

PMBus™ Monitoring Graphical User Interface User's Guide

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Object of Declaration: PMBus™ Monitoring Graphical User Interface

EU Declaration of Conformity

Manufacturer: Microchip Technology Inc.
2355 W. Chandler Blvd.
Chandler, Arizona, 85224-6199
USA

This declaration of conformity is issued by the manufacturer.

The development/evaluation tool is designed to be used for research and development in a laboratory environment. This development/evaluation tool is not a Finished Appliance, nor is it intended for incorporation into Finished Appliances that are made commercially available as single functional units to end users under EU EMC Directive 2004/108/EC and as supported by the European Commission's Guide for the EMC Directive 2004/108/EC (8th February 2010).

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This development/evaluation tool, when incorporating wireless and radio-telecom functionality, is in compliance with the essential requirement and other relevant provisions of the R&TTE Directive 1999/5/EC and the FCC rules as stated in the declaration of conformity provided in the module datasheet and the module product page available at www.microchip.com.

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Derek Carlson
VP Development Tools

12-Sep-14
Date

NOTES:

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Preface

NOTICE TO CUSTOMERS

All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our web site (www.microchip.com) to obtain the latest documentation available.

Documents are identified with a "DS" number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is "DSXXXXXXXXA", where "XXXXXXXX" is the document number and "A" is the revision level of the document.

For the most up-to-date information on development tools, see the MPLAB® IDE online help. Select the Help menu, and then Topics to open a list of available online help files.

INTRODUCTION

This chapter contains general information that will be useful to know before using the PMBus™ Monitoring Graphical User Interface. Items discussed in this chapter include:

- Document Layout
- Conventions Used in This Guide
- Warranty Registration
- Recommended Reading
- The Microchip Web Site
- Development Systems Customer Change Notification Service
- Customer Support
- Document Revision History

DOCUMENT LAYOUT

This document describes how to use the PMBus™ Monitoring Graphical User Interface as a development tool to emulate and debug firmware on a target board. The manual layout is as follows:

- **Chapter 1. "Product Overview"** – Contains important information about the PMBus™ Monitoring Graphical User Interface
- **Chapter 2. "Installation and Operation"** – Covers the initial setup of the PMBus™ Monitoring Graphical User Interface
- **Chapter 3. "Graphical User Interface Description"** – Describes the Graphical User Interface
- **Chapter 4. "Using the PMBus Graphical User Interface"** – Covers the operation of the PMBus™ Monitoring Graphical User Interface

CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Arial font:		
Italic characters	Referenced books	*MPLAB® IDE User's Guide*
	Emphasized text	...is the *only* compiler...
Initial caps	A window	the Output window
	A dialog	the Settings dialog
	A menu selection	select Enable Programmer
Quotes	A field name in a window or dialog	"Save project before build"
Underlined, italic text with right angle bracket	A menu path	*File>Save*
Bold characters	A dialog button	Click **OK**
	A tab	Click the **Power** tab
N'Rnnnn	A number in verilog format, where N is the total number of digits, R is the radix and n is a digit.	4'b0010, 2'hF1
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>
Courier New font:		
Plain Courier New	Sample source code	`#define START`
	Filenames	`autoexec.bat`
	File paths	`c:\mcc18\h`
	Keywords	`_asm, _endasm, static`
	Command-line options	`-Opa+, -Opa-`
	Bit values	`0, 1`
	Constants	`0xFF, 'A'`
Italic Courier New	A variable argument	*`file`*`.o`, where *`file`* can be any valid filename
Square brackets [ ]	Optional arguments	`mcc18 [options]` *`file`* `[options]`
Curly brackets and pipe character: { | }	Choice of mutually exclusive arguments; an OR selection	`errorlevel {0|1}`
Ellipses...	Replaces repeated text	`var_name [, var_name...]`
	Represents code supplied by user	`void main (void) { ... }`

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Please complete the enclosed Warranty Registration Card and mail it promptly. Sending in the Warranty Registration Card entitles users to receive new product updates. Interim software releases are available at the Microchip web site.

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RECOMMENDED READING

This user's guide describes how to use the PMBus™ Monitoring Graphical User Interface. Other useful documents are listed below. The following Microchip documents are available and recommended as supplemental reference resources:

MCP19110/11 Data Sheet (DS20002331)

This data sheet describes the operation and features of the MCP19110/11 digitally-enhanced power analog controller with integrated synchronous driver.

MCP19111 PMBus™ Protocol-Enabled Point-of-Load (POL) Converter Reference Design User's Guide (DS50002379)

This user's guide describes how to use the MCP19111 PMBus protocol-enabled POL converter reference design.

TB3139, MCP19111 PMBus™ Firmware Technical Brief (DS90003139)

This technical brief describes how to use the MCP19111 PMBus firmware.

MCP2221 Breakout Module User's Guide (DS50002282)

This technical brief describes how to use the MCP19111 PMBus firmware.

PMBus Specification

This specification can be found at: http://www.pmbus.org.

THE MICROCHIP WEB SITE

Microchip provides online support via our web site at www.microchip.com. This web site is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, the web site contains the following information:

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- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

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The Development Systems product group categories are:

- **Compilers** – The latest information on Microchip C compilers, assemblers, linkers and other language tools. These include all MPLAB® C compilers; all MPLAB assemblers (including MPASM™ Assembler); all MPLAB linkers (including MPLINK™ Object Linker); and all MPLAB librarians (including MPLIB™ Object Librarian).
- **Emulators** – The latest information on Microchip in-circuit emulators.This includes the MPLAB REAL ICE™ and MPLAB ICE 2000 In-Circuit Emulators.
- **In-Circuit Debuggers** – The latest information on Microchip in-circuit debuggers. This includes MPLAB ICD 3 In-Circuit Debugger and PICkit™ 3 Debug Express.
- **MPLAB® IDE** – The latest information on Microchip MPLAB IDE, the Windows® Integrated Development Environment for development systems tools. This list is focused on the MPLAB IDE, MPLAB IDE Project Manager, MPLAB Editor and MPLAB SIM Simulator, as well as general editing and debugging features.
- **Programmers** – The latest information on Microchip programmers. These include production programmers, such as MPLAB REAL ICE In-Circuit Emulator, MPLAB ICD 3 In-Circuit Debugger and MPLAB PM3 Device Programmer.

CUSTOMER SUPPORT

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or field application engineer (FAE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

Technical support is available through the web site at:
http://www.microchip.com/support

DOCUMENT REVISION HISTORY

Revision A (August 2015)

- Initial Release of this Document.

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Chapter 1. Product Overview

1.1 INTRODUCTION

The PMBus™ Monitoring Graphical User Interface (PMBMonitor GUI) is a universal user interface that can be used with any device that has a Power Management Bus (PMBus) protocol incorporated. For the purpose of this user's guide, the MCP19111 PMBus™ Protocol-Enabled POL Converter Reference Design board (ARD00609) has been used.

1.2 THE DEVELOPMENT SYSTEM'S COMPONENTS

To use the GUI, the following tools are required:

- PMBus™ Monitoring Graphical User Interface: This Graphical User Interface allows monitoring and changing input and output parameters for any device that has a PMBus protocol incorporated.
- PICkit™ Serial Analyzer: PICkit is recommended as a communication tool to configure the board; it is available for purchase on microchipDIRECT.
- MCP2221 Breakout Module (ADM00559): This board is available from Microchip and provides a method to evaluate/demonstrate the capabilities of the PMBus™ Monitoring Graphical User Interface. This device allows I/O control and custom device configuration. The MCP222X device can be incorporated on board (e.g., evaluation board).

In order to connect the GUI to the device, a PICkit Serial Analyzer or an MCP2221 Breakout Module must be used, as described in **Chapter 2. "Installation and Operation"**. If the device has standard PMBus commands implemented, the interface can collect basic data from the device. Values, such as the output voltage, the input voltage, the output current, the temperature, as well as the corresponding thresholds, can be modified using the PMBus™ Monitoring Graphical User Interface. The time evolution of the output and input voltage, output current and temperature can be analyzed using the graphs provided by the interface.

NOTES:

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Chapter 2. Installation and Operation

2.1 GETTING STARTED

In order to install, use and evaluate the product, there are several software and hardware tools required to be installed and/or set.

2.1.1 Required Software

- PMBus Monitoring GUI (v.1.0)
- Microsoft® .NET Framework 4.5 or Higher
- Adobe® Reader
- Windows® 7

2.1.2 Required Hardware

2.1.2.1 CONNECTED BOARDS

- MCP19111 PMBus™ Protocol-Enabled POL Converter Reference Design (ARD00609)

  or
- Any board that supports the PMBus protocol

NOTICE

The PMBus™ Monitoring Graphical User Interface must be used with the MCP19111 PMBus™ Protocol-Enabled POL Converter Reference Design board (ARD00609), or any other board with the PMBus protocol implemented, connected to the PC. Otherwise, the PMBus™ Monitoring Graphical User Interface will not be completely functional.

2.1.2.2 COMMUNICATION TOOLS

- PICkit™ Serial Analyzer, Firmware Revision 0x0305 or newer

  or
- MCP2221 Breakout Module

Note: The board connected to the PC might have the adapter incorporated. In this case, no other adapter is required, only a USB cable is needed. Please refer to the board user's guide.

2.2 GRAPHICAL USER INTERFACE INSTALLATION

The following steps describe how to install the PMBus™ Monitoring Graphical User Interface.

1. If Microsoft .NET Framework is already installed, go to Step 3. If not, download Microsoft .NET Framework from www.microsoft.com and follow the installation instructions.
2. If Adobe Reader is already installed, go to Step 3. If not, download Adobe Reader from http://get.adobe.com/reader/ and follow the installation instructions.
3. Download the PMBus Monitoring GUI (v.1.0) archive from www.microchip.com/mcp19111, under "Documentation & Software".
4. Unzip the PMBus Monitoring GUI (v.1.0) archive, which contains the `setup.exe` file.

Note: If an older version or a corrupted version of the current PMBMonitor is already installed on the computer, please see **Section 2.4 "PMBMonitor Software Uninstall"** before proceeding with the installation.

5. Double click on the `setup.exe` file to open the InstallShield Wizard window and wait for the extraction to complete. If required, the installation can be stopped by pressing the **Cancel** button.

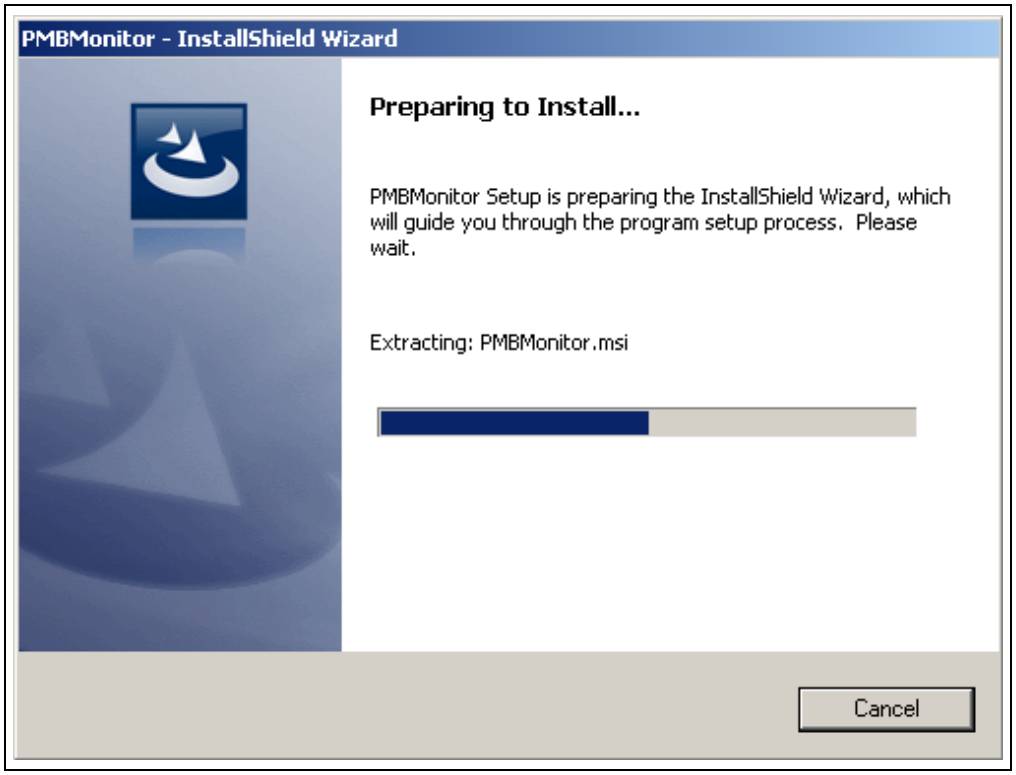


FIGURE 2-1: *Preparing the InstallShield Wizard for the PMBMonitor.*

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6. In the Welcome to the InstallShield Wizard for PMBMonitor window, click on the **Next** button to start the installation.

