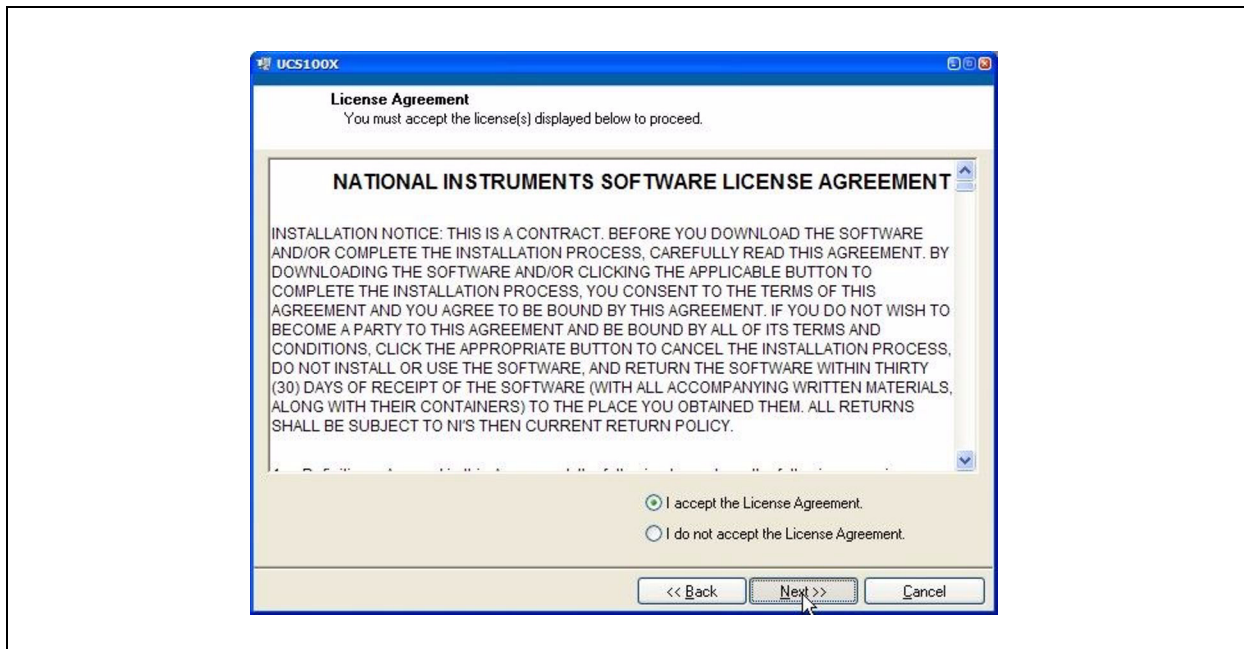


Figure 2.4 Software Installation Step 4

Follow the on-screen instructions to complete the installation. During installation, shortcuts will be created on the Windows Start Menu under Programs>SMSC>UCS1002 and on the desktop. When installation is complete, the program will automatically run (see [Figure 2.5](#)). The UCS1002 GUI will have SMBus communications.

Note: Screen captures in this document were taken on a PC with Windows XP using the default desktop colors. The colors on your screen may vary, especially if a Windows theme has been applied on the PC.

2.2 SMSC USB Bridge Installation

Connect the USB mini connector to the EVB and the standard USB connector to any available USB port on the PC. If the SMSC USB Bridge driver has not previously been installed on the selected USB port, the “Find New Hardware” wizard will pop up on the PC’s screen. Follow the on-screen instructions to complete the installation process. The files will automatically be retrieved from the CD. See [Figure 2.6](#) through [Figure 2.10](#) for a step by step view of the installation. If installation of driver on Windows 7 PC, please see included Installation Note located on CD.

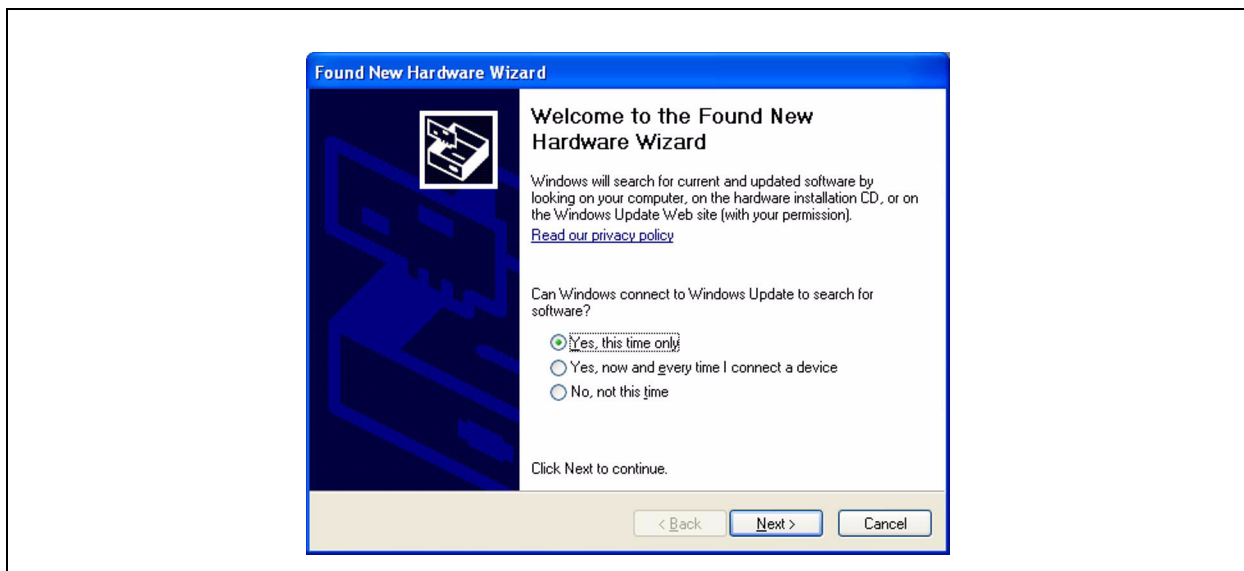


Figure 2.5 SMSC USB Bridge Driver Installation Step 1

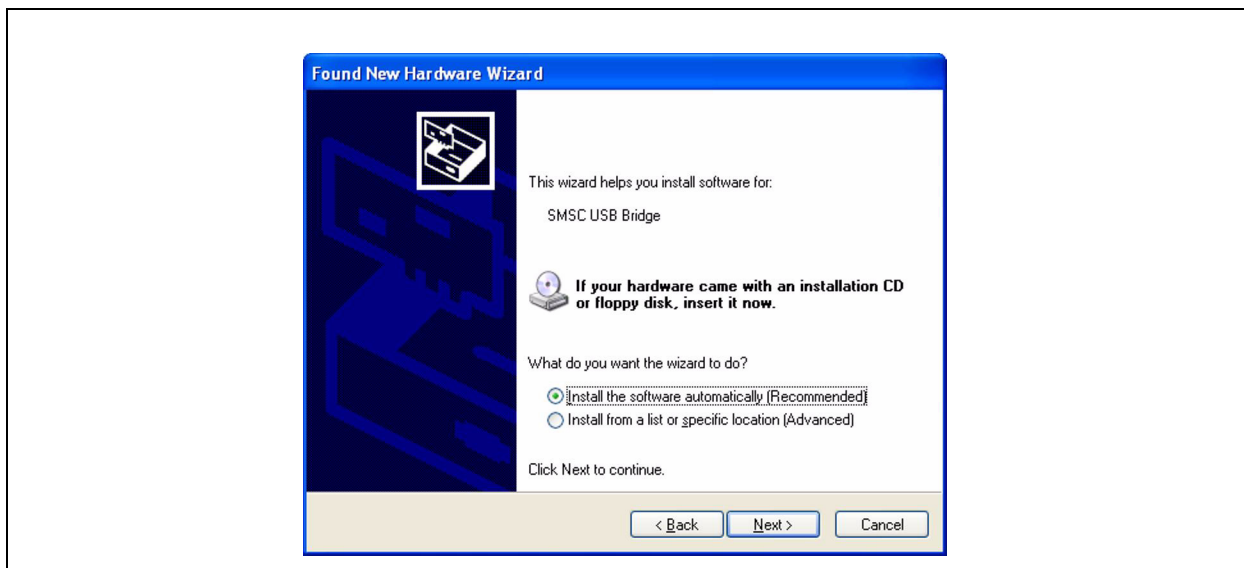


Figure 2.6 SMSC USB Bridge Driver Installation Step 2

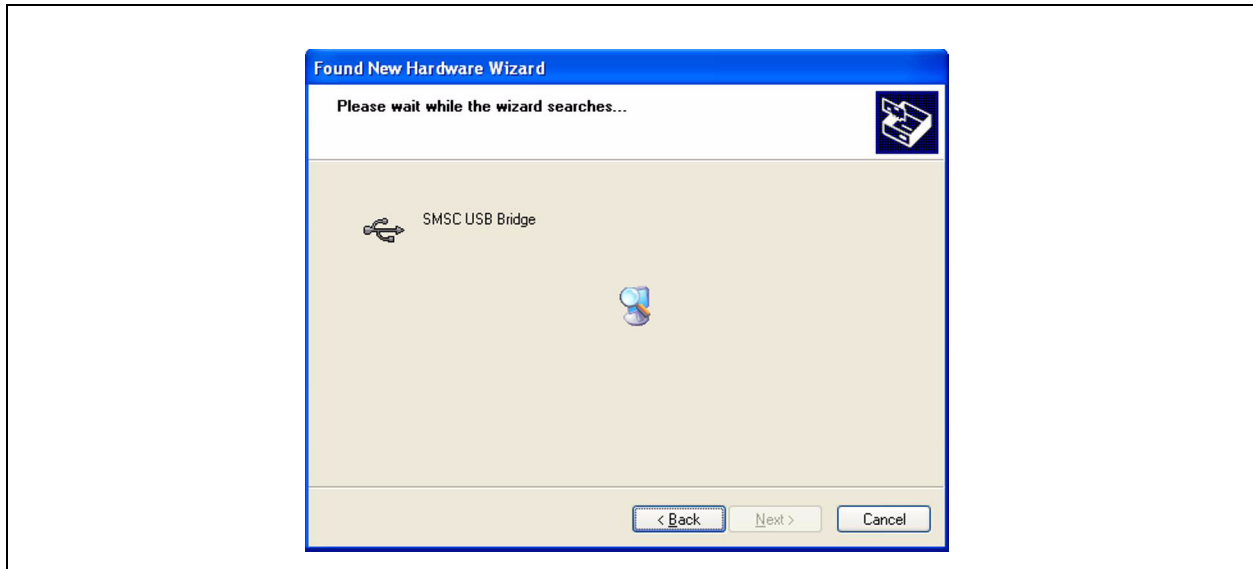


Figure 2.7 SMSC USB Bridge Driver Installation Step 3

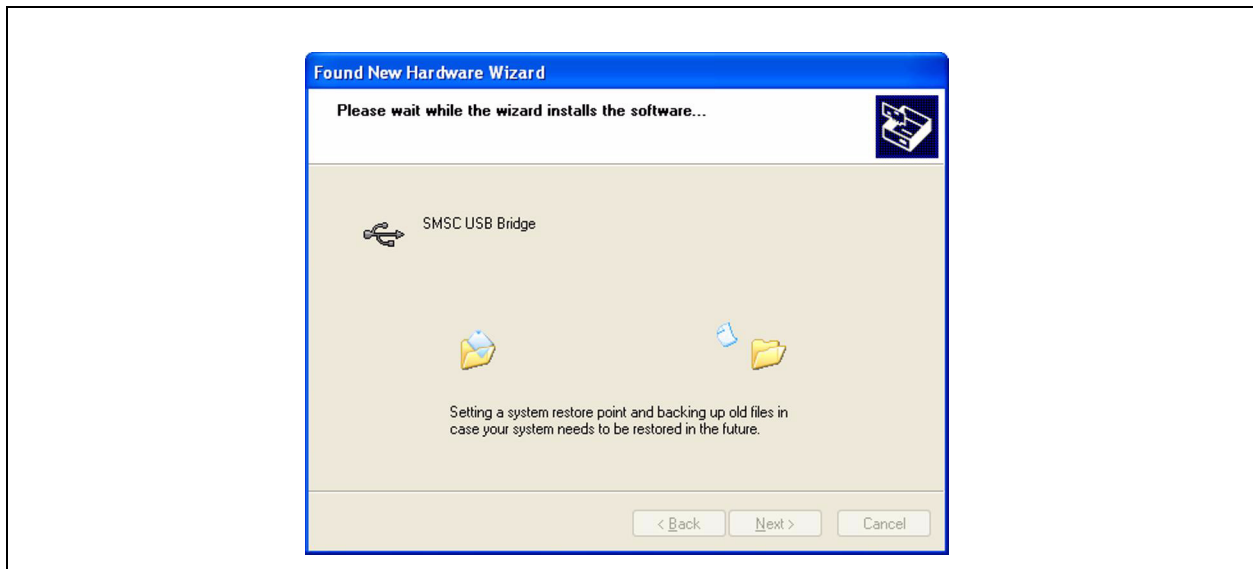


Figure 2.8 SMSC USB Bridge Driver Installation Step 4

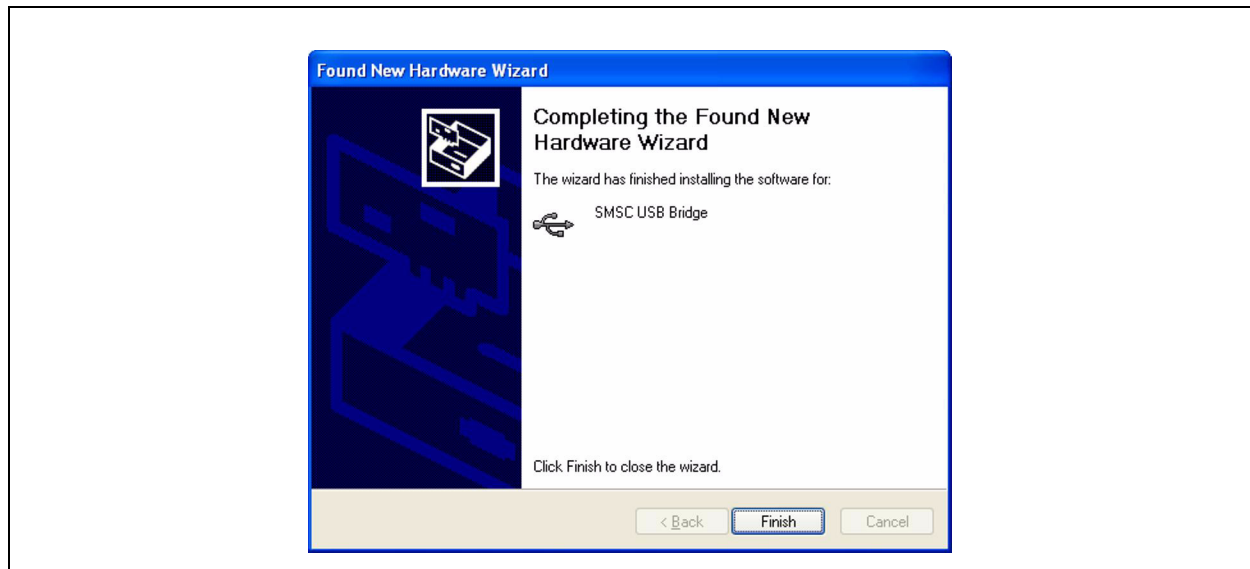


Figure 2.9 SMSC USB Bridge Driver Installation Step 5

Chapter 3 Hardware Description

3.1 UCS1002

The UCS1002 provides a single USB port power switch for precise control of up to 2.5 amperes continuous current with over current limiting, dynamic thermal management, latch / auto-recovery upon fault, selectable active low or high enable, under and over voltage lockout, and back-drive protection.

USB Charging Port profiles are integrated into the UCS1002 to assure compliance to multiple standards. In addition to power switching and USB Charging Port profiling, the UCS1002 provides automatic and configurable USB data line handshaking to enable charging of USB-IF Battery Charging 1.2 (CDP or DCP modes), YD/T-1591 (2009), Apple®, RIM®, and many other mobile devices.

The UCS1002 provides a device attachment detection output, as well as a dedicated alert output, with current monitoring, charge rationing for controlled delivery of current regardless of a host's power state. When the limit is reached, the UCS1002 will perform the user programmed behavior (report and disconnect is the default).

3.2 EVB Power Source

This EVB requires a single USB cable to operate. USB bus voltage is provided to the onboard indicator LEDs and the SMSC USB Bridge. This bridge regulates the +5V USB power to +3.3V used by the EVB circuitry.

3.3 VS 5V Power Source

A 5V power source is needed for VS to charge the portable device. This can come from a PC USB port (limited to 500mA) through a USB cable with a Standard-B plug end into the EVB, or from the 5V wall adapter provided (up to 2.5A).

3.4 USB to SMBus Bridge

The USB to SMBus bridge is based on an 8051 microcontroller with integrated USB to SMBus interfaces as well as internal flash and RAM. During EVB manufacture, firmware is loaded into the bridge that provides the interface between the USB and the SMBus. Power is sourced to the microcontroller from the USB interface.

3.4.1 Direct SMBus Connect Option

It is also possible to connect an external SMBus master to the UCS1002 EVB:

- Remove the jumpers on J16 and J18 and connect the SMBus master to pin 1 of the appropriate header. The USB connection on P3 must remain attached to provide +3.3V for the chip and indicator LEDs. Note that ground must be connected to one of the test point grounds on the EVB. See [Figure 3.1](#) for connector pins.



3.5 LED Indicators

The EVB has LED status indicators, as listed in [Table 3.1](#).

Table 3.1 LED Status Indicators

| LED | SIGNAL | OFF | GREEN | RED | YELLOW |
|-----|----------------|---|-----------------------|---|----------------------------------|
| 2 | USB Activity | No activity on USB port | N/A | NA | Activity on USB port |
| 3 | SMBus Activity | No Activity within USB-SMBus bridge | N/A | N/A | Activity within USB-SMBus bridge |
| 4 | ALERT# | $\overline{\text{ALERT}}$ pin is not asserted | N/A | $\overline{\text{ALERT}}$ pin is asserted | N/A |
| 5 | A_DET# / CHRG# | A device is not attached. | A device is attached. | N/A | N/A |

3.6 Jumper Settings

The EVB has pin headers and jumper configurations to evaluate the features of the UCS1002, as listed in [Table 3.2](#).

Table 3.2 Jumper Settings

| PIN HEADER | LABEL | DEFAULT POSITION | ALTERNATE POSITION |
|------------|----------------|---|--|
| J4 | PWR_EN | No jumper = signal high | Jumpered = signal low |
| J5 | N/A | N/A | N/A |
| J6 | EM_EN | No jumper = signal high | Jumpered = signal low |
| J7 | M1 | Jumpered = signal low | No jumper = signal high |
| J8 | M2 | Jumpered = signal low | No jumper = signal high |
| J9 | SMCLK / S0 | Open for SMBus Comms. | See Datasheet for Standalone operation |
| J10 | SMDATA / LATCH | Open for SMBus Comms. | See Datasheet for Standalone operation |
| J11 | J11 | No jumper = voltage input to power switch coming from auxiliary power input (J3) | Jumper = voltage input to power switch coming from host (J2) |
| J12 | SMBus | Applicable only to UCS1002. Jumpered pins select the corresponding resistor which selects the ILIM setting. | |
| J13 | STAND ALONE | Applicable only to UCS1001 and UCS1002 in stand-alone mode. Jumpered pins select the corresponding resistor which selects the ILIM setting. | |
| J14 | ACTIVE LOW | No jumper selected, see J17 | Install 1 jumper (J14-J17) to select an SMBus address. |
| J15 | J15 | Jumper = voltage output from power switch going to the portable device (P1) | No jumper = voltage output from power switch going to auxiliary power output (J16) |
| J16 | SDA_8051 | Jumpered = SMBus via 8051 | No jumper = external SMBus host |
| J17 | ACTIVE HIGH | Jumper = 15-16 installed = address 57h | Install 1 jumper (J14-J17) to select an SMBus address. |
| J18 | SCL_8051 | Jumpered = SMBus via 8051 | No jumper = external SMBus host |

3.7 Test Points

The EVB provides test points for ground reference and signal access, as listed in [Table 3.3](#).

Table 3.3 Test Points

| TEST POINT | SIGNAL FUNCTION MONITORED |
|------------|---------------------------|
| 1 | PWR_EN |
| 2 | N/A |
| 3 | EM_EN |
| 4 | M1 |
| 5 | M2 |
| 6 | SMCLK / S0 |
| 7 | SMDATA / LATCH |
| 8 | ALERT# |
| 9 | A_DET# / CHRG# |
| 10 | DMin |
| 11 | DPin |
| 14 | DP_out |
| 16 | DM_out |
| SGND1 | signal ground |
| SGND2 | signal ground |
| EGND1 | earth ground |
| EGND2 | earth ground |
| EGND3 | earth ground |

Follow these instructions to get the EVB running.