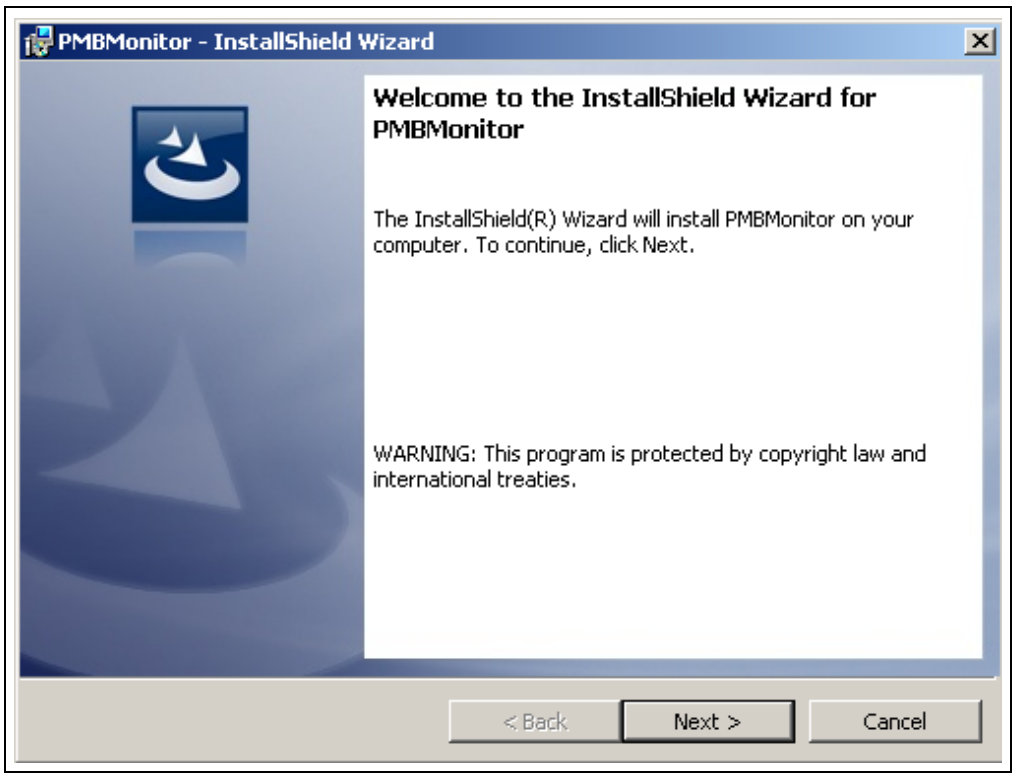


FIGURE 2-2: *Starting the PMBMonitor Installation.*

7. Review and accept the License Agreement by checking the **I accept the terms in the license agreement** option button, then click on the **Next** button.

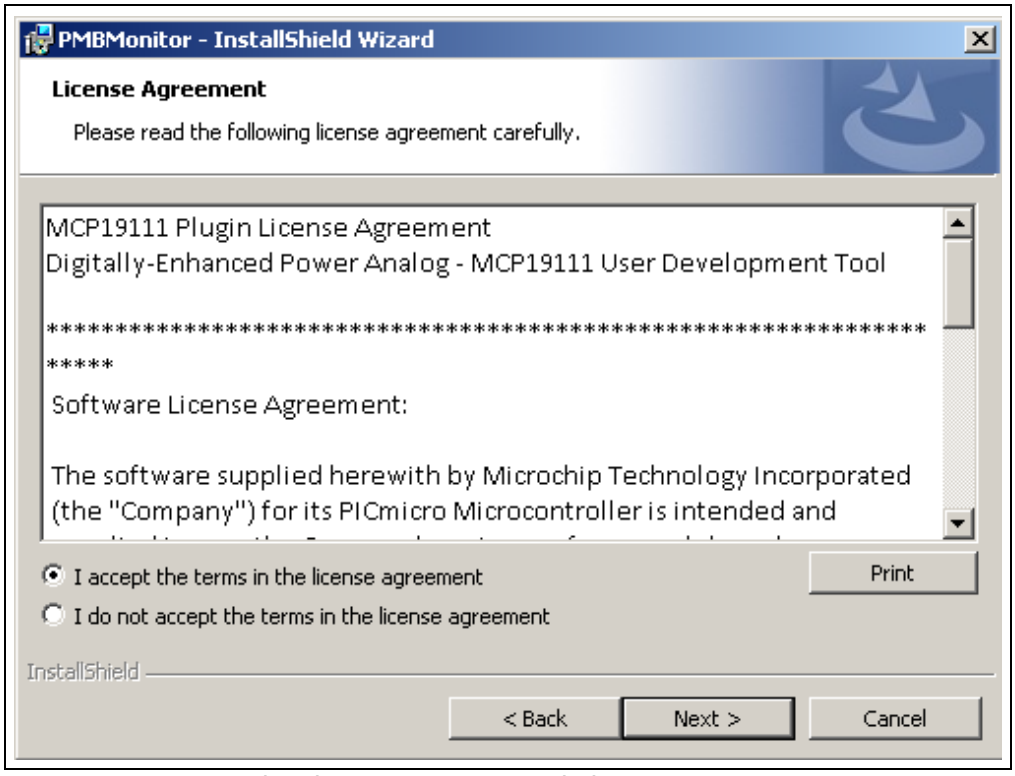


FIGURE 2-3: *The License Agreement Window.*

8. The installation path can be changed, although it is recommended to keep the default path. Click on the **Next** button to continue.

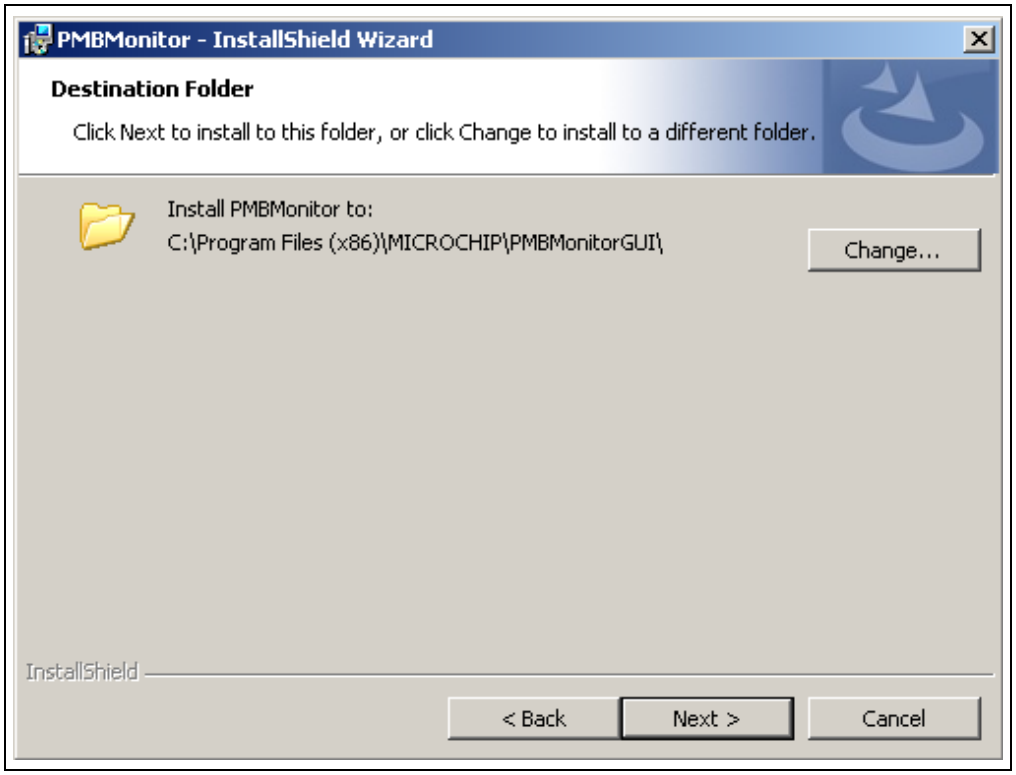


FIGURE 2-4: *Selecting the Destination Folder.*

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9. In the Ready to Install the Program window, click on the **Install** button and wait for the application to proceed with the installation. The progress can be observed in the “Status” bar.

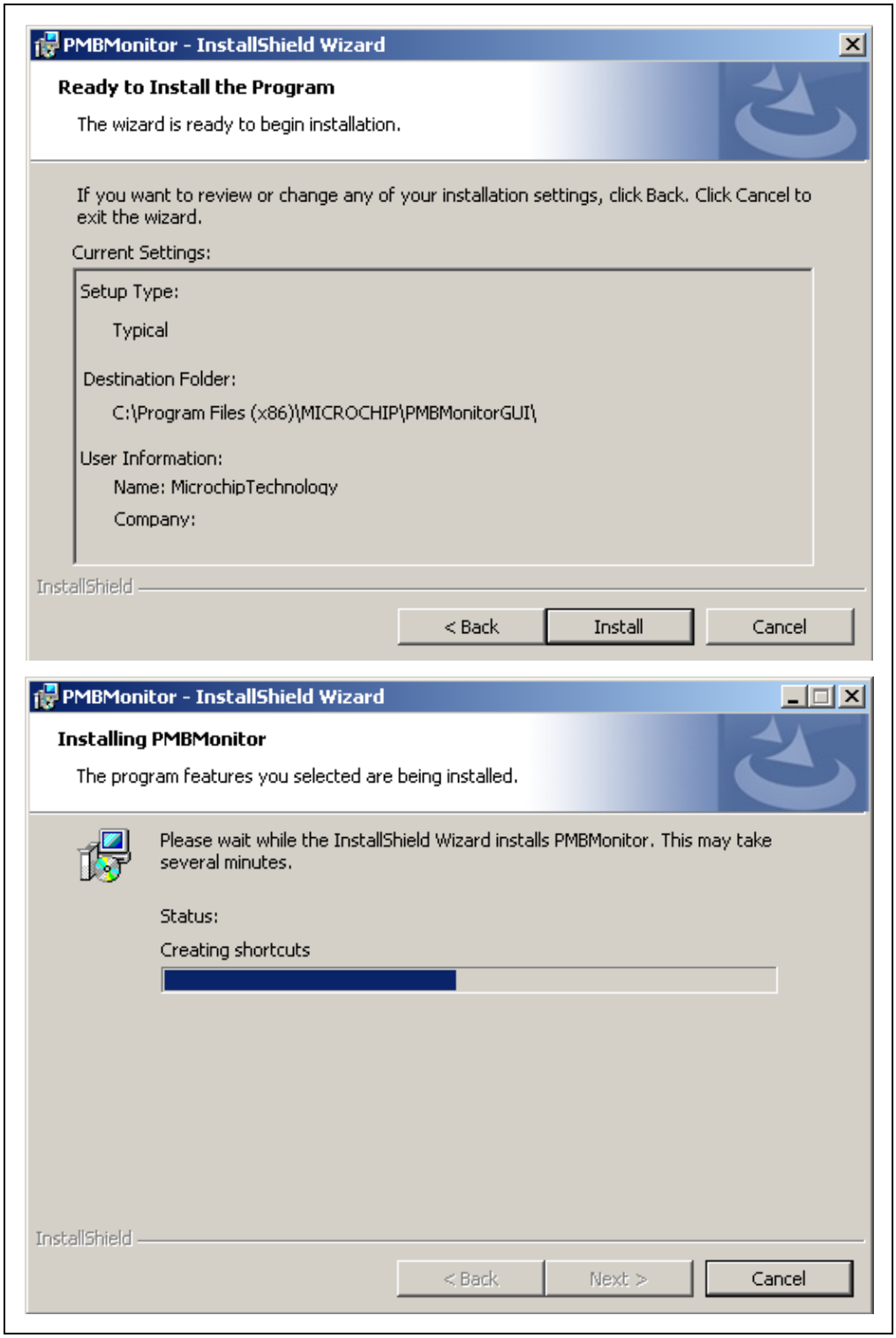


FIGURE 2-5: *Installing the PMBMonitor.*

10. Once the installation completes, leave the **Launch the program** box checked to automatically start the PMBMonitor user interface or deselect this check box to start the GUI at a later stage. Click **Finish** to end the installation.

    To start the GUI at a later stage, either click on the desktop icon or browse to *Windows Start>All Programs>Microchip>PMBMonitor.*

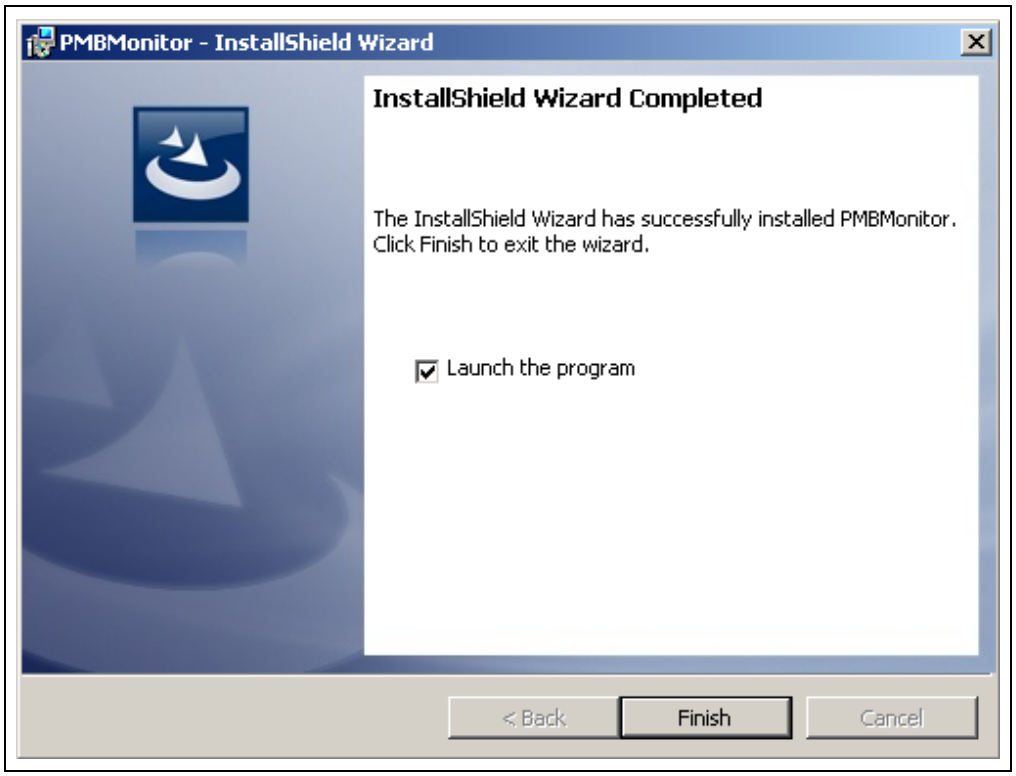


FIGURE 2-6: *The Installation Complete Window.*

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11. The interface will display the Status menu and the scan address function will be active.