1. Start the UCS100X GUI software. From the Windows Start menu, select Programs > SMSC > UCS100X.
2. Connect the USB mini connector end of the cable to the EVB and the standard USB connector of the cable to any available USB port on the PC. The USB Activity LED should light, indicating that the EVB is getting power.

Chapter 5 GUI Overview

5.1 Starting the GUI and EVB

The UCS1002 EVB GUI, shown in [Figure 5.1](#), consists of 5 tabs (Main, Configuration & General Status, Custom Charging, Register Set, and Demo) as well as the right side sections that are always visible (Panel Controls, Pin State & Attach Status, and Active Mode Selection).

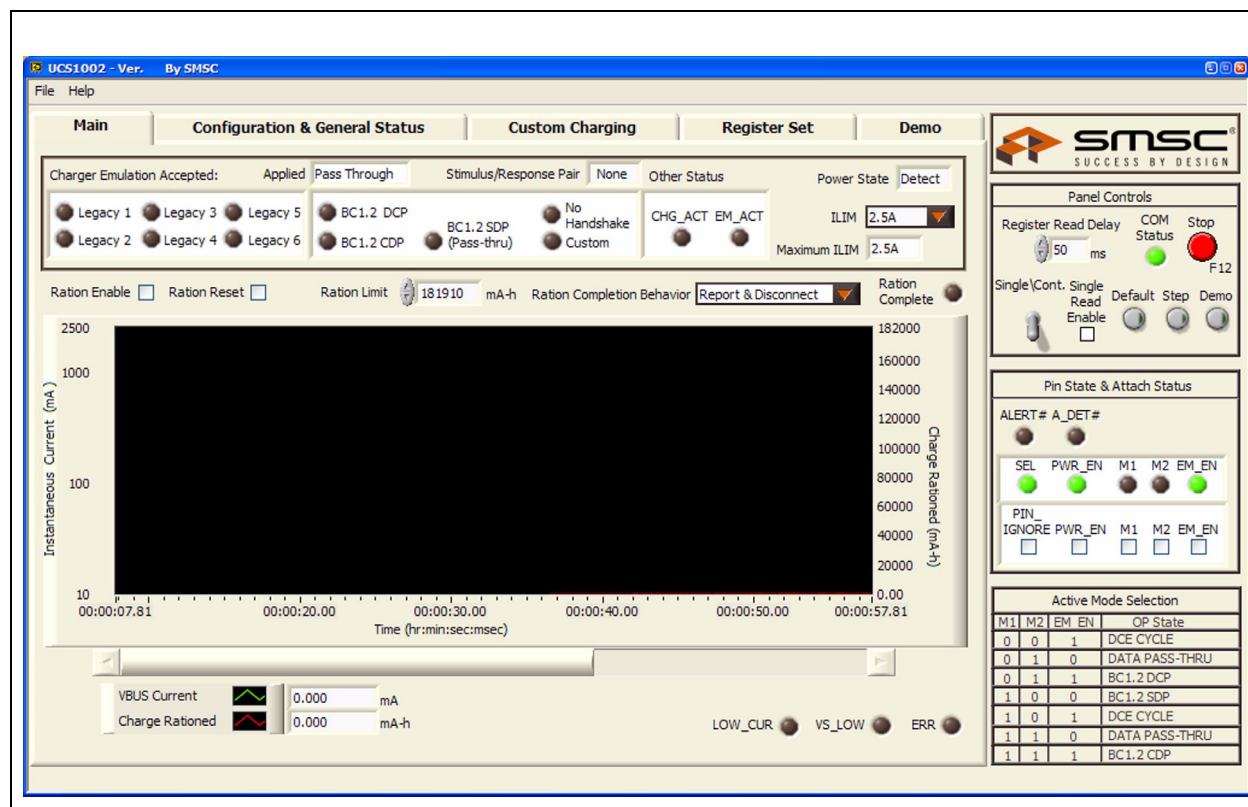


Figure 5.1 UCS1002 EVB GUI

5.2 Tips for Using the EVB GUI

- For many controls on the GUI panel, hovering the mouse cursor over a control will pop up context help that indicates the register address or gives a description. In addition, a context help window can be displayed by clicking the Help menu and then selecting Show Context Help. Display speed varies by system.
- After a power up of the EVB, the default settings are loaded. Users can save setting configurations to user-named files which can be reloaded at any time for quick re-configuration (see [Section 10.4](#), "Configuration Save and Load").
- The GUI cannot be used to demonstrate UCS1002 behavior in Stand-alone mode since SMBus communication is required.

5.2.1 GUI Abbreviations

BC = battery charging

CDP = charging downstream port

DBP = dead battery provision

DC = dedicated charger

DCE = dedicated charger emulation

DCP = dedicated charging port

EM = emulation

EM_EN = emulation enable

M1 = mode control pin number one

M2 = mode control pin number two

5.2.2 Keyboard Shortcuts

Some GUI controls have keyboard shortcuts, as shown in [Table 5.1](#).

Table 5.1 UCS1002 EVB GUI Keyboard Shortcuts

| GUI CONTROL | SHORTCUT | CONTROL DESCRIPTION |
|-------------|----------|---|
| Run | CTRL + R | Section 6.1.1, "Stop and Run Buttons" |
| Stop | F12 | Section 6.1.1, "Stop and Run Buttons" |

Chapter 6 Fixed Right Side of Panel

6.1 Panel Controls

The Panel Controls section on the right side of the GUI, shown in [Figure 6.1](#), affects GUI operation. This section is always displayed.

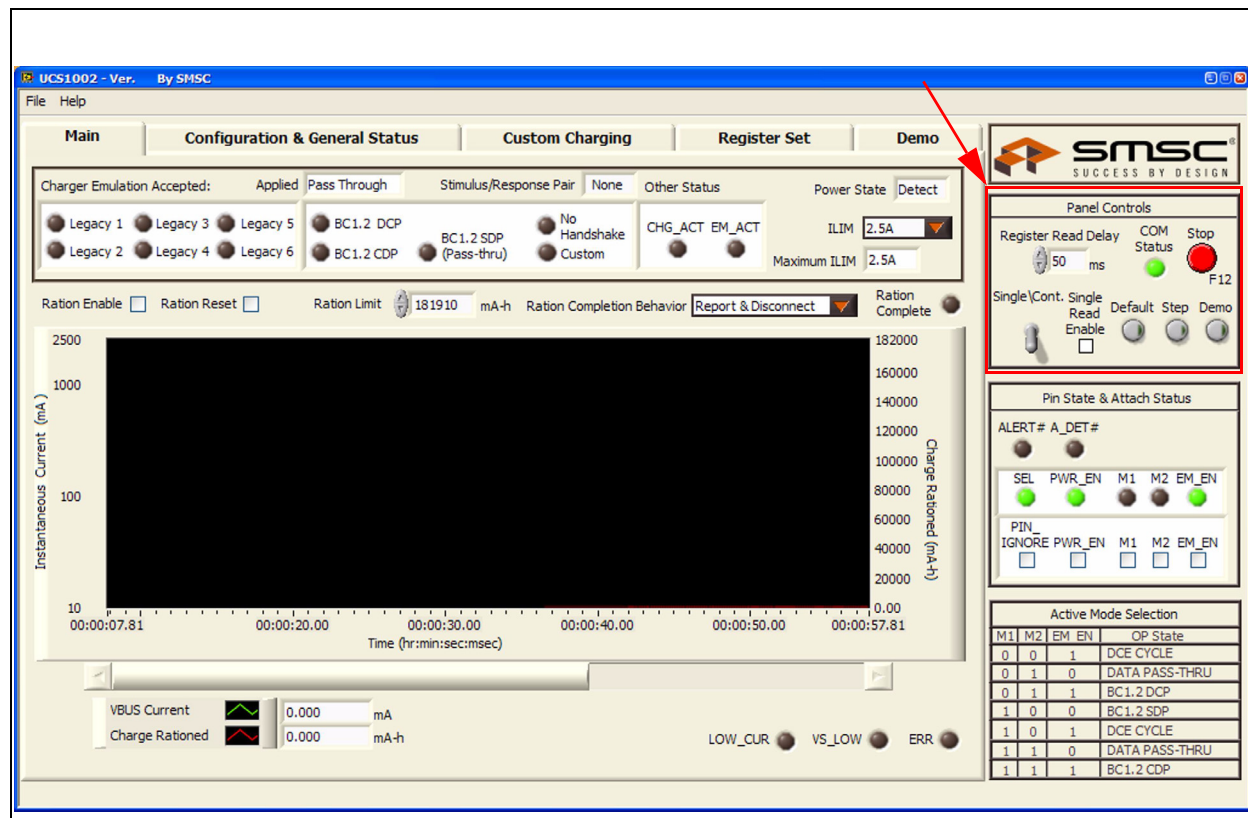


Figure 6.1 Panel Controls

6.1.1 Stop and Run Buttons

The Stop button, shown in [Figure 6.1](#), halts GUI software communication with the EVB. When this button is clicked, the Run button, which has an arrow on it, displays below the menu bar, as shown in [Figure 6.2](#).

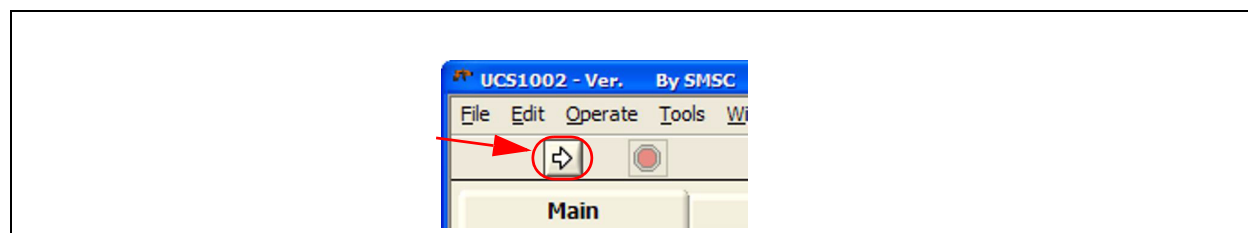


Figure 6.2 Run Button

To restart communications between the software and the EVB, click the Run button. The arrow button disappears when communications resume.

Note: Stopping and restarting the GUI do not affect register settings. To restore default register settings, disconnect power from the EVB, then reconnect power.

To close the program, use the red X in the upper right corner of the window.

6.1.2 COM Status Indicator

The COM Status indicator, on the right side of the panel shown in [Figure 6.1](#), indicates the status of communications over the SMBus. During normal operation, COM Status is green. If SMBus communications fail, COM Status turns red (or alternates red and green).

6.1.3 Register Read Delay

The Register Read Delay, shown in [Figure 6.1](#), sets the GUI control panel update speed. It affects the speed that the software reads the registers but will not affect the device's sampling time. The default is 50 ms. This number can range from 0 to 5000ms in increments of 25ms.

6.1.4 Single / Continuous Read

The panel defaults to continuous register reads (toggle switch in down position, as shown in [Figure 6.1](#)). To stop continuous register reads, click the Single Read Enable box to place an 'X' in it. In order to capture the register values at a given time, click the switch, which will briefly flip to Single Read.

6.1.5 Default

Loads the defaults to all registers of the UCS1002.

6.1.6 Step

When selected, Step will "step" through the Emulation Profiles in sequence from Legacy 1 through 6, then BC1.2 DCP, then Custom. Actual DCE cycle is slightly different, please see datasheet for more information.

6.1.7 Demo

The Demo button enables an automated routine to cycle through a user defined set of profiles and selects the highest current profile. This feature emulates an external controller and is not part of the UCS1002 device.

6.2 Pin State & Attach Status

The Pin State & Attach Status section on the right side of the GUI, shown in [Figure 6.3](#), provides a quick graphical status reference and allows physical control pin override. This section is always displayed.

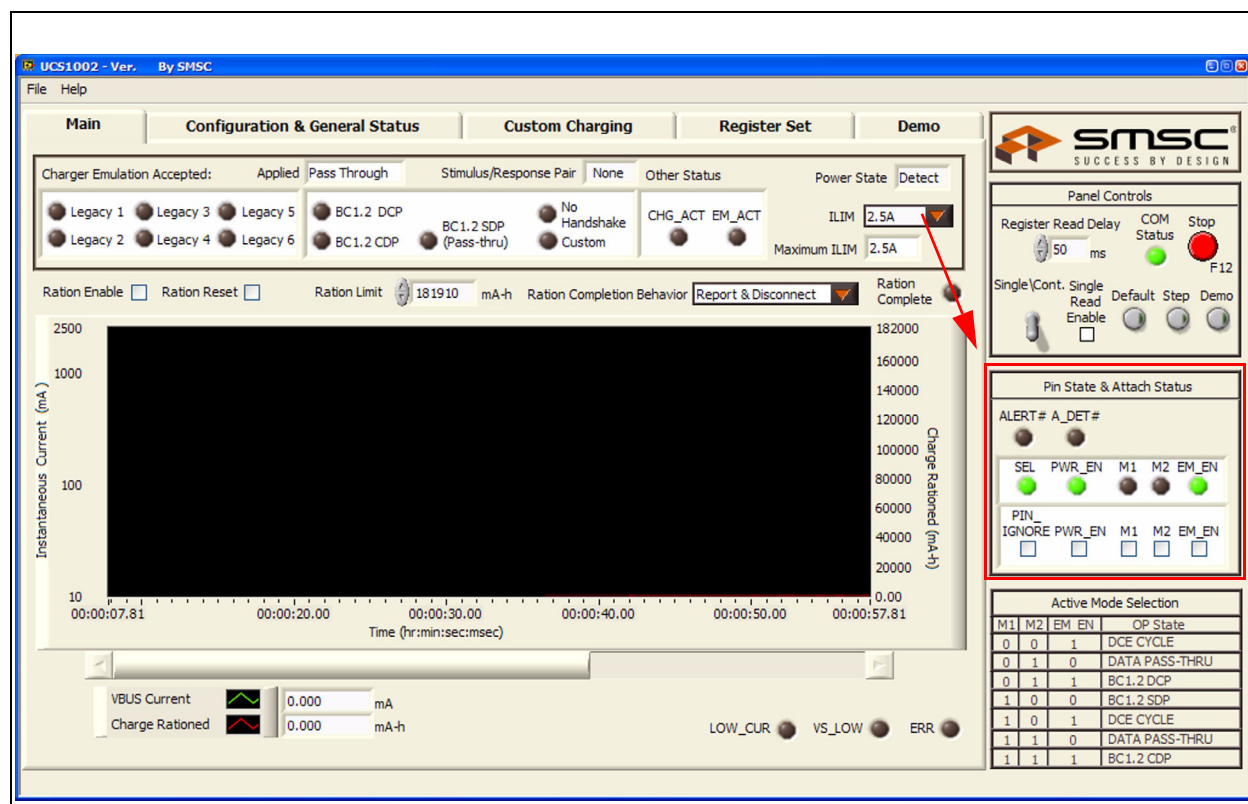


Figure 6.3 Pin State & Attach Status

6.2.1 ALERT# and A_DET# Indicators

When the ALERT# and A_DET# indicators are green, the signals at the devices respective pin are low and the corresponding condition has occurred (alert or device attached, respectively). When the indicators are dark, the pin states are high.

6.2.2 Pin Indicators

The pin indicators (SEL, PWR_EN, M1, M2, and EM_EN) shown in [Figure 6.3](#) are green if the signal on the corresponding pin on the UCS1002 device is high and dark if the signal is low. If the Pin Ignore box is checked (see [Section 6.2.3, "Pin Override"](#)), these indicators reflect the GUI overrides for these pins.

6.2.3 Pin Override

For evaluation convenience, the GUI can override the setting of the following pins on the UCS1002 device: PWR_EN, M1, M2, and EM_EN. Place a checkmark in Pin Ignore box (see [Figure 6.3](#)) to enable pin override. Then, place a checkmark in the corresponding pin box to set the value high.

Note 6.1 Pin override does not affect the actual signal on the pin. It only affects the register values.

Note 6.2 The SEL pin is only read once by the UCS1002 at power up, so there is no pin override for it. To close the port power switch, the PWR_EN state must match the SEL state (e.g., SEL = high and PWR_EN = high).

6.3 Charger Emulation Selection

The Charger Emulation Selection section on the right side of the GUI, shown in [Figure 6.4](#), provides a quick reference regarding operating state based on the values of M1, M2, and EM_EN. This section is always displayed.

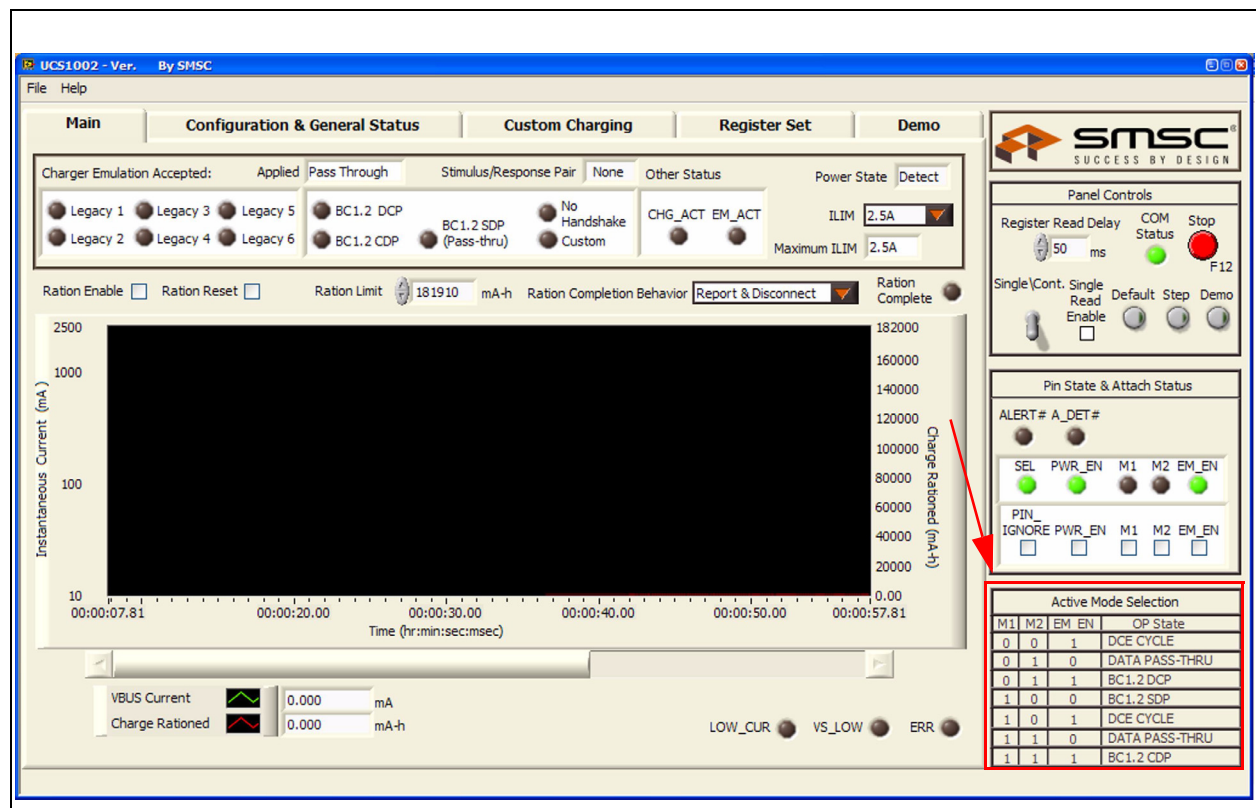


Figure 6.4 Charger Emulation Selection

Chapter 7 Main Tab

The Main Tab, shown in [Figure 7.1](#), shows key parameters related to the port power switch, including the maximum current limit, the present current limit (always equal to or less than maximum current limit), and power state (e.g. detect, active, error, etc.). When a portable device has been successfully attached, the screen shows the power state change from Detect to Active and shows the various handshakes applied. Once it is determined that the device is charging, the screen shows which emulation profile was successful, and the graph shows the charging current. Optionally, the user may monitor the charge delivered or ration the charge delivered to the attached device.