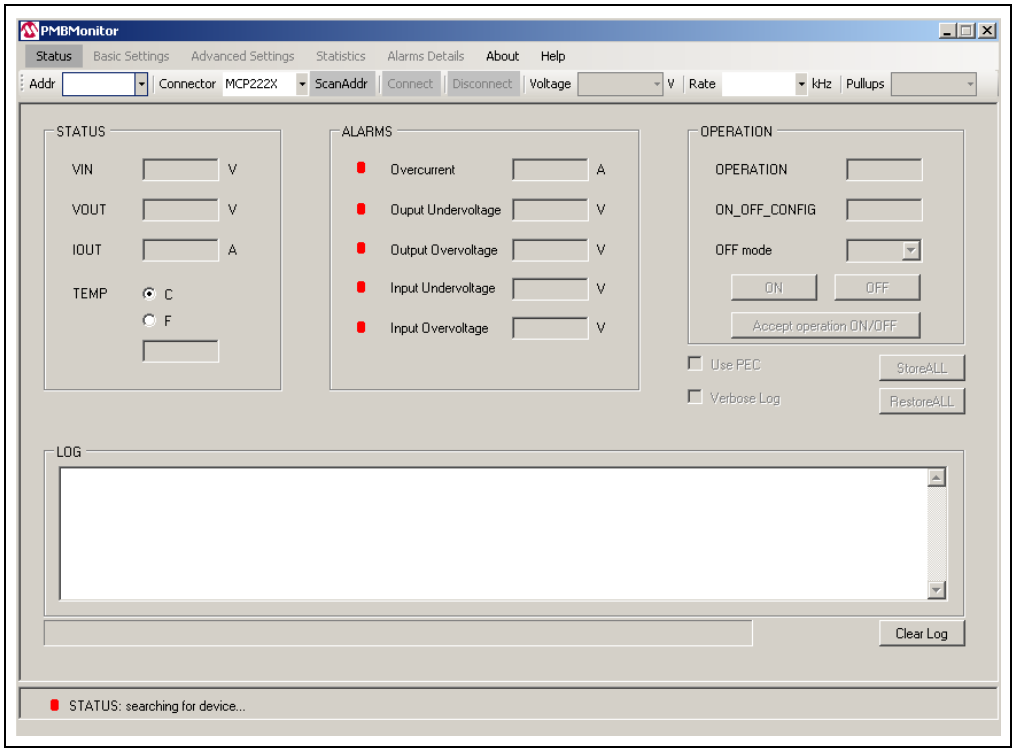


FIGURE 2-7: *Initial Status Menu.*

2.3 DRIVER INSTALLATION FOR THE ADAPTER

If the USB integrated on the board or a separated MCP2221 Breakout Module is used, install the appropriate driver after installing the GUI.

The following steps describe the installation process.

1. Go to *Windows Start>Control Panel>System and Security*. Choose System from the right panel and click Device Manager from the left pane to open the list of installed hardware. In the "Other devices" list, identify a USB unknown connection.

   Right click on the unknown driver and click on "Update Driver Software".

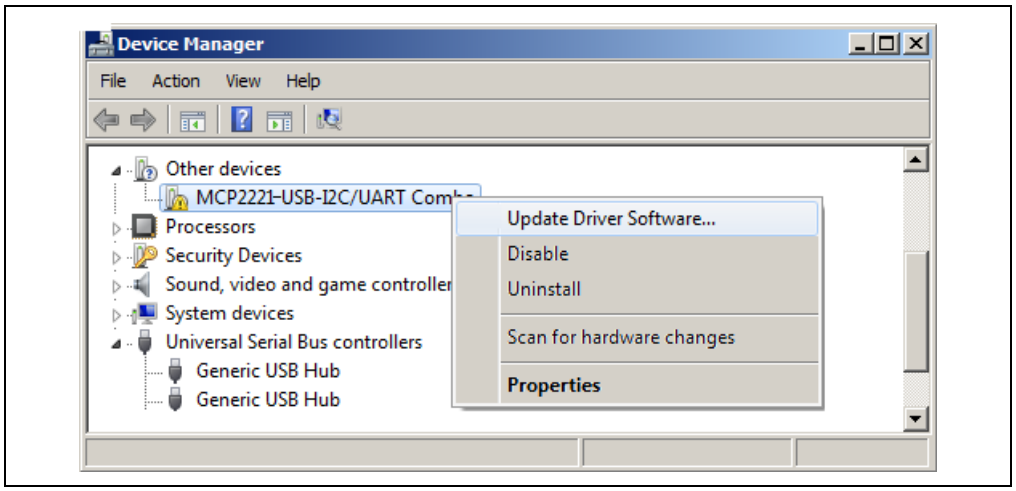


FIGURE 2-8: *Device Manager – Update Driver.*

2. In the Update Driver Software window, click on "Browse my computer for driver software" option.

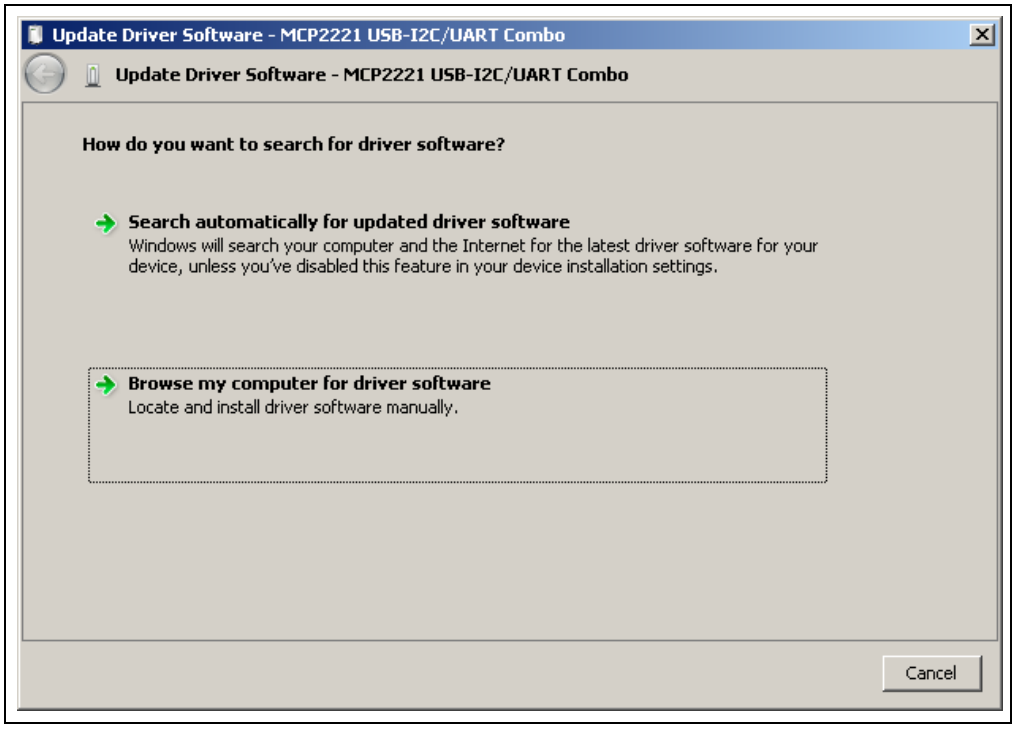


FIGURE 2-9: *Browse Computer for Driver.*

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3. Click on the **Browse** button and select the path where the GUI was installed. If the path was left unchanged, go to the `C:\Program Files (x86)\Microchip\PMBMonitorGUI` folder and click the **OK** button.

   Click **Next** to start the driver installation.

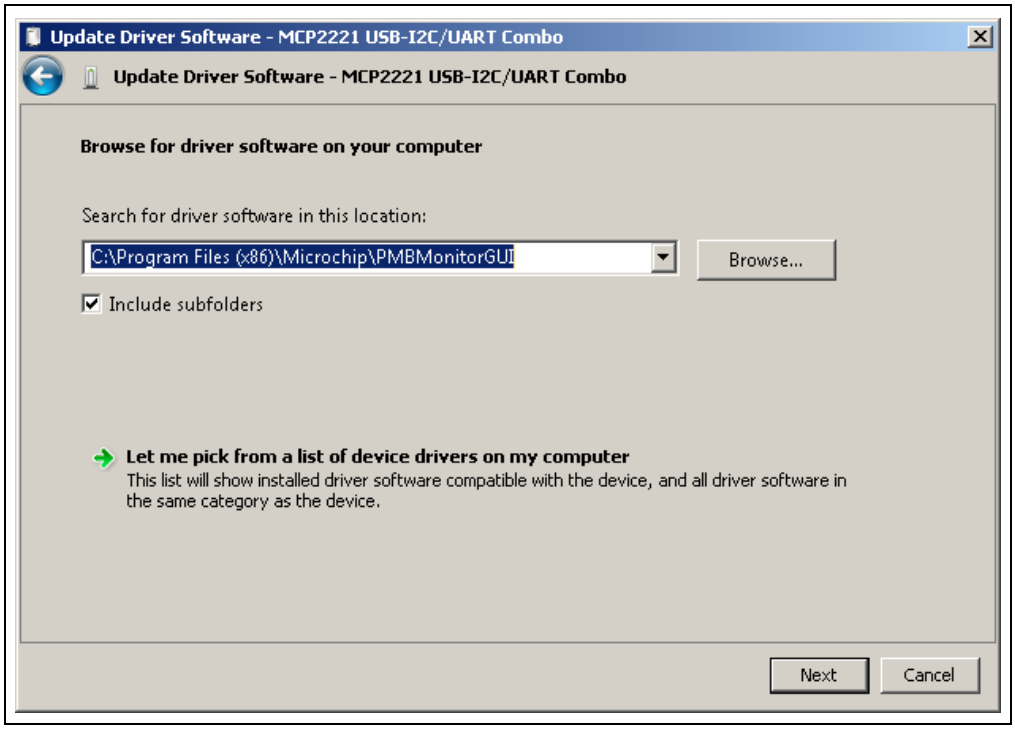


FIGURE 2-10: *Selecting the Path.*

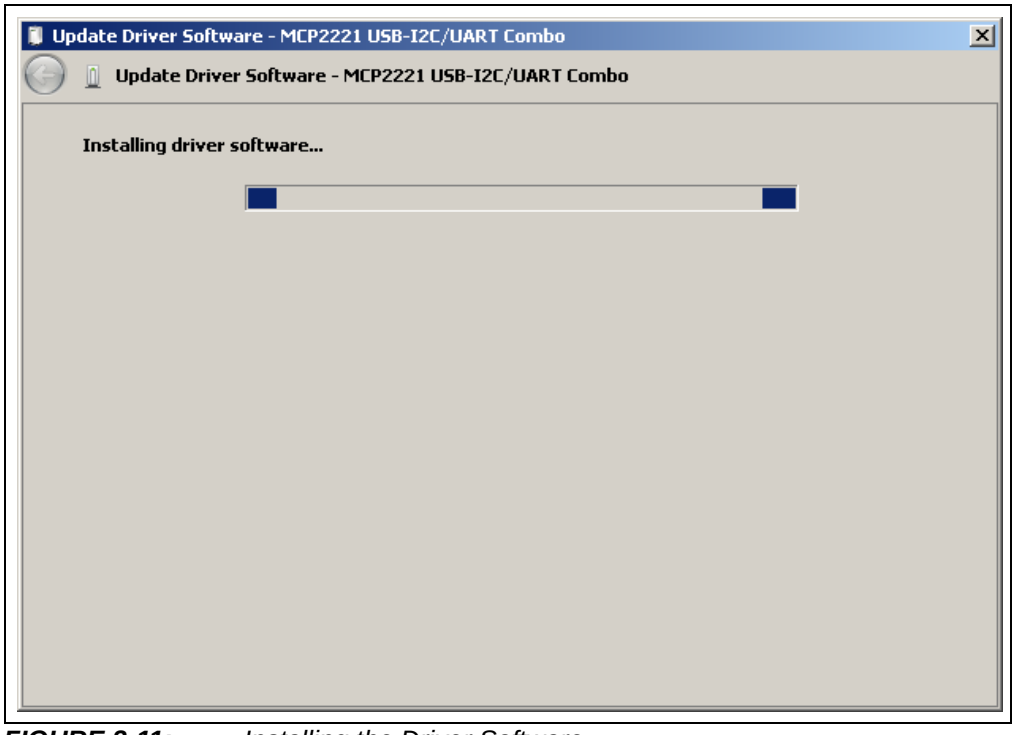


FIGURE 2-11: *Installing the Driver Software.*

4. If the following warning message pops up, select the "Install this driver anyway" option; otherwise, skip this step.



FIGURE 2-12: *Warning Message.*

If the driver was successfully installed, the following window pops up:

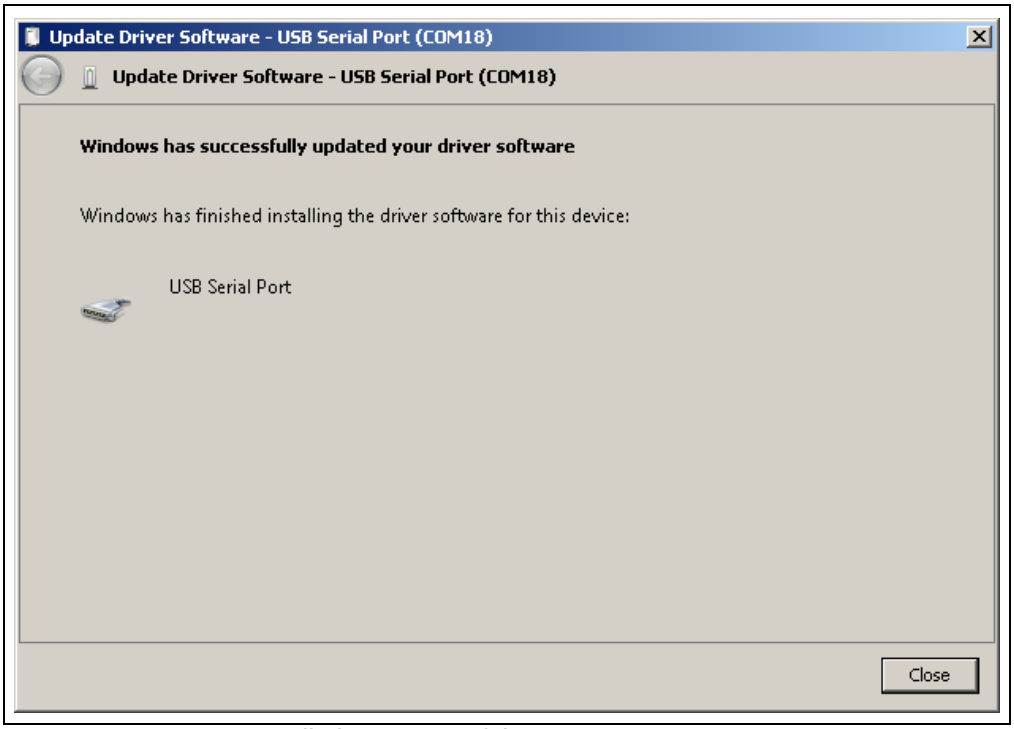


FIGURE 2-13: *Installation Successful.*

After installation, the device should be recognized in the Device Manager; otherwise, remove and plug in the USB cable again.