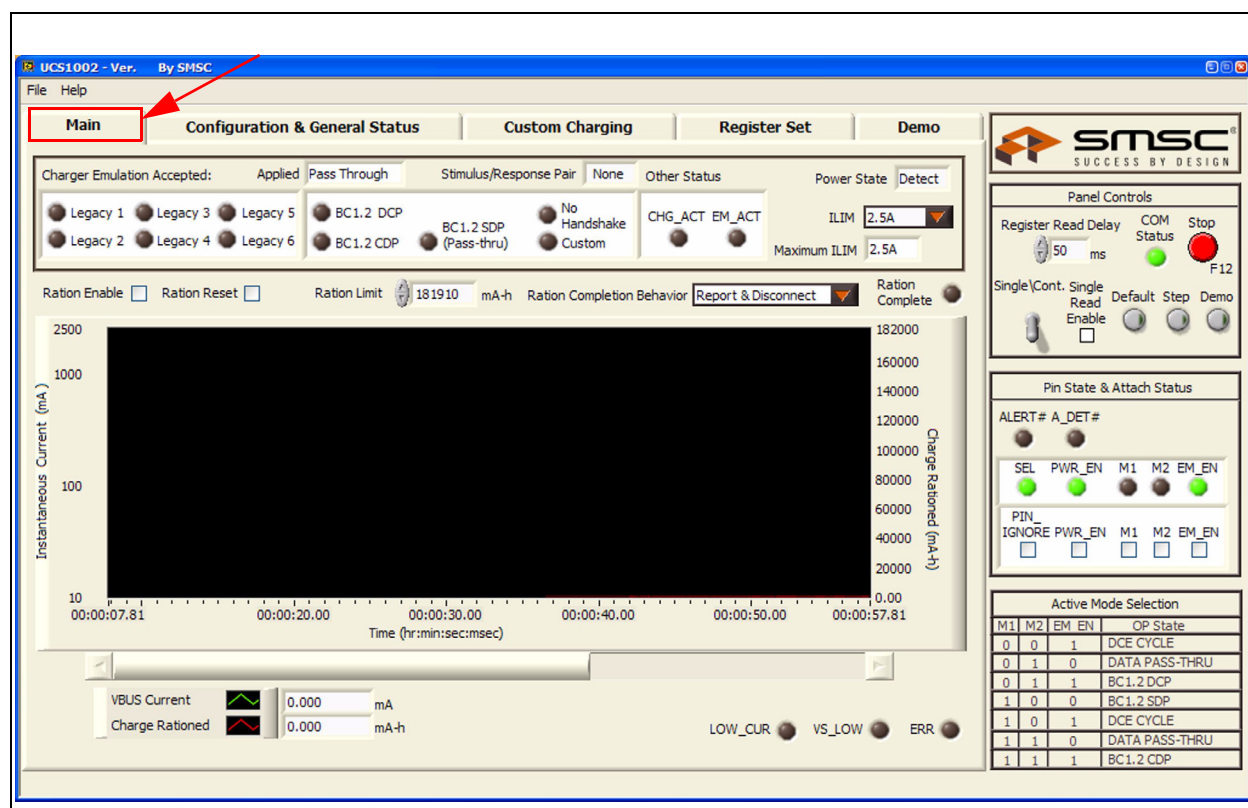


Figure 7.1 Main Tab

7.1 Dedicated Charger Emulation (DCE) Cycle

As shipped, the UCS1002 is ready to function as a dedicated charger, which will be applied when there is an attach detection. To view this behavior, perform the following:

1. Connect VS to the EVB (see [Section 3.6, "Jumper Settings"](#)). The VS Low indicator on the Main Tab must be dark. If the VS Low indicator is red, the voltage is not high enough to charge a portable device.
2. Connect a portable device to the EVB. Use the OEM USB charging cable that came with the portable device.
3. The UCS1002 should detect an attachment, switch to the Active power state, apply an emulation profile, and deliver a charge. [Figure 7.2](#) shows the GUI after charging has started.

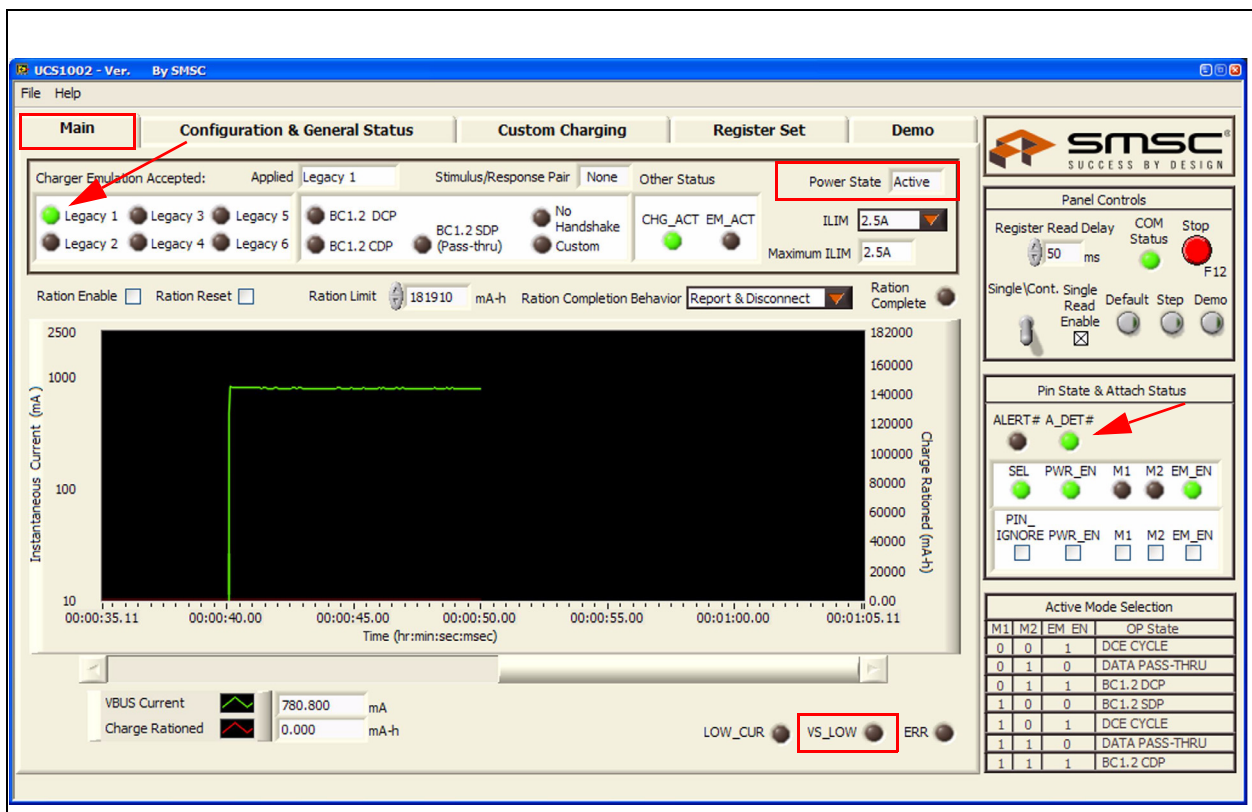


Figure 7.2 Main Tab - Charging

4. Disconnect the portable device from the EVB.
5. The UCS1002 should detect a removal, switch to the Detect power state, and stop delivering a charge. [Figure 7.3](#) shows the GUI after a removal was detected.

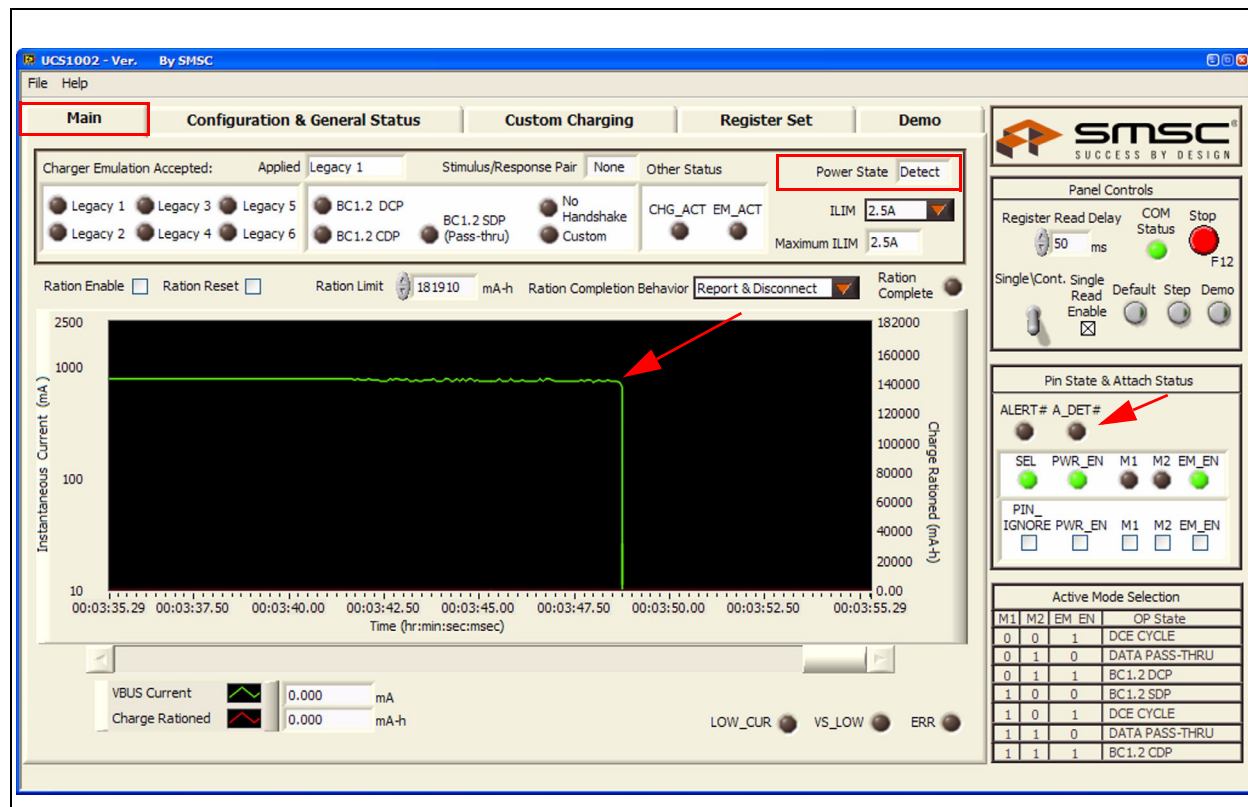


Figure 7.3 Main Tab - Removal

7.2 Charging Downstream Port (CDP)

The CDP charging profile is based on the Battery Charging standard 1.x. When a BC1.x compliant portable device attachment is detected, the UCS1002 and the portable device do handshaking based on the standard. If handshaking is successful, charging occurs up to the set current limit.

To select the CDP port power profile, M1, M2, and EM_EN must all be high. This can be done by removing the jumpers for these pins (J7, J8, and J6 respectively) or by using the pin override in the GUI (see [Section 6.2.3, "Pin Override"](#)).

7.3 Pass-Through

Data Pass-Through does not apply any type of charger emulation. When selected, it closes the USB high speed data switch and supplies current up to the current limit.

To select Data Pass-Through, M1, M2, and EM_EN can be set to any one of the two data pass-thru combinations (010 and 110), as shown in [Figure 7.4](#). This can be done by setting the jumpers for these pins (J7, J8, and J6 respectively - [Section 3.6, "Jumper Settings"](#)) or by using the pin override in the GUI (see [Section 6.2.3, "Pin Override"](#)).

| Active Mode Selection | | | | |
|-----------------------|----|----|----|----------------|
| M1 | M2 | EM | EN | OP State |
| 0 | 0 | 1 | | DCE CYCLE |
| 0 | 1 | 0 | | DATA PASS-THRU |
| 0 | 1 | 1 | | BC1.2 DCP |
| 1 | 0 | 0 | | BC1.2 SDP |
| 1 | 0 | 1 | | DCE CYCLE |
| 1 | 1 | 0 | | DATA PASS-THRU |
| 1 | 1 | 1 | | BC1.2 CDP |

Figure 7.4 Data Pass-Through Selection Options

7.4 Current Monitoring and Charge Rationing

To view current monitoring and current rationing, perform the following on the Main Tab:

1. Set a Ration Limit. The ration limit is in units of mA-h (electric charge).
2. Set Rationing Behavior. The Ration Completion Behavior defaults to "Report and Disconnect". Once the Ration Limit is reached, portable device charging will cease, the ALERT# pin will assert, and the Ration Complete bit will be set. If you do not want the system to behave in this fashion, select one of the other three options: Report, Report & Sleep, and Take No Action.
3. Connect VS to the EVB (see [Section 3.6, "Jumper Settings"](#)). The VS Low indicator on the Main Tab must be dark. If the VS Low indicator is red, the voltage is not high enough to charge a portable device.
4. Connect a portable device to the EVB. Use the OEM USB charging cable that came with the portable device.
5. Enable Rationing. Place a checkmark in the Ration Enable box on the Main Tab.
6. Watch the GUI as the device starts charging. [Figure 7.5](#) shows the GUI after the ration limit was reached (in the case of "Report & Disconnect").

Note: As shown in [Figure 7.5](#), the green trace is the instantaneous current and the red diagonal line is the charge being delivered in mA-h. Both are also presented in numeric format in the bottom left boxes. Trace color and characteristics can be change by clicking on the waveform boxes to the left of these numerical values.

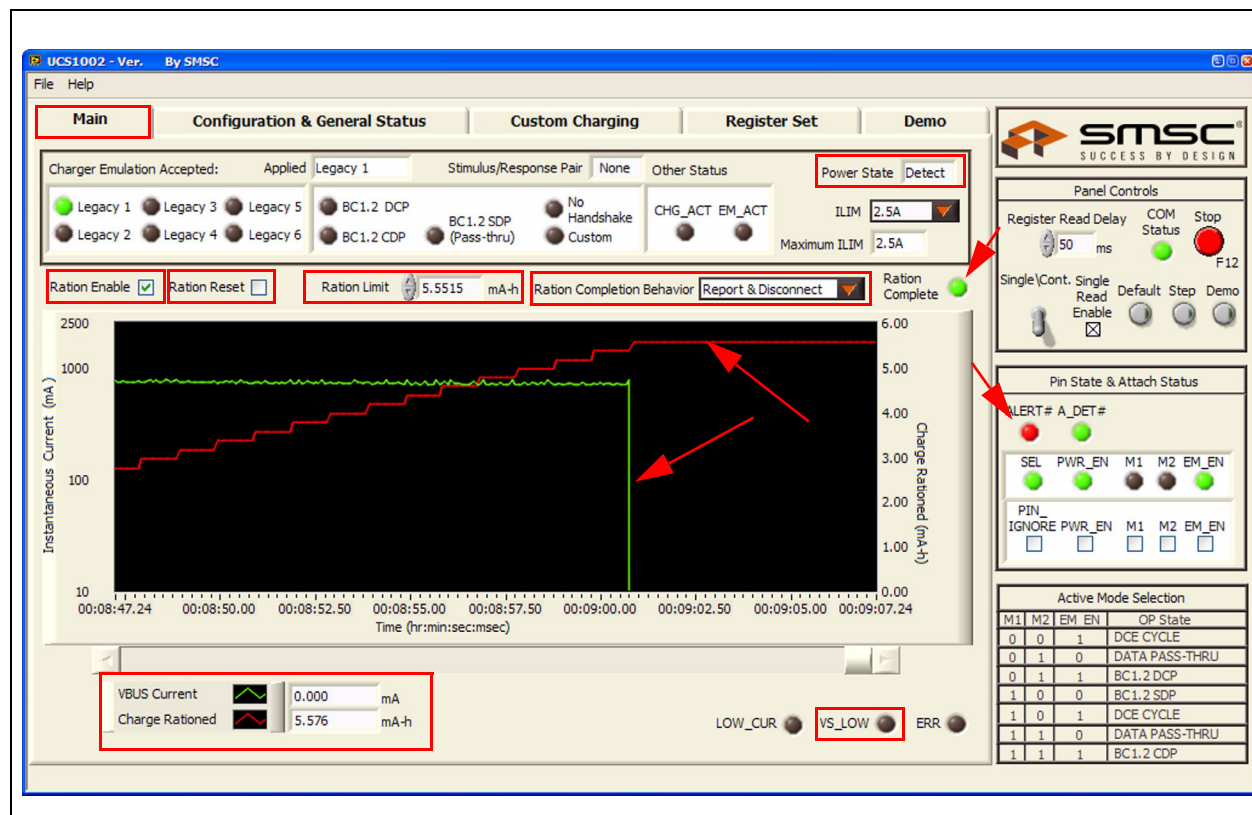


Figure 7.5 Main Tab - Ration Limit Reached

Chapter 8 Configuration & General Status Tab

The Configuration & General Status Tab, shown in [Figure 8.1](#), includes various status indicators and configuration controls. Items are grouped by function.

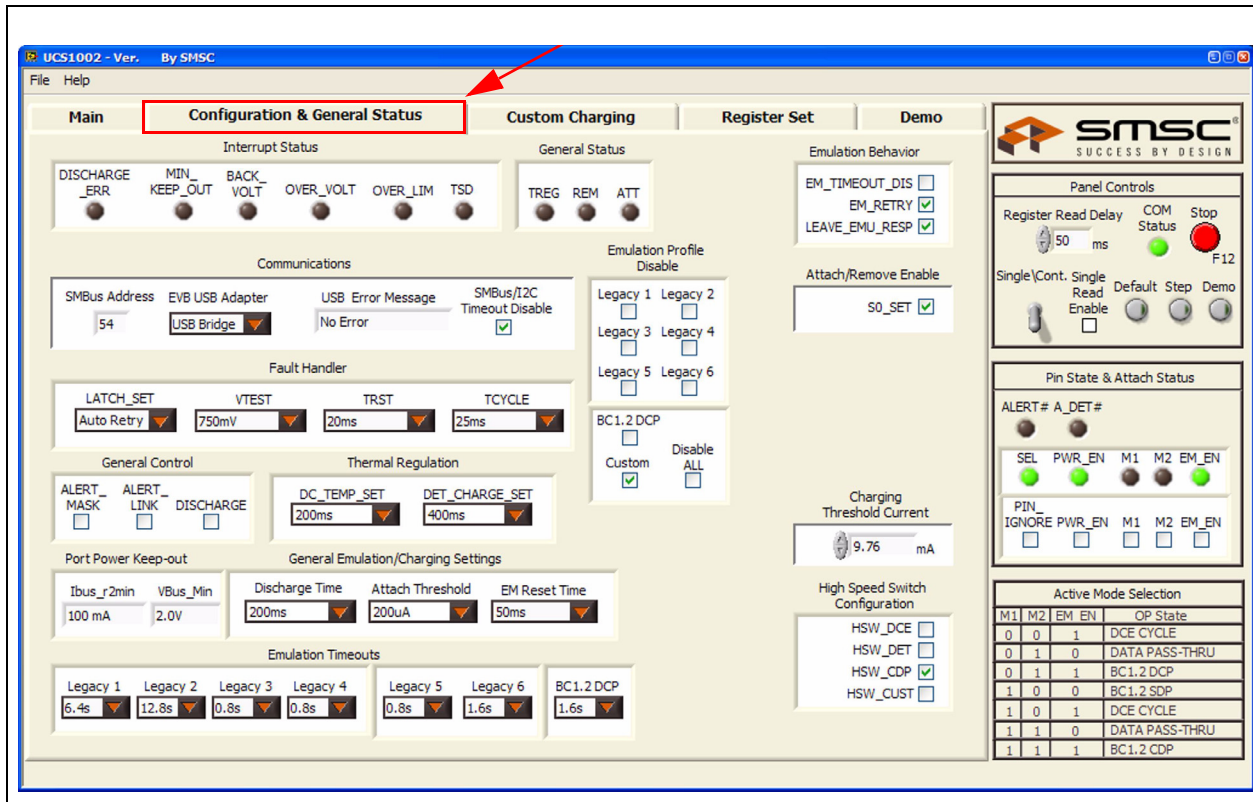


Figure 8.1 Configuration & General Status Tab

8.1 Interrupt Status

Indicators in the Interrupt Status section turn green when the corresponding bit is high and are dark when the bit is low.

8.2 General Status

Indicators in the General Status section turn green when the corresponding bit is high and are dark when the bit is low.

8.3 Emulation Behavior

Place a checkmark in a box to enable the corresponding emulation behavior.

8.4 Attach/Remove Enable

Click the S0_SET box to remove the checkmark and disable the function.

8.5 Emulation Profile Disable

Profiles corresponding to boxes with a checkmark are disabled. They will not be used during emulation. Selecting the Disable ALL will toggle ALL profile check boxes.

8.6 Communications

Controls related to SMBus and USB communications.

8.7 Fault Handler

Controls related to fault handling.

8.8 General Control

Controls for general parameters.

8.9 Thermal Regulation

Controls for thermal and detection delay parameters.

8.10 Port Power Keep-out

Displays values for the port power parameters.

8.11 General Emulation / Charging Settings

Controls for emulation and charging.

8.12 Emulation Timeouts

Sets the emulation timeout period for each profile. These timeout periods are not used if the EM Timeout Disable control in the Emulation Behavior section is checked.

8.13 Charging Threshold Current

Controls charging threshold current setting.

8.14 High Speed Switch Configuration

Controls the high speed switch parameters.

Chapter 9 Custom Charging Tab

The Custom Charging Tab, shown in Figure 9.1, provides the means for users to create custom charger emulator configurations. Custom charger configurations include signaling on the USB data lines, as well as what method of current limiting to employ (constant current or trip). For more information, please refer to the UCS1002 Datasheet and Custom Emulation application note.