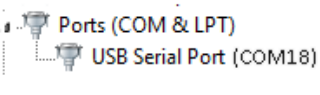


FIGURE 2-14: *USB Recognized.*

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2.4 PMBMonitor SOFTWARE UNINSTALL

In order to install the current PMBMonitor version, any previous version or corrupted version of the current one should be removed from the computer.

If there is an older version installed on the computer, the message box from Figure 2-15 will be displayed in Step 5 of the installation process. Uninstall the older version from *Windows Start>Control Panel>Programs>Uninstall a Program*, then go to Step 5 to resume the installation.

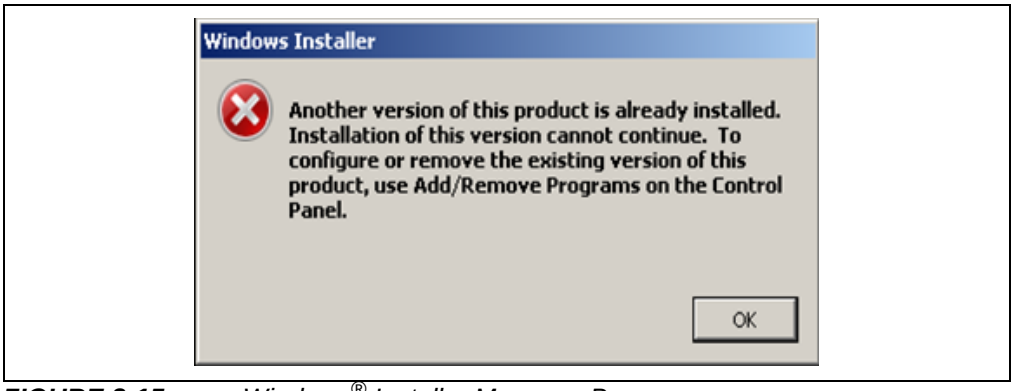


FIGURE 2-15: *Windows® Installer Message Box.*

If the current PMBMonitor version is already installed on the computer, but it is corrupted, the message box in Figure 2-16 will be displayed in Step 6 of the installation process. In this case, the following steps should be followed to uninstall the current version of the PMBMonitor:

1. Select the **Remove** option button, then click the **Next** button.

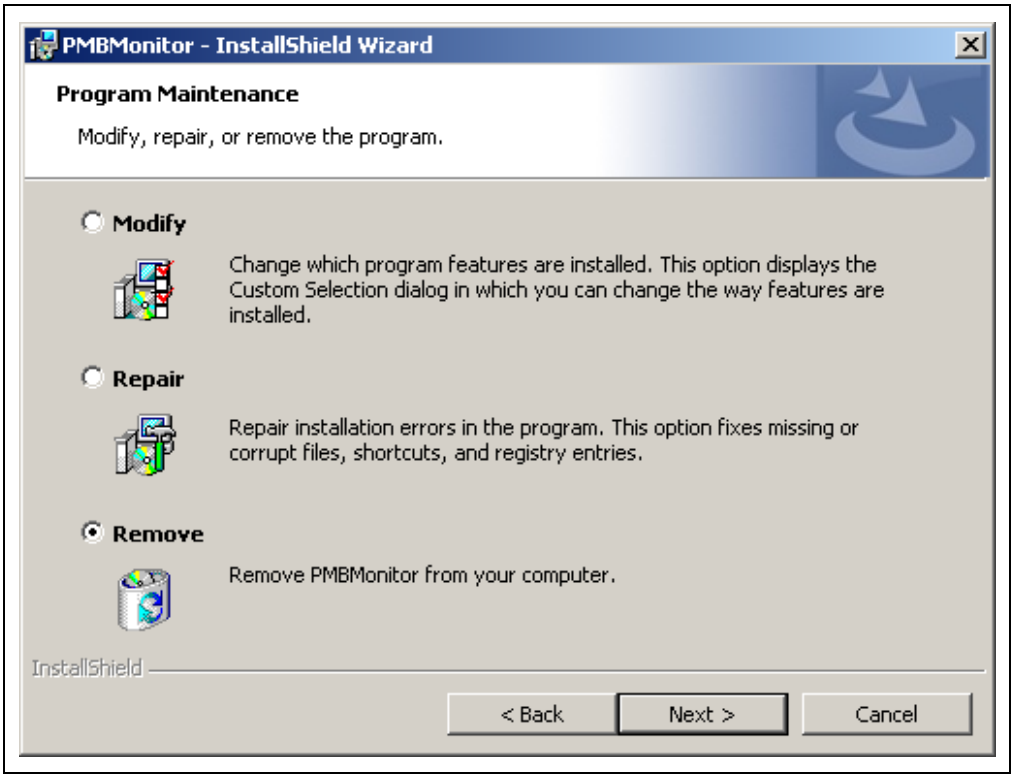


FIGURE 2-16: *The Program Maintenance Window.*

2. In the Remove the Program window, click the **Remove** button to remove the current PMBMonitor version from the computer.

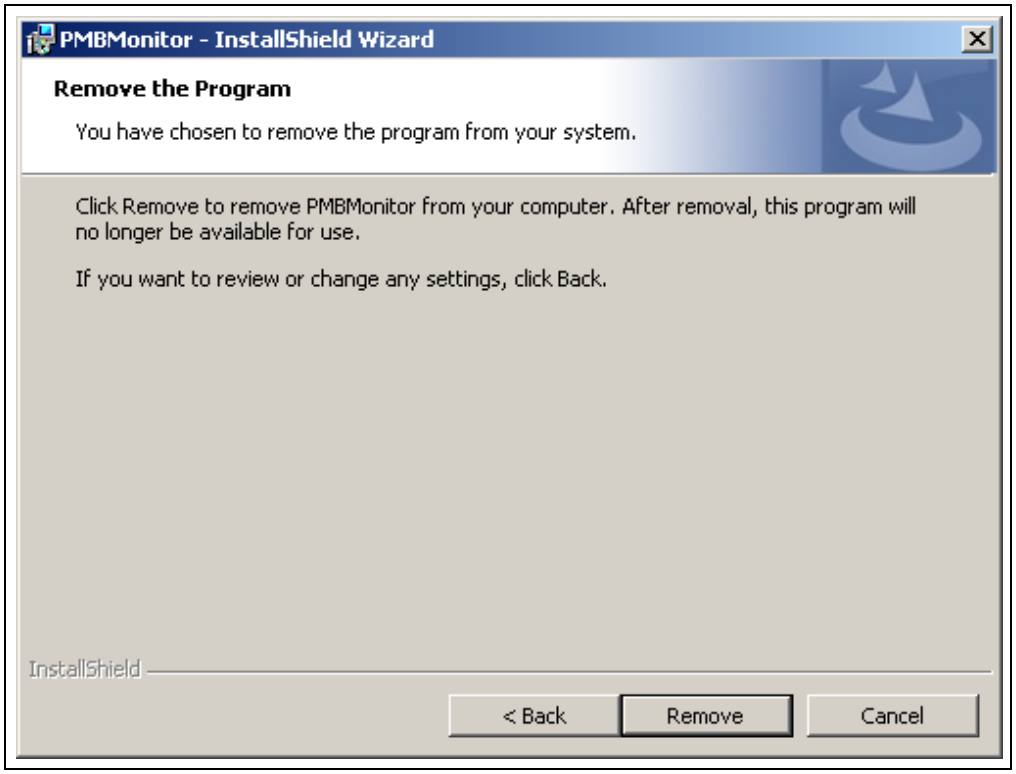


FIGURE 2-17: *Removing Previous Installations.*

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3. When the PMBMonitor completes the uninstall process, click on the **Finish** button, then go to Step 5 to resume the installation of the PMBMonitor GUI.

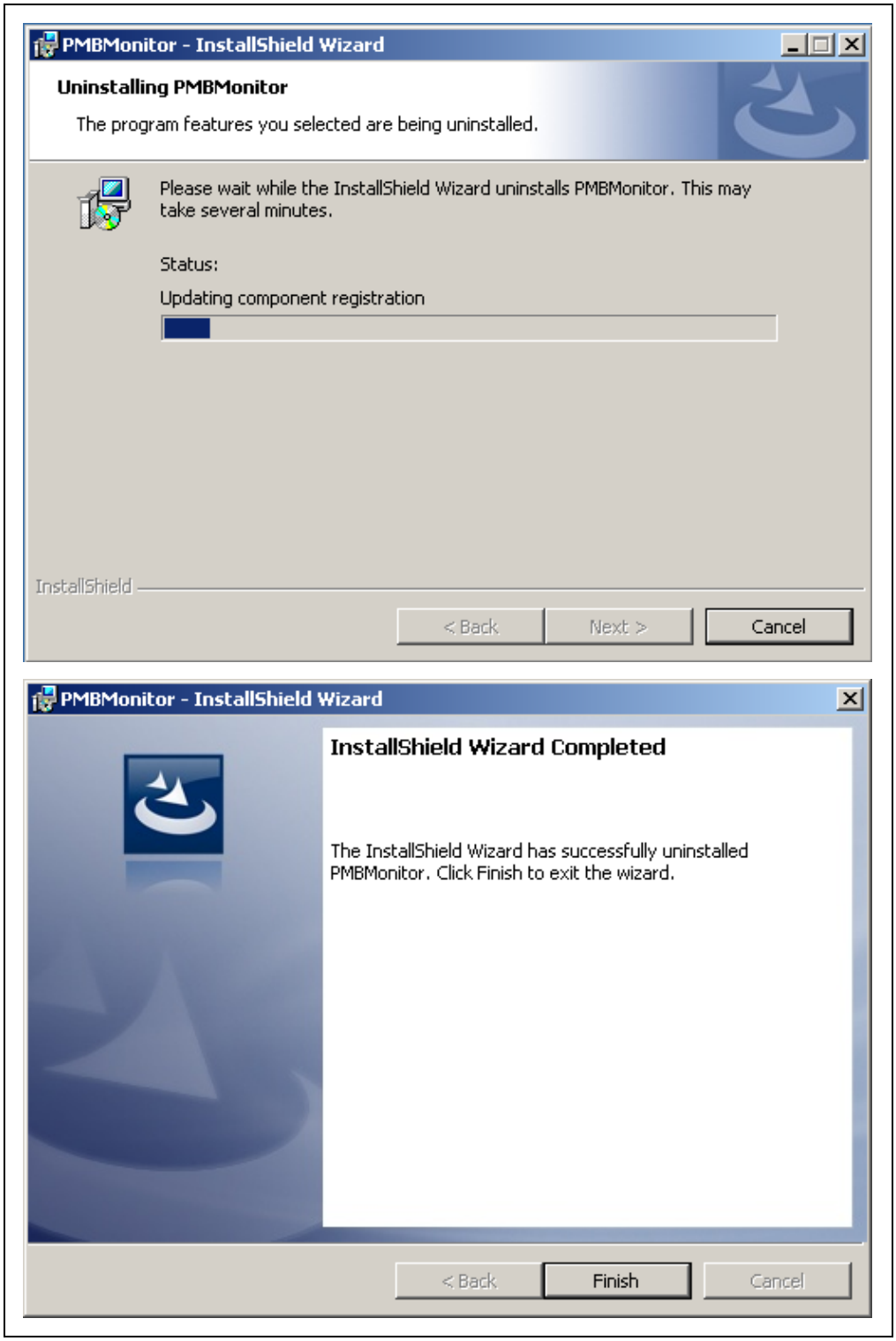


FIGURE 2-18: *Uninstalling the PMBMonitor.*

NOTES:

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Chapter 3. Graphical User Interface Description

3.1 INTRODUCTION

This chapter describes how to use the GUI and the PMBus™ protocol device characteristics that are included and monitored.

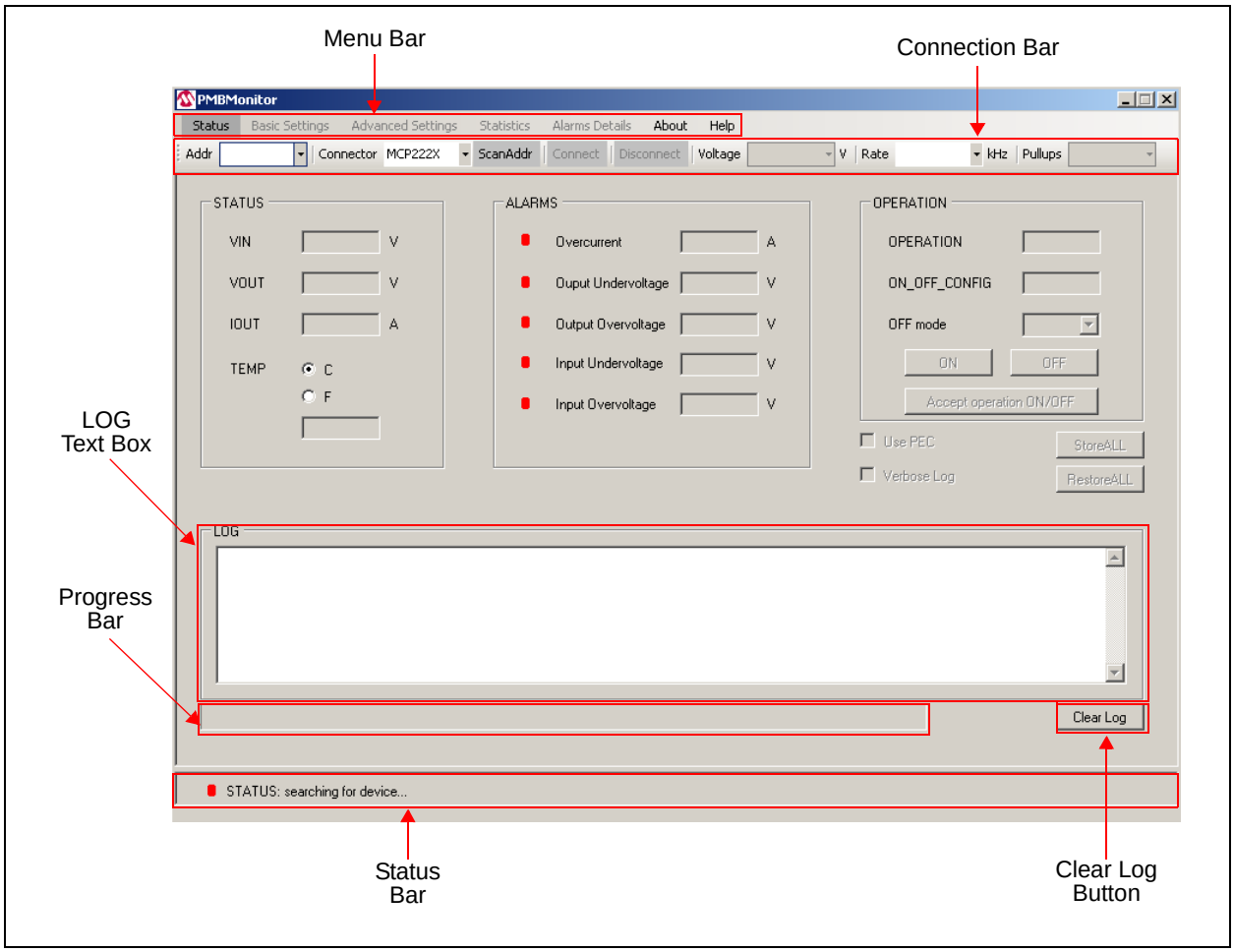


FIGURE 3-1: *Graphical User Interface – Initial Screen.*

Note:	If the commands are not implemented for the connected device, the "Err" message will be displayed in the corresponding fields.

3.2 THE GRAPHICAL USER INTERFACE

The following sections describe the items in the Graphical User Interface.

3.2.1 Menu Bar

The menu bar contains the items available for the user to display the device's characteristics and settings, as shown in Table 3-1.

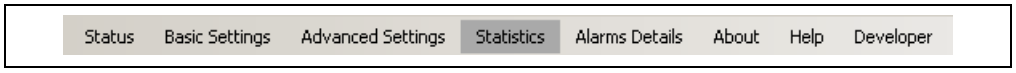


FIGURE 3-2: *Menu Bar.*

TABLE 3-1: MENU BAR ITEMS

Item	Description
Status	Displays the Status menu.
Basic Settings	Displays the Basic Settings menu.
Advanced Settings	Displays the Advanced Settings menu.
Statistics	Displays the Statistics menu.
Alarms Details	Displays the Alarms Details menu.
About	Shows information about the version of the product.
Help	Opens a PDF document with details on the PMBus™ Monitoring Graphical User Interface.
Developer	Displays the Developer menu. This menu is only available for Microchip PMBus protocol-enabled devices.

3.2.2 Connection Bar

The connection bar contains the items in Table 3-2.



FIGURE 3-3: *Connection Bar.*

TABLE 3-2: CONNECTION BAR ITEMS

Item	Description
Addr	This drop-down menu shows the address of the PMBus™ protocol device.
Connector	This drop-down menu shows the type of connector used to connect the board to the PC. The connector is automatically recognized. Connect the MCP19111 board to the PC by connecting a PICkit™ Serial Analyzer (PICkitSA) to the I^2C connector on the board. Alternatively, connect to the PC using the USB port on the MCP19111 board. In this case, the MCP222X integrated in the MCP19111 board is used to perform the communication.
ScanAddr	This button is used to scan for PMBus protocol devices connected to the PC.
Connect/Disconnect	These buttons are used to connect/disconnect the PMBus protocol device. **(Note 1)**
Voltage	This drop-down menu is used to select the voltage level of the I^2C communication interface. **(Note 2)**
Rate	This drop-down menu is used to select the corresponding communication rate for the device.
Pullups	This drop-down menu is only available when the PICkitSA connector is used and allows enabling/disabling the PICkit pull-ups.

Note 1: The **Disconnect** button is disabled when the **ScanAddr** and **Connect** buttons are enabled, and enabled when the **ScanAddr** and **Connect** buttons are disabled.

2: When using the MCP2221 Breakout Module, the voltage can be set by hardware (the jumpers on the board).

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3.2.3 Status Bar

The status bar provides information on the status of the device connected to the PC. This bar is available in all menus.

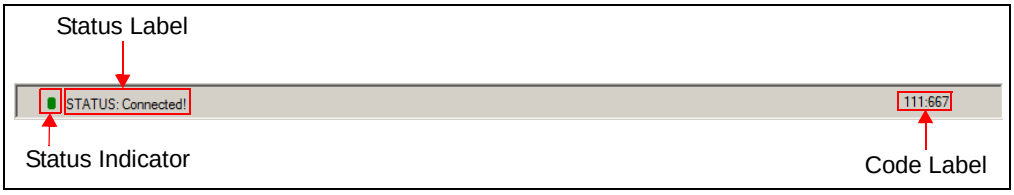


FIGURE 3-4: *The Status Bar.*

The items available in the status bar are shown in Table 3-3.

TABLE 3-3: STATUS BAR ITEMS

Item	Description
Status Indicator	The status indicator turns red if there is no device connected to the PC. Otherwise, this indicator turns green.
Status Label	The status label on the bottom of the GUI shows if there is any device connected to the board. Refer to Table 3-4 for a list of the possible labels.
Code Label	If an MCP19111 board is connected, this label shows the firmware version. For devices that do not implement this specific command, this label shows “N/A:N/A”.

TABLE 3-4: STATUS LABELS

Status Label	Description
STATUS: searching for device...	This message is shown when opening the GUI, before scanning the address of the device.
STATUS: Connected!	This message is shown when the GUI detects a device connected to the board.
STATUS: Disconnected!	This message is shown when the GUI does not detect any device connected to the board.

3.2.4 LOG Text Box

This text box is used to display messages from the PMBus communication. It is updated after each command and it gathers all information if the “Verbose Log” check box in the Status menu is selected, and until the **Clear Log** button is pressed. If the “Verbose Log” check box is not selected, the “LOG” text box will be updated only after the values have been sent on the PMBus protocol and the parameter values have been written.

The LOG text box is available in the Status, Basic Settings, Advanced Settings, Statistics and Developer menus.

3.2.5 Clear Log Button

This button deletes all messages shown in the “LOG” text box, up to the time when the button has been pressed.

The **Clear Log** button is available in the Status, Basic Settings, Advanced Settings, Statistics and Developer menus.

3.2.6 Status Menu

The Status menu is the first tab displayed when opening the PMBMonitor.

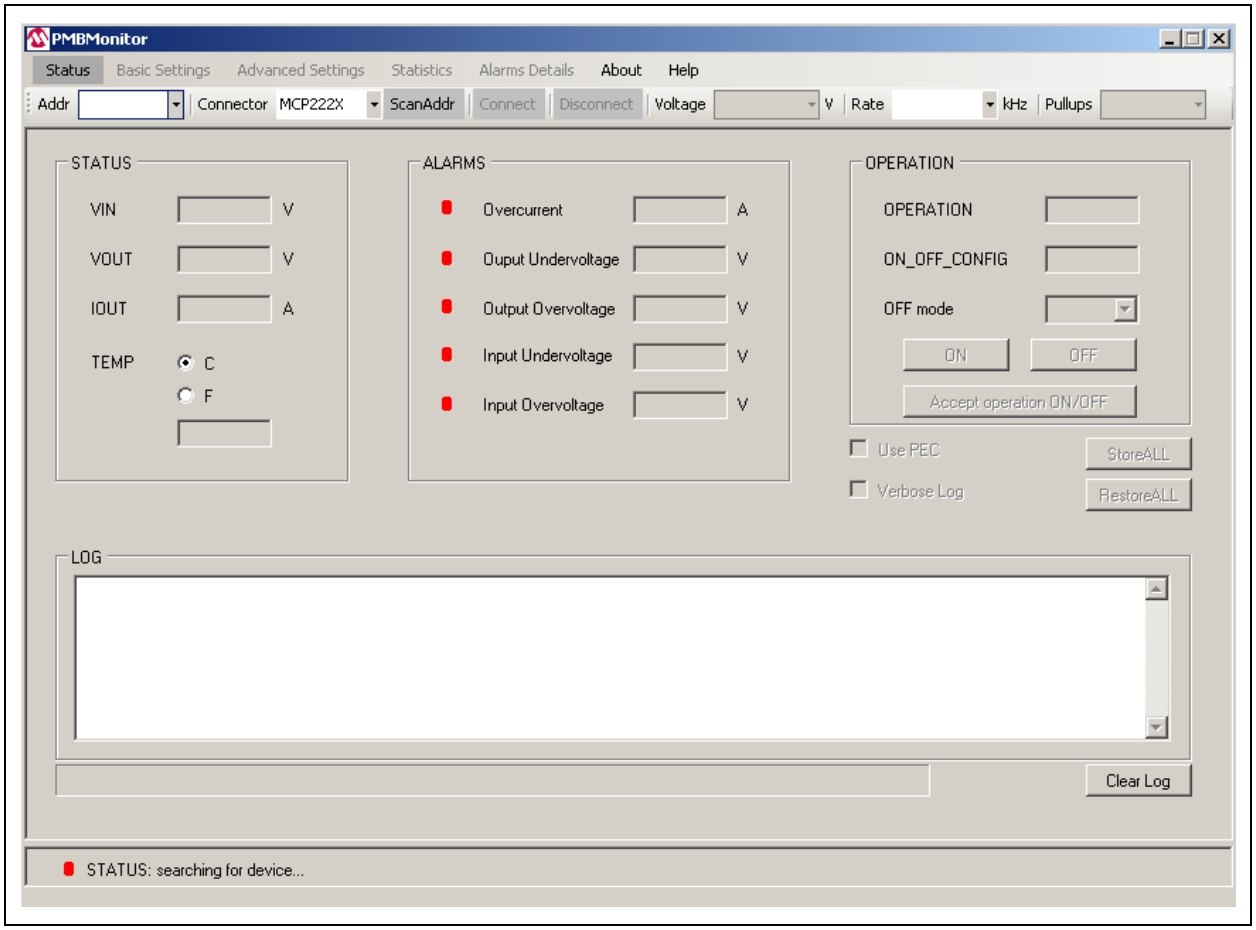


FIGURE 3-5: *Initial Status Menu.*

The Status menu is only used to monitor the PMBus device parameters, to enable/disable the converter and to store/restore values. The items found in the Status menu are shown in Table 3-5.

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TABLE 3-5: STATUS MENU ITEMS

Panel	Item	Description
STATUS	VIN	Shows the input voltage value.
	VOUT	Shows the output voltage value.
	IOUT	Shows the output current value.
	TEMP	Shows the temperature value. Use the **C** and **F** radio buttons to choose the type of degrees to display the temperature: Celsius or Fahrenheit.
ALARMS	Overcurrent	Shows the overcurrent Fault limit. The green alarm on the left will turn red when the IOUT value is equal to or greater than the overcurrent warning/Fault limit. The overcurrent warning limit is lower than the overcurrent Fault limit. If the IOUT value is equal to or greater than the overcurrent warning/Fault limit value, the red alarm turns on and stays red until the “CLEAR FAULTS” command is sent from the Alarms Details menu.
	Output Undervoltage	Shows the output undervoltage Fault limit. The green alarm on the left will turn red when the VOUT value is lower than or equal to the output undervoltage warning/Fault limit. The output undervoltage warning limit is greater than the output undervoltage Fault limit. If the VOUT value is lower than or equal to the output undervoltage warning/Fault limit, the red alarm turns on and stays on until the “CLEAR FAULTS” command is sent from the Alarms Details menu.
	Output Overvoltage	Shows the output overvoltage Fault limit. The green alarm on the left will turn red when the VOUT value is equal to or greater than the output overvoltage warning/Fault limit. The output overvoltage warning limit is lower than the output overvoltage Fault limit. If the VOUT value is equal to or greater than the overvoltage output warning/Fault limit, the red alarm turns on and stays on until the “CLEAR FAULTS” command is sent from the Alarms Details menu.
	Input Undervoltage	Shows the input undervoltage Fault limit. The green alarm on the left will turn red when the VIN value is lower than or equal to the input undervoltage warning/Fault limit. The input undervoltage warning limit is greater than the input undervoltage Fault limit. If the VIN value is lower than or equal to the input undervoltage warning/Fault limit, the red alarm turns on and stays on until the “CLEAR FAULTS” command is sent from the Alarms Details menu.
	Input Overvoltage	Shows the input overvoltage Fault limit. The green alarm on the left will turn red when the VIN value is equal to or greater than the input overvoltage warning/Fault limit. The input overvoltage warning limit is lower than the input overvoltage Fault limit. If the VIN value is equal to or greater than the input overvoltage warning/Fault limit, the red alarm turns on and stays on until the “CLEAR FAULTS” command is sent from the Alarms Details menu.

Note 1: An extra byte. after the standard number of bytes specified by the command. is considered a PEC byte.

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TABLE 3-5: STATUS MENU ITEMS (CONTINUED)

Panel	Item	Description
OPERATION	OPERATION	This box is filled in with the operation command value. If the Most Significant bit (MSb) is '1', the converter is enabled; otherwise, the converter is disabled.
	ON_OFF_CONFIG	This box is filled in with the `ON_OFF_CONFIG` command value. The converter is initially disabled and can be enabled using the operation PMBus command.
	OFF mode	This drop-down menu allows the user to choose whether the converter will be turned off with the delay set in the Advanced Settings menu or with no delay.
	ON/OFF	These buttons are used to enable/disable the converter.
	Accept operation ON/OFF	This button is used to modify the `ON_OFF_CONFIG` value so that the PMBus device accepts the ON/OFF operation.
	Use PEC	The PMBus stack supports communication with or without a Packet Error Checking (PEC) byte.(1) This check box is used to communicate the supporting PEC byte.
	StoreALL	This button stores the values in the Flash (nonvolatile) memory.
	Verbose Log	This check box is used to activate or deactivate the log from the "LOG" text box. When checked, the log is written in the "LOG" text box for all the menus (including Status, Basic Settings, Advanced Settings, Statistics and Developer).
	RestoreALL	This button restores values from the Flash memory. **Before restoring, press the OFF button to stop the board from switching**.
	Progress Bar	The progress bar completes after scanning for the PMBus devices process or when the PMBus devices process has finished.