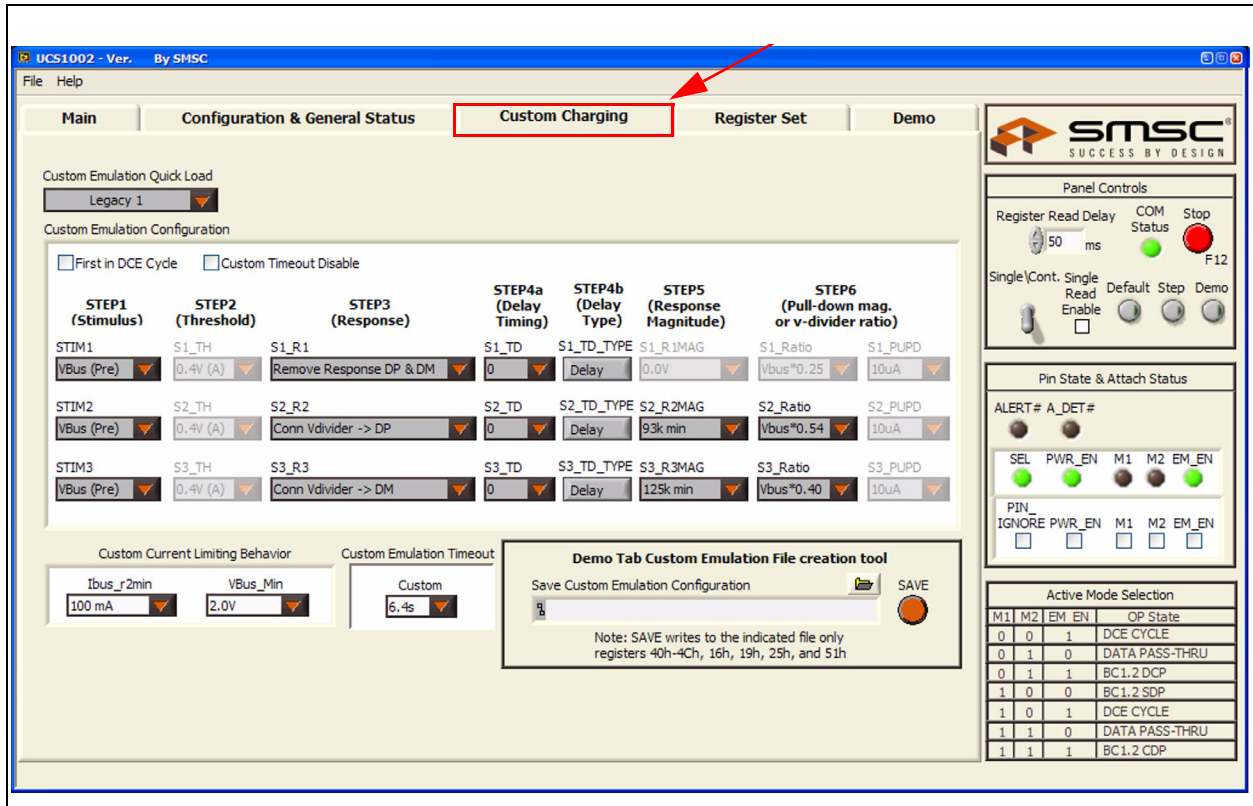


Figure 9.1 Custom Charging Tab

9.1 Custom Emulation Configuration

Creating a custom emulation profile is a two part process of entering the appropriate stimulus-response pairs in the fields provided as well as the desired current limiting behavior (after emulation is applied, and the portable device starts to draw current).

9.1.1 Example

The settings shown in Figure 9.1 will apply the Legacy 1 stimulus pair. This includes a voltage divider on DP and on DM with the values shown under STEP 5.

If the portable device draws bus current greater than the charging threshold being used, it will always operate in “trip” mode current limiting (with trip point based on the current limit setting).

To modify

9.2 Custom Current Limiting Behavior

The second part of creating custom profiles is to specify the behavior of current limiting and minimum voltage output. This is accomplished using the Ibus_r2min and Vbus_Min entry boxes shown in [Figure 9.2](#).

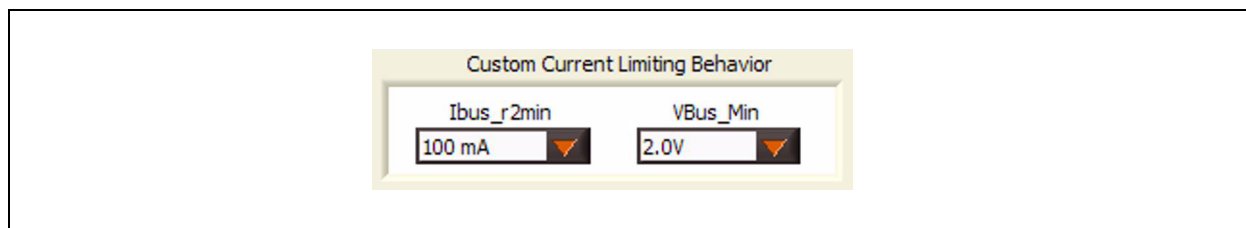


Figure 9.2 Voltage-Current Behavior

9.3 Custom Emulation Quick Load

The Custom Emulation Quick Load pull down menu allows single click loading of the Custom Emulation Configuration registers. Simply select the profile to load from the pull down menu and registers 41h-4Ch will be loaded with that profile. Emulation Timeout will also be loaded based on the settings of the corresponding Emulation Timeout on the Configuration & General Status tab.

9.4 Save Custom Emulation Configuration

Customs Emulation Configuration allows for a quick way to save to a file the necessary registers to configure the UCS1002 for a custom profile. Enter the path and press the SAVE button. Files will be overwritten if duplicate file names are used.

Registers 40h-4Ch (Custom Emulation Configuration - Custom Charging Tab), 16h (Emulation Behavior - Configuration Tab), 19h (ILIM - Main), 25h (High Speed Switch Configuration - Configuration Tab), and 51h (Custom Current Limiting Behavior - Custom Charging Tab) will be saved in a 2 column format. Comments can be added at the end of the file for documentation.

Chapter 10 Register Set Tab

The Register Set Tab, shown in [Figure 10.1](#), allows viewing and updating of the UCS1002 registers, identifies the device on the EVB, and manages configuration files.

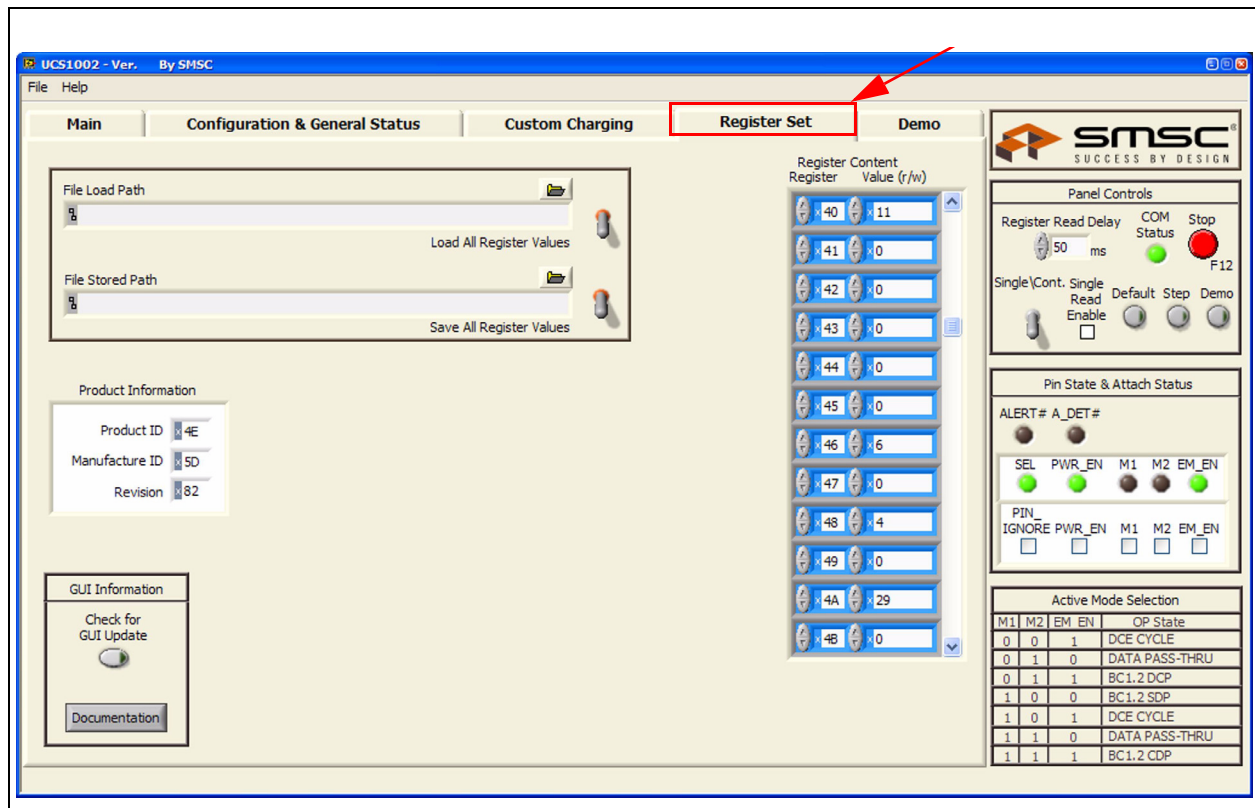


Figure 10.1 Register Set Tab

10.1 Register Content

Register Content, shown in [Figure 10.1](#), is a scrollable list of the UCS1002 registers and the current value. It is important to note that not all addresses are physical memory locations on the device; these registers will read "0". Likewise, some registers shown that are undocumented in the datasheet may have data. Editing these registers can cause unexpected results.

To update a register value, locate the register address in the left column, type the new value in the corresponding cell in the right column, and press the Enter key on the keyboard or click on another part of the GUI.

10.1.1 Numbering Systems Views

The Register Content section allows values to be displayed using different numbering systems: Decimal, Hex, Octal, Binary or SI Notation.

To view a value using a different numbering system, click the indicator to the left of the value in the cell, shown circled in [Figure 10.2](#).

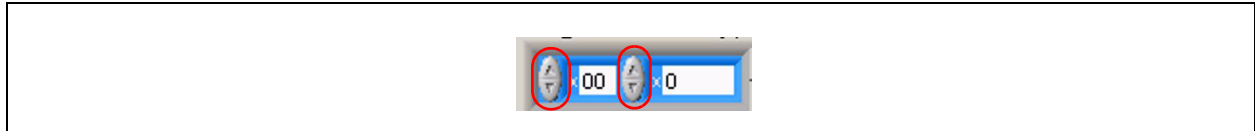


Figure 10.2 Numbering System Indicators

10.2 Product Information

Product Information, shown in [Figure 10.1](#), shows the values of three registers (FDh, FEh, and FFh) which identify the device on the EVB.