Note 1: An extra byte. after the standard number of bytes specified by the command. is considered a PEC byte.

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3.2.7 Basic Settings Menu

The Basic Settings menu allows changing the VOUT value, the output undervoltage threshold and output overvoltage threshold warning/Fault limit, the input undervoltage and input overvoltage warning/Fault limit, and the overtemperature threshold. The overcurrent threshold warning/Fault limit and VOUTmax value cannot be changed.

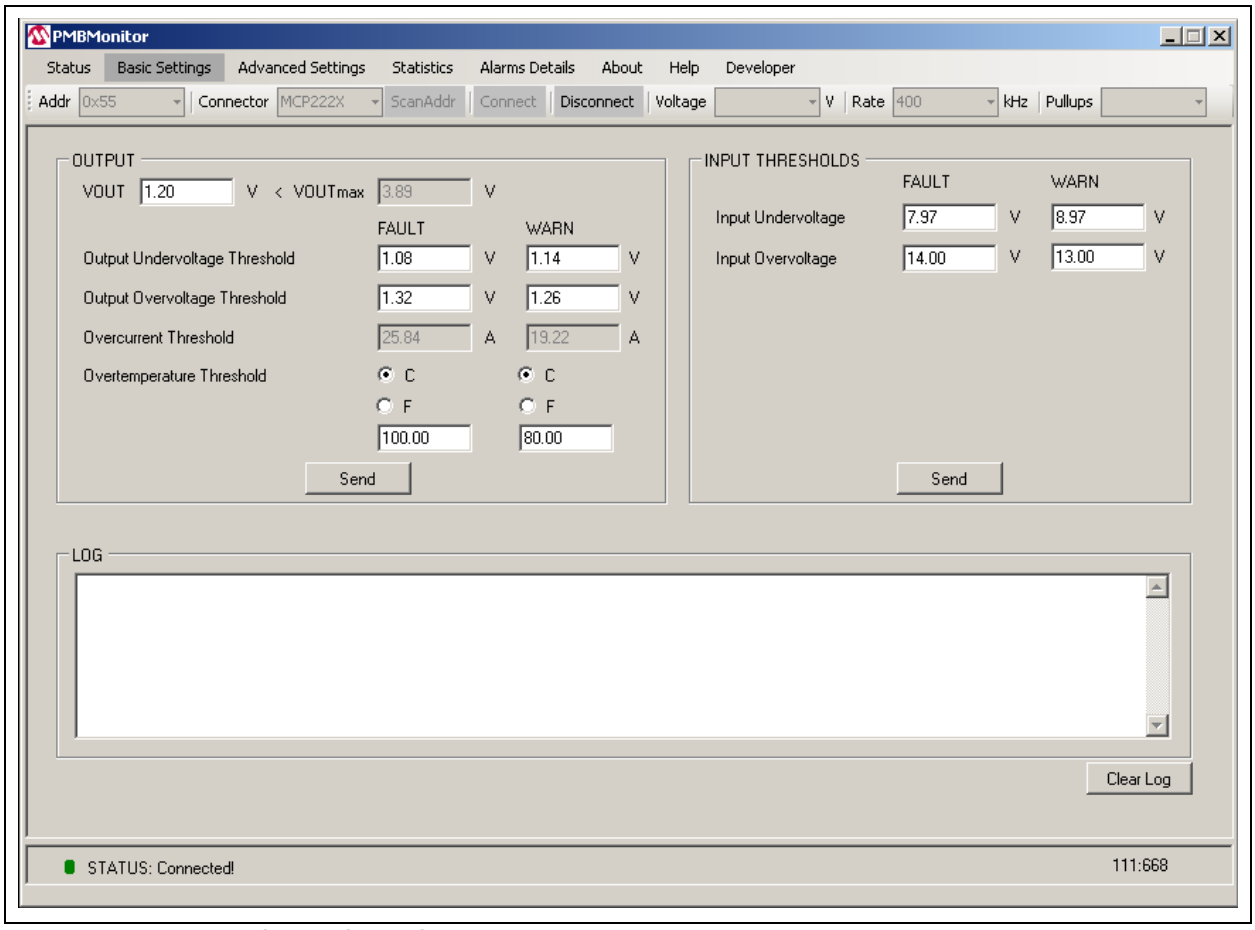


FIGURE 3-6: *The Basic Settings Menu.*

The items found in the Basic Settings menu are shown in Table 3-6.

TABLE 3-6: BASIC SETTINGS MENU ITEMS

Panel	Item	Description
OUTPUT	VOUT	Shows the last updated value sent on the PMBus™ to the device.
	VOUTmax	Shows the maximum output voltage value.
	Output Undervoltage Threshold(1)	Shows the output undervoltage limit value.
	Output Overvoltage Threshold(1)	Shows the output overvoltage limit value.
	Overcurrent Threshold(1)	Shows the overcurrent limit value.
	Overtemperature Threshold(1)	Shows the overtemperature limit value.
	FAULT(2)	Shows the corresponding Fault limit value for the output undervoltage/output overvoltage/overcurrent/overtemperature.
	WARN(2)	Shows the corresponding warning limit value for the output undervoltage/output overvoltage/overcurrent/overtemperature.
	C/F	These radio buttons allow choosing the type of degrees used to display the temperature: Celsius or Fahrenheit.
	Send	This button is used to send the above parameters to the PMBus.
INPUT THRESHOLDS	Input Undervoltage	Shows the input undervoltage limit value.
	Input Overvoltage	Shows the input overvoltage limit value.
	FAULT(2)	Shows the corresponding Fault limit value for the input undervoltage/input overvoltage.
	WARN(2)	Shows the corresponding warning limit value for the input undervoltage/input overvoltage.
	Send	This button is used to send the above parameters to the PMBus.

Note 1: For the overvoltage, overcurrent and overtemperature thresholds, the FAULT value must be greater than the WARN value. For the undervoltage threshold, the FAULT value must be smaller than the WARN value.

2: Usually, the FAULT and WARN values for one threshold must be changed simultaneously. If one threshold remains unchanged, it could raise unexpected alarms.

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3.2.8 Advanced Settings Menu

The Advanced Settings menu is used to change the maximum output voltage (VOUTmax), the output voltage related parameters (POWER_GOOD_ON, POWER_GOOD_OFF, TON_RISE, TOFF_FALL) and the switching frequency (SWITCHING_FREQUENCY).

WARNING

Use caution when changing certain parameters, such as SWITCHING_FREQUENCY, because it may affect the hardware functionality. Make sure a correct value is filled in as there is no verification mechanism.

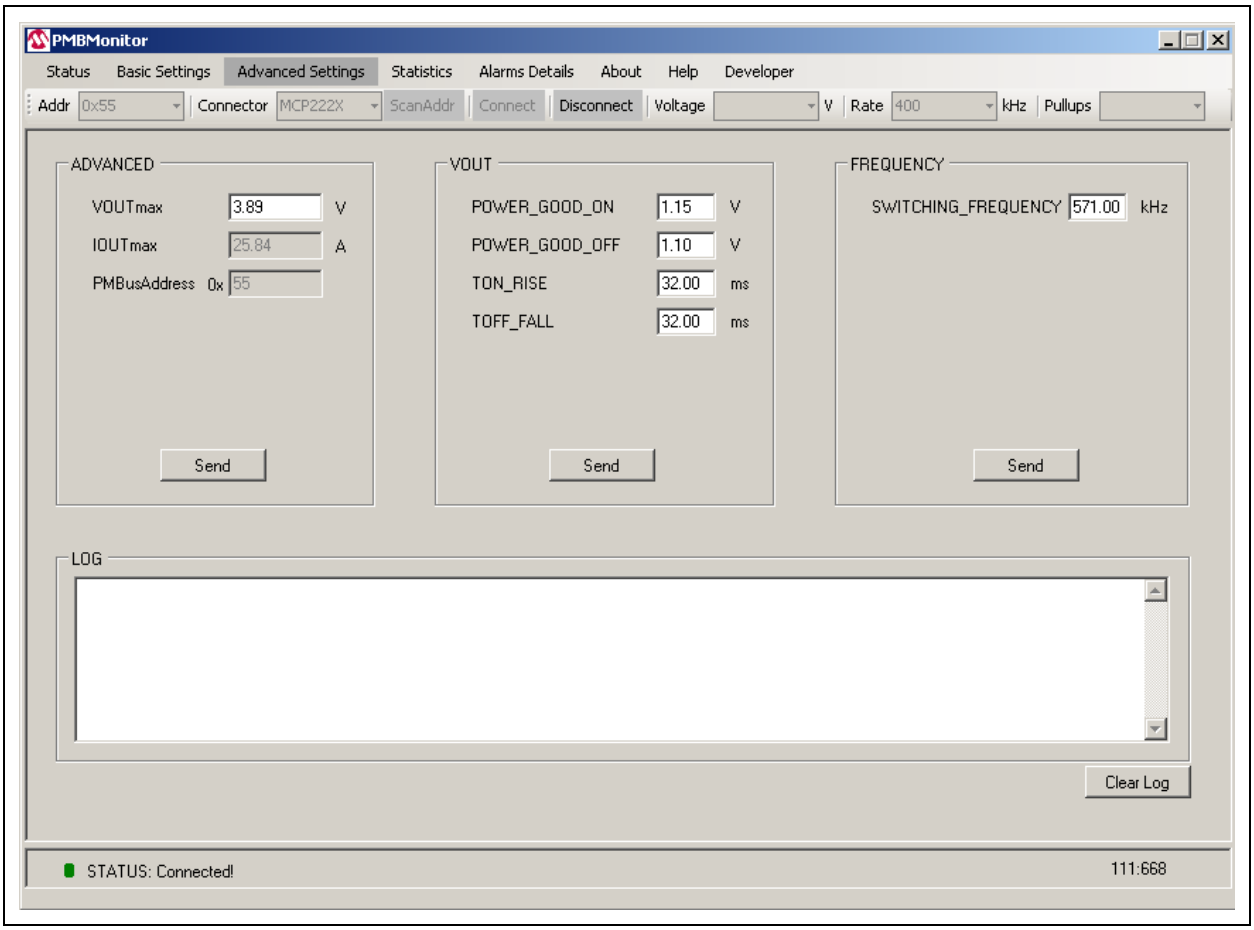


FIGURE 3-7: *The Advanced Settings Menu.*

The items found in the Advanced Settings menu are shown in Table 3-7.

TABLE 3-7: ADVANCED SETTINGS MENU ITEMS

Panel	Item	Description
ADVANCED	VOUTmax	Shows the maximum output voltage value in Volts.
	IOUTmax	Shows the overcurrent Fault limit in Amperes.
	PMBusAddress	Shows the address of the PMBus™ protocol-enabled device.
	Send	This button is used to send the information set in the ADVANCED panel to the PMBus.
VOUT	POWER_GOOD_ON	Sets the output voltage at which an optional POWER_GOOD signal should be asserted.
	POWER_GOOD_OFF	Sets the output voltage at which an optional POWER_GOOD signal should be negated.
	TON_RISE	Represents the turn-on delay of the converter in milliseconds.
	TOFF_FALL	Represents the turn-off delay of the converter in milliseconds.
	Send	This button is used to send the information set in the "VOUT" group box to the PMBus.
FREQUENCY(1)	SWITCHING_FREQUENCY	Shows the switching frequency value in kHz.
	Send	This button is used to send the information set in the "FREQUENCY" group box to the PMBus.

Note 1: Depending on the revision of the board, the "FREQUENCY" group box will not be included in the Advanced Settings menu.

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3.2.9 Statistics Menu

The Statistics menu provides an overview of the output voltage (VOUT), input voltage (VIN), output current (IOUT) and temperature (TEMP) values over time.

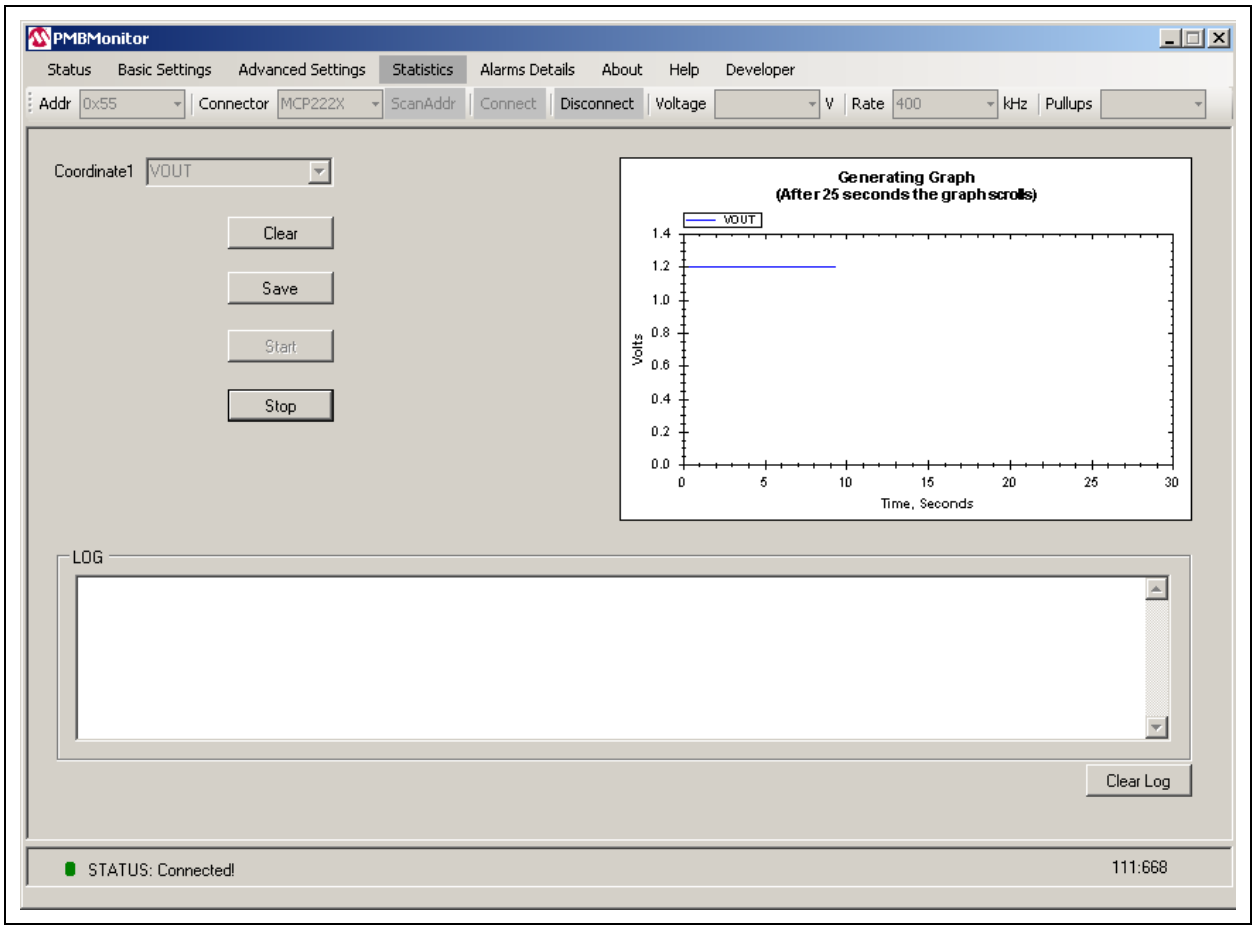


FIGURE 3-8: *The Statistics Menu.*

The items found in the Statistics menu are shown in Table 3-8.

TABLE 3-8: STATISTICS MENU ITEMS

Item	Description
Coordinate1	Use this selection box to choose the characteristic to monitor: VOUT, VIN, IOUT, TEMP.
Clear	Use this button to clear the graph.
Save	Use this button to save the current image of the graph.
Start	Use this button to start monitoring the chosen characteristic and to start generating the graph.
Stop	Use this button to stop scrolling the graph and to stop generating the graph.
Graph Area	This area displays the graph created while monitoring the chosen characteristic.

3.2.10 Alarms Details Menu

The Alarms Details menu presents the following status indicators: STATUS_WORD, STATUS_VOUT, STATUS_IOUT, STATUS_INPUT, STATUS_TEMPERAURE, STATUS_CML. Green means the corresponding parameters function properly, while red means a warning, a Fault or an error has occurred.

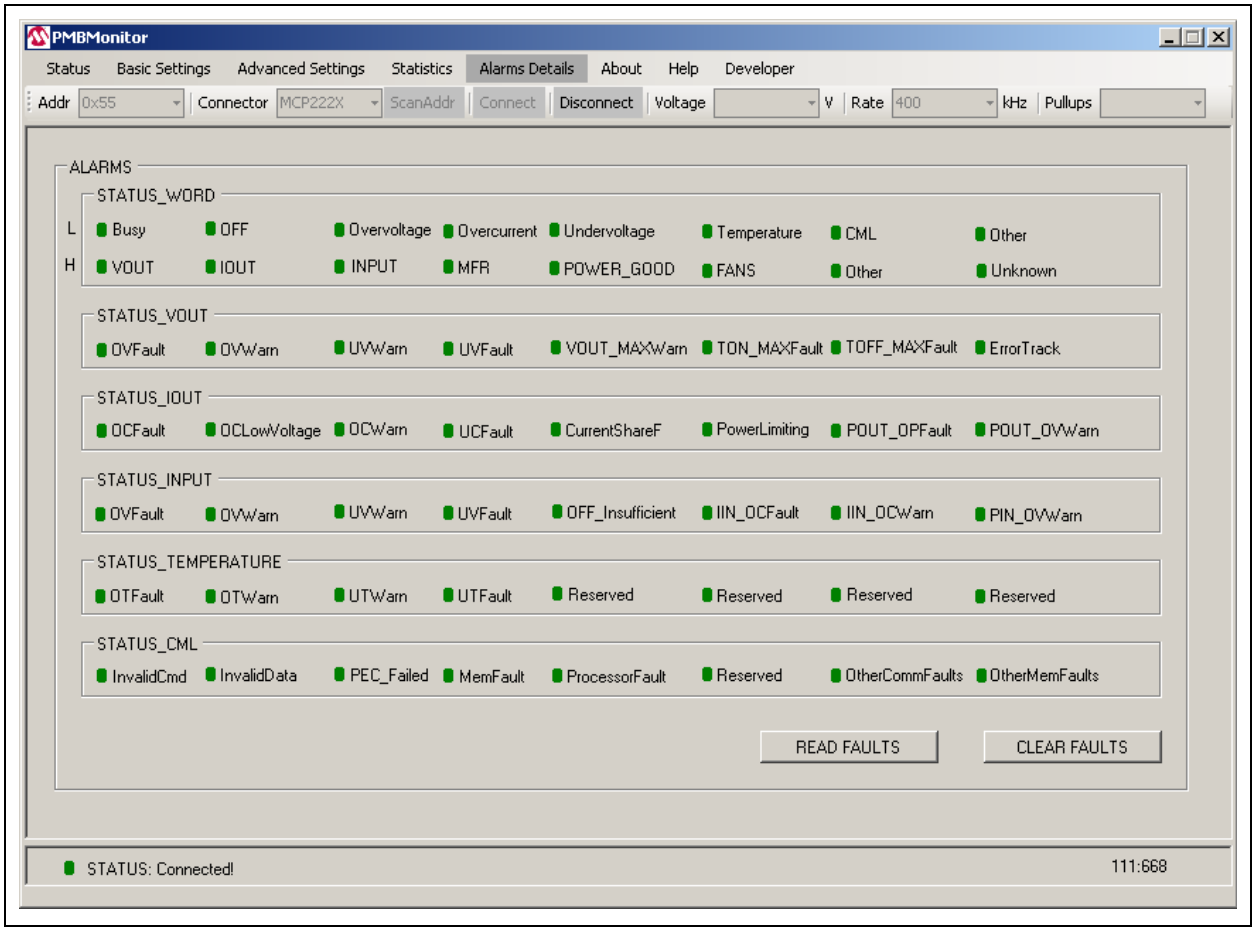


FIGURE 3-9: *The Alarms Details Menu.*

The items found in the Alarms Details menu are shown in Table 3-9.

TABLE 3-9: ALARMS DETAILS MENU ITEMS

Item	Description
STATUS_WORD	Combines all other status indicators and resumes Faults and warnings.
STATUS_VOUT	Displays warnings, Faults and other errors regarding the output voltage values.
STATUS_IOUT	Displays warnings, Faults and other errors regarding the output current.
STATUS_INPUT	Displays warnings, Faults and other errors regarding the input characteristics.
STATUS_TEMPERATURE	Displays warnings and Faults regarding temperature.
STATUS_CML	Displays warnings, Faults and other errors regarding communication.
READ FAULTS	Reads and updates/refreshes the alarms.
CLEAR FAULTS	Clears all these indicators and turns them to green.

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3.2.11 About Menu

The About menu includes the PMBMonitor version number.

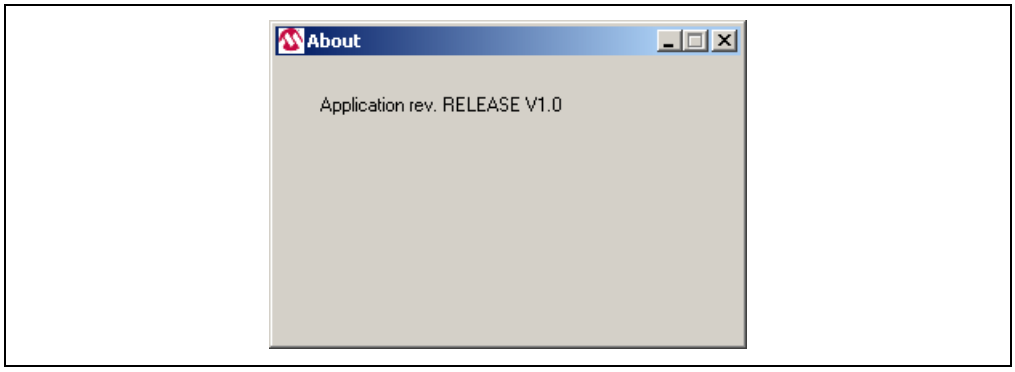


FIGURE 3-10: *The About Menu.*

3.2.12 Help Menu

The Help menu opens the current user's guide in PDF format.

3.2.13 Developer Menu

The Developer menu consists of two tabs: **Settings** and **Calibration**.

3.2.13.1 SETTINGS TAB

The **Settings** tab allows changing some manufacturer compensation values and setting the overcurrent limit.

WARNING

Check the values before clicking on the **Send** button; new values can affect hardware functionality. Make sure to read and understand the hardware specifics. The **Settings** tab is available only for Microchip devices. This step uses only custom commands, manufacturer-specific, and these commands are functional with the specific Microchip firmware. For more information, read the material listed under **Recommended Reading**.

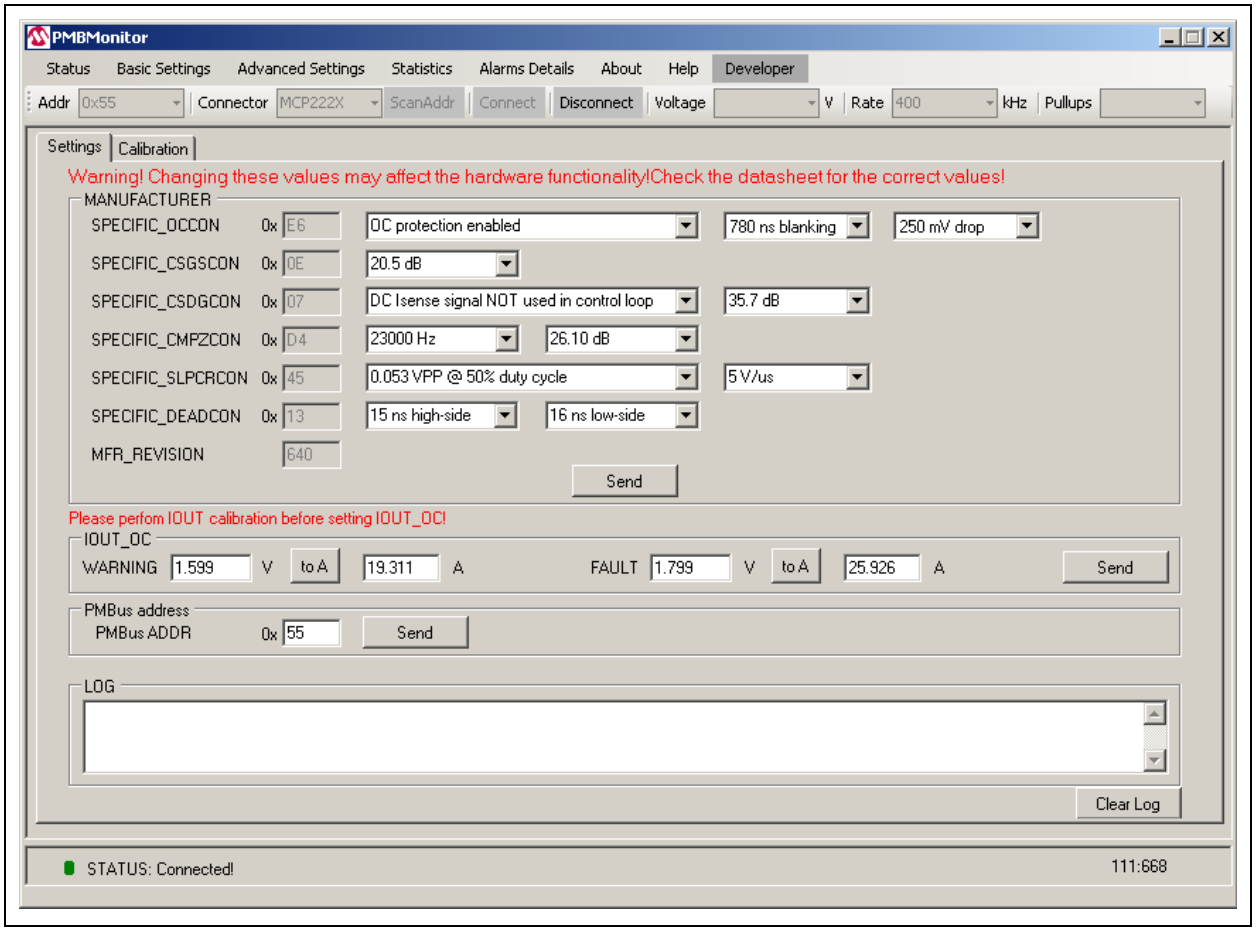


FIGURE 3-11: *The Settings Tab.*

The items found in the **Settings** tab are shown in Table 3-10.

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TABLE 3-10: SETTINGS TAB ITEMS

Group Box	Item	Description
MANUFACTURER	SPECIFIC_OCCON	This register controls the voltage drop across the high-side MOSFET to determine when an output overcurrent exists.
	SPECIFIC_CSGSCON	This register controls the amount of gain amplified by the current sense AC gain circuitry.
	SPECIFIC_CSDGCON	This register controls the amount of DC gain added to the sensed inductor current to allow it to be read.
	SPECIFIC_CMPZCON	This register is used to adjust the compensation zero frequency and gain.
	SPECIFIC_SLPCRCON	This register controls the amount of slope added to the error amplifier output signal before it is compared to the current sense signal.
	SPECIFIC_DEADCON	This register controls the adjustment of the driver dead time.
	MFR_REVISON	Shows the revision of the PMBus™ protocol-enabled device.
	Send	Use this button to send the specific commands to the PMBus.
IOUT_OC	WARNING	Shows the overcurrent warning limit value. The value in Volts comes from the ADC.
	to A	These buttons transform the voltage in the overcurrent warning/Fault value from Volts (coming from ADC) to the corresponding values in Amperes using the specific compensation equation.
	FAULT	Shows the overcurrent Fault limit value. The value in Volts comes from the ADC.
	Send	Use this button to send the overcurrent warning and Fault limit to the PMBus.

3.2.13.2 CALIBRATION TAB

The **Calibration** tab allows calibrating the reading/settings of the output voltage and the output current.