10.3 GUI Information

Check for GUI Update requires an internet connection. When pressed it will check with SMSC if the current version is up to date and will automatically download a zip file if out of date.

The Documentation button will launch a Windows file viewer opening the local folder containing the current EVB documentation.

10.4 Configuration Save and Load

The Register Set Tab contains controls, shown in [Figure 10.3](#), which save the settings currently configured in the UCS1002 to allow quick re-configuration at any time.

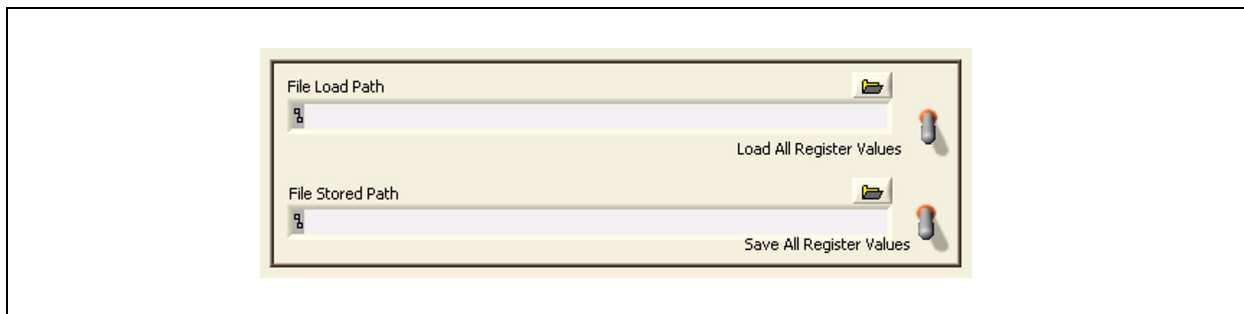


Figure 10.3 Save / Load Section

To save configuration settings, configure the UCS1002 as desired, then display the Register Set Tab. In the File Stored Path box, type in a path, or select the folder icon to use a Windows-based navigation aid to select the folder where the configuration file will be saved. The file should be named with the extension “.txt” or similar text file format. Once a file name and location has been chosen, click the “Save All Register Values” switch, and the file is saved.

Note: If a file with the same name already exists, the file will be overwritten and old data will be lost.

The data is saved in 2 columns separated by tabs. The first column is the register address and the second column is the register data.

Once a file is saved, it can be recalled at any time by selecting the file in the File Load Path box and clicking the “Load All Register Values” switch.

Chapter 11 Demo Tab

The Demo Tab, shown in Figure 11.1, demonstrates external controller logic to apply custom emulation profiles and optimize charging current. This feature uses the LabView engine to step through the selected files and store the current drawn by the device. Several options are available to customize the operation of the demo and explore the potential of the UCS1002.

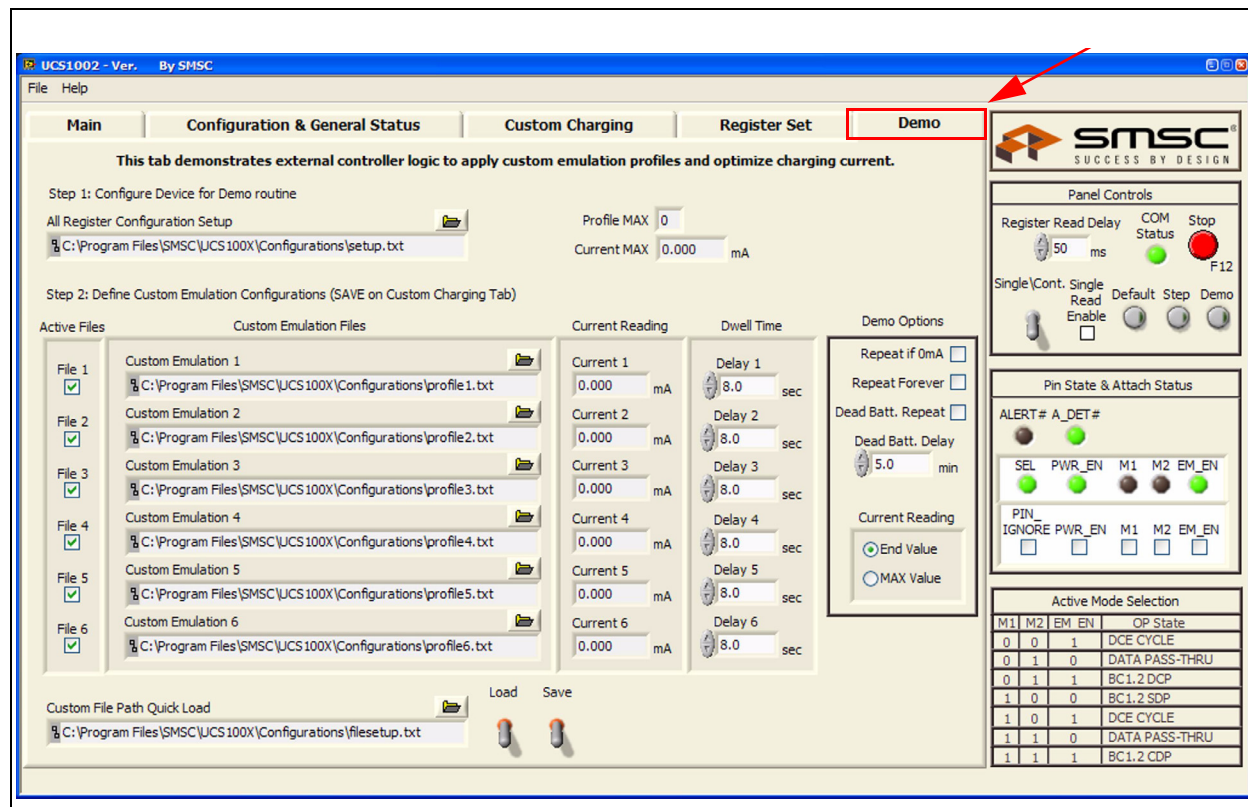


Figure 11.1 Demo Tab

11.1 Step 1: Configure Device for Demo Routine

The first step in preparing to run the Demo feature is to configure the device to the desired starting configuration. A file has been pre-loaded at installation that can be used, or a new configuration can be created. Each time the Demo button (in the Panel Control section) is toggled, the Configuration Setup file will be loaded.

11.2 Step 2: Define Custom Emulation Configurations

At installation a set of files are pre-loaded on the users system (profile1.txt-profile6.txt) with the default profiles of the UCS1002. These files can be changed easily by using the Custom Charging tab.

11.2.1 Active Files

A check in the box will activate that profile in the demo routine.

11.2.2 Custom Emulation Files

This contains the full path to the profile file to be loaded. This file should contain registers 40h-4Ch, 16h, and 25h. This file can be created with the GUI on the Custom Charging tab.

11.2.3 Current Reading

This displays the current being drawn from the attached device. If End Value is selected, this will update continuously. If MAX Value is selected, this will store the highest value of current during the dwell time.

11.2.4 Dwell Time

Dwell Time defines the amount of time from PWR_EN set to PWR_EN unset. The default is 8 seconds which has been found to work with most devices and profiles. Each profile can have a different Dwell Time.

11.3 Demo Options

- Repeat if 0mA: when set will repeat if all of the profiles read 0mA, i.e. no device connected
- Repeat Forever: when set will repeat the set of files until unchecked.
- Dead Batt. Repeat: when set will start the demo after the initial cycle after the specified Dead Batt. Delay time. This is useful when the battery is completely discharged and the device OS is unable to handshake with UCS1002.
- Dead Batt. Delay: defined in minutes. Minimum is 0 minutes, maximum is 10 minutes.
- Current Reading: Select either the End Value (last value before PWR_EN set low) or MAX Value (highest value during Dwell Time).

11.4 Custom File Path Quick Load

When starting the UCS1002 GUI, the file paths are reset to a default path. If desired, the user may save the files in an alternate location. This Quick Load feature saves the paths of the Configuration Setup and all 6 profile locations to quickly return or change files with one click.

11.5 Running the Demo

Once the files and settings are configured as desired, enable the Demo routine by pressing the Demo switch within the Panel Controls area. Once pressed, the routine begins and the results are displayed in Profile MAX and Current MAX. By default the Demo routine will enable the profile that is indicated by Profile MAX.

- Profile MAX: Stores the profile of the highest value of current draw.
- Current MAX: Stores the highest current associated with the Profile MAX #.

Note: The Demo Tab does not need to be visible to activate the Demo routine.

Chapter 12 Troubleshooting

12.1 GUI Controls Unresponsive After Installation

Restart the computer. In some cases, a restart is required after installation.

12.2 GUI Freezes

If the GUI freezes for unknown reasons, communications cannot be stopped, and the program cannot be closed, disconnect the USB cable from the EVB, then close the program. Reconnect the EVB, then restart the GUI.

12.3 Random Panel Display

When an EVB is not connected to the PC running the GUI, the panel will be in an all zero register displayed state. This also occurs when SMBus communications are disconnected. The panel display is not meaningful. Connect the EVB and establish SMBus communications. If this still doesn't work, there's a problem with the connection. The cable or the USB port could be bad.

12.4 Device Is Not Charging or Not Charging Optimally

- Check current limit jumper is set appropriately.
- The current source may not have high enough capacity from VS.
- Run the Demo routine to determine highest current profile.

Chapter 12 Revision History

Table 12.1 Customer Revision History

| REVISION LEVEL & DATE | SECTION/FIGURE/ENTRY | CHANGE |
|-----------------------|---|--|
| Rev. 1.1 (09-30-11) | Section 2.1 | Removed GUI selection. |
| Rev. 1.0 (09-14-11) | Updated all sections. | Updates for Ver 3.0 of GUI and B1 of EVB. |
| Rev. 0.2 (09-01-11) | Updated Table 3.2 Jumper Settings | Swapped positions between Default and Alternate for M1, M2, and EM_EN jumpers. |
| Rev. 0.1 (07-07-11) | Updated screen shots for Config & Gen Status | Replaced. |
| Rev. 0.09 (06-20-11) | Updated screen shots for selector and Config & Gen Status | Replaced. |
| Rev. 0.08 (06-17-11) | Updated screen shots. | Replaced. |
| Rev. 0.07 (06-16-11) | Split LEDs and Connector section, added data test points and ground test point sections. Described legacy 1 in Custom Section 9.1 | Added. |
| Rev. 0.06 (06-16-11) | Updated all for Rev 2.0 of panel and B0 silicon | Added. |
| Rev. 0.05 (05-20-11) | Figure 3.1, "UCS100X to SMBus Bridge Jumpers" | Added. |
| Rev. 0.04 (04-07-11) | Initial release | |