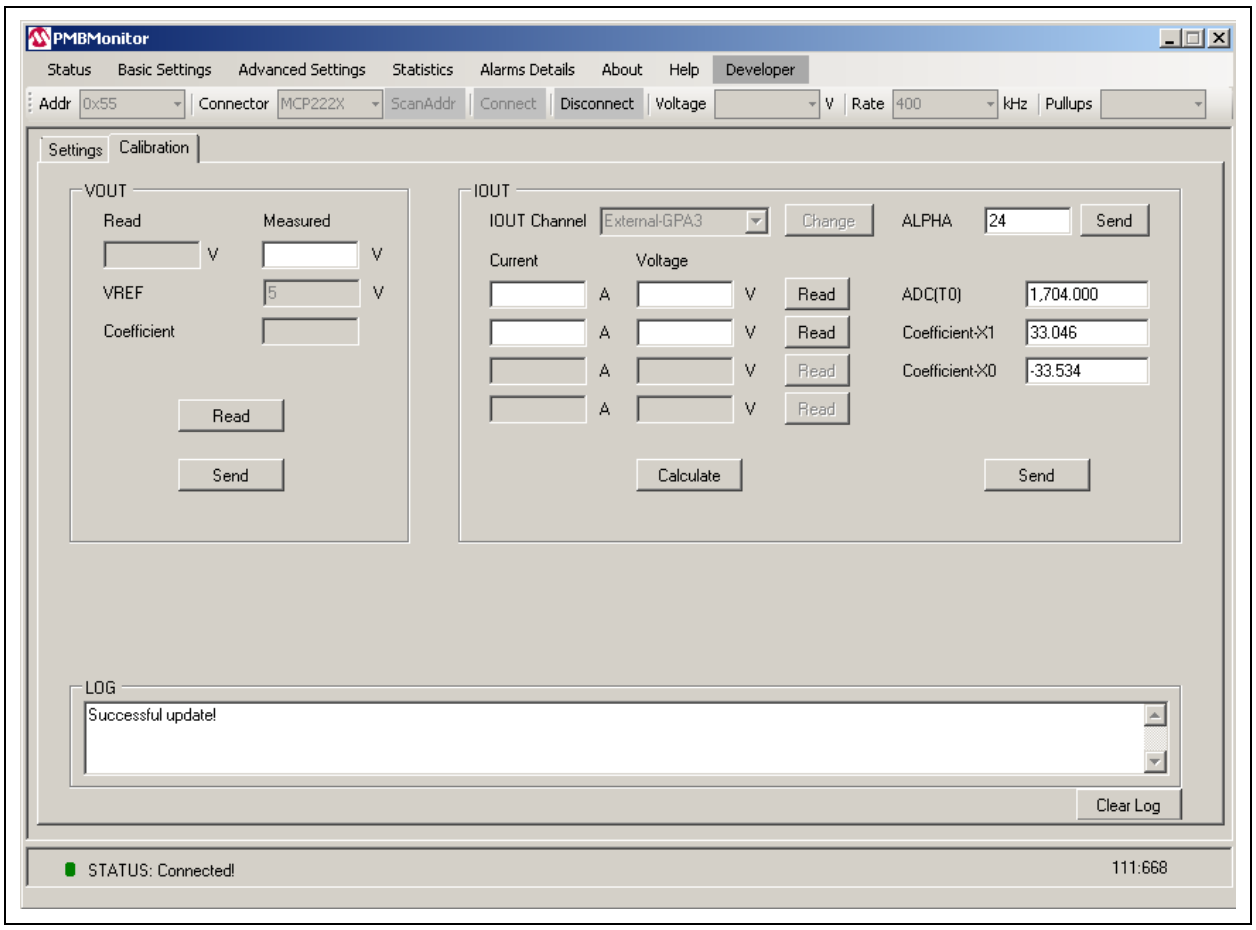


FIGURE 3-12: *The Calibration Tab – Firmware Version 668.*

The items found in the **Calibration** tab are shown in Table 3-11.

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TABLE 3-11: CALIBRATION TAB ITEMS

Group Box	Item	Description
VOUT	Read	Shows the output voltage value read from the PMBus™ in Volts.
	Measured	Shows the measured output voltage value in Volts.
	VREF	Shows the reference for ADC.
	Coefficient	Represents the correction to the VOUT value.
	Read	Use this button to read the VOUT “Read” value.
	Send	Use this button to send the correction coefficient to the PMBus.
IOUT	IOUT Channel	Sets the internal or external channel to measure the output current.
	Change	Use this button to change the output current channel to external or internal.
	Current	This column contains the selected output current values the voltage will be read for.
	Voltage	This column contains the voltage read for the specified output current value.
	Read	Use this button to read the voltage for the specified output current, to be filled in the “Voltage” column.
	Coefficient-X2(1)	Shows the first coefficient of the correction equation.
	ADC(T0)(1)	Indicates ADC units that represent the initial temperature (T0).
	Coefficient-X1	Shows the second coefficient of the correction equation.
	Coefficient-X0	Shows the third coefficient of the correction equation.
	Calculate	Use this button to calculate the correction coefficients for the output current.
	Send	Use this button to send the correction coefficients for the output current to the PMBus.
	ALPHA	This parameter represents the temperature variation coefficient.

Note 1: When ADC(T0) is present, the Coefficient-X2 label is not present. In fact, ADC(T0) appears instead of Coefficient-X2 and Coefficient-X2 appears instead of ADC(T0), depending on the firmware version.

For the 667 and 668 firmware revisions, “ADC(T0)” replaces the “Coefficient-X2” field, and the last two lines from the “Current” and “Voltage” columns are disabled. Calibration will be done only in two points, taking into consideration the temperature.

For the 666 revision, “ADC(T0)” is replaced by “Coefficient-X2”.

WARNING

The calibration is hardware-specific and is related to Microchip devices. Do not calibrate unless you carefully read the documentation.

NOTES:

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Chapter 4. Using the PMBus Graphical User Interface

WARNING

Make sure you are familiar with the PMBus™ protocol before starting to use the GUI.
If this is the first use of the board, a compensation/calibration procedure might be required. Severe malfunction of the board can occur if these steps are skipped. Read the board user guide before starting to use the GUI.

To perform the communication between the board and the PC, follow these steps:

1. Connect the board to the PC, using either a PICkit™ Serial Analyzer to be connected to the I^2C connector, or the MCP2221 Breakout Module. The connector is automatically detected by the interface. The board connected to the PC may already include the MCP2221 Breakout Module. For these devices, just plug the USB cable into the USB connector.
2. Select the "400" option from the Rate drop-down menu. If the "Connector" field shows "PICkitSA", also select the "5" option from the Voltage drop-down menu and the "enabled" option from the Pullups drop-down menu.

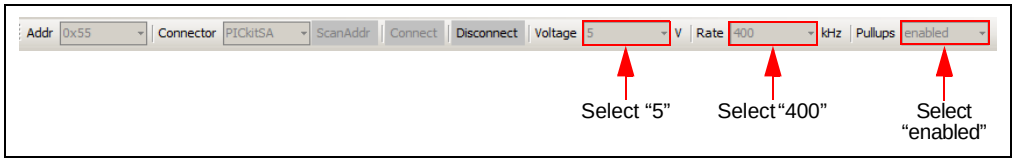


FIGURE 4-1: *Connection Bar.*

3. Press on the **ScanAddr** button. If the board is connected, the address will be shown in the Addr drop-down menu. If there are several addresses, manually select the correct address of the board from the list of available addresses (0x55 for the MCP19111 board). Then, press the **Connect** button for the communication to start running.

Note: If "PICkitSA" is selected in the Connector drop-down menu, do not press on the **ScanAddr** button several times in a row. Unplug and replug the PICKit Serial Analyzer, then press the **ScanAddr** button.

The same behavior occurs on pressing the **Disconnect** button, followed by pressing the **Connect** button. If "PICKitSA" is selected, unplug and then plug the connector again after pressing the **Disconnect** button, and before pressing the **Connect** button.

No restrictions apply if MCP222X is selected in the Connector drop-down menu.

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4. In the Status menu, under the OPERATION panel, press the **ON** button to enable the converter. If the converter does not start and an alarm is triggered (the red button on the left of a threshold), check the Alarms Details menu, identify and solve the issues before retrying to start the converter. To enable the converter, it might be necessary to set the output voltage in the Basic Settings menu to a greater or lower value. If the output overvoltage, undervoltage or overcurrent Fault limit has been reached, the converter turns off automatically and it can be powered on again only after the alarms triggered have been resolved.

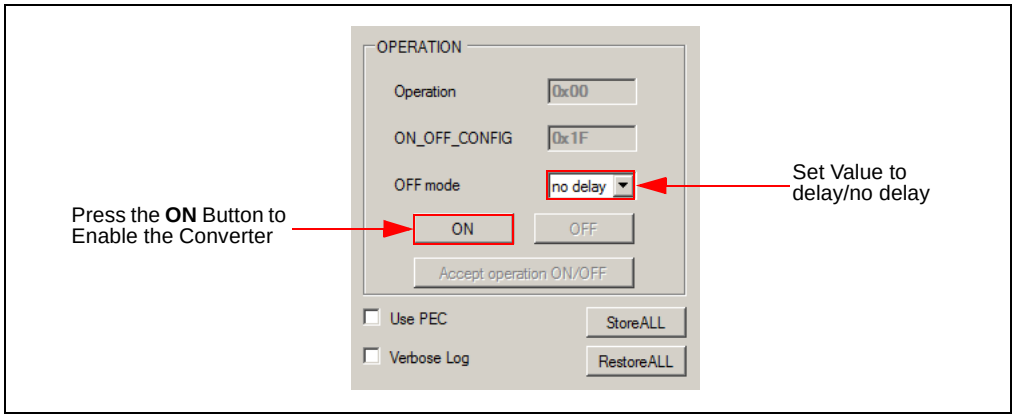


FIGURE 4-2: *Status Menu – OPERATION Panel.*

5. From the drop-down menu, set the "OFF mode" parameter to turn off the converter with or without delay. If the "delay" option is chosen, the converter will stop with a TOFF_FALL delay, set in the Advanced Settings menu.
6. Depending on the user's preferences, the following options can be selected:
   - Choose between the **C** and **F** radio buttons for the temperature to be displayed in either Celsius or Fahrenheit degrees.
   - Select the "Use PEC" check box if the communication must support the PEC byte.

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7. To close the communication between the GUI and the board, press the **Disconnect** button from the Connection bar, then resume from Step 1.

Note: If “PICkitSA” is selected in the Connector drop-down menu, a label with the PICkit Serial Analyzer firmware version will be displayed under the **RestoreALL** button, as shown in Figure 4-3.

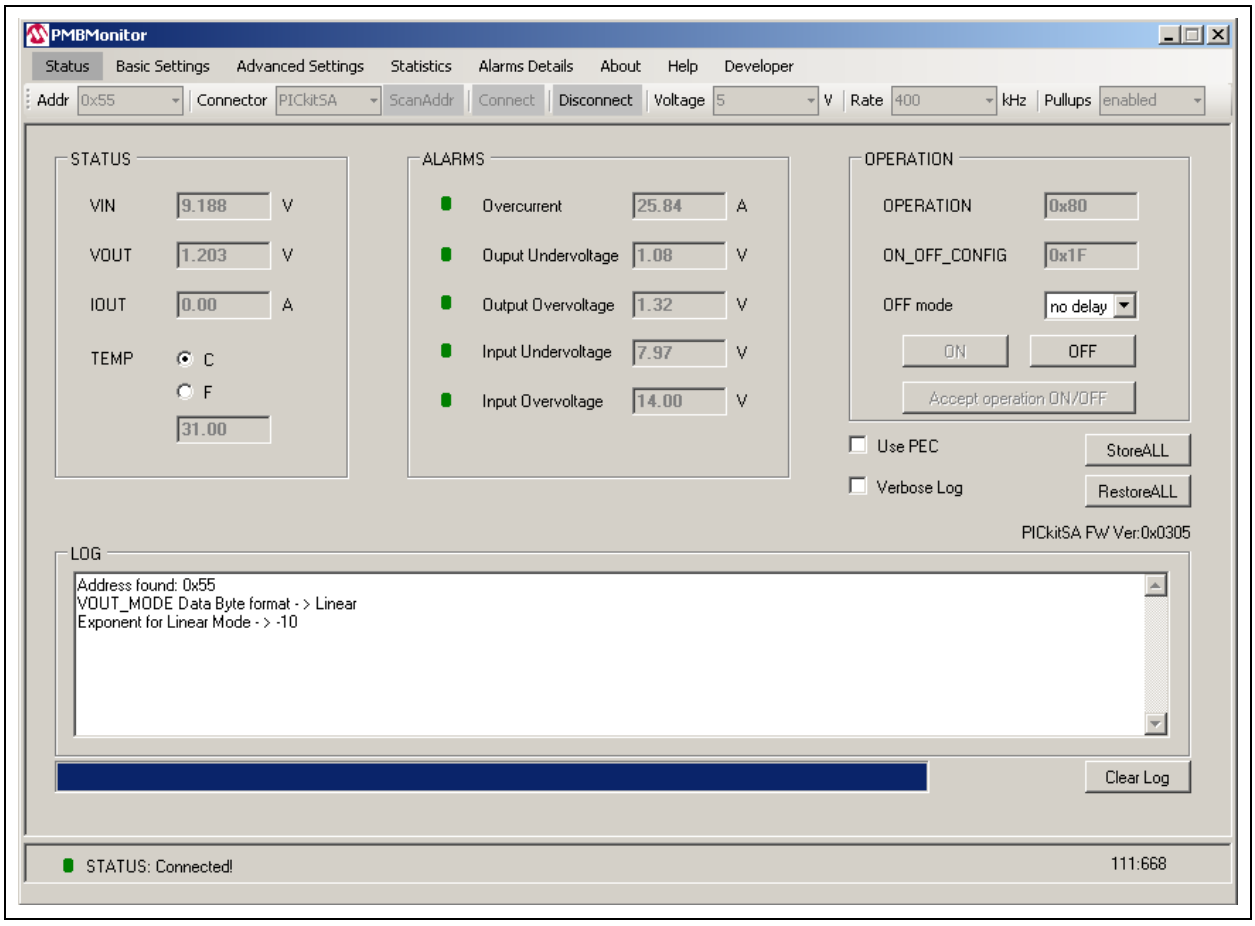


FIGURE 4-3: *Status Menu – PICkit™ Serial Analyzer Connected.*

8. In the Basic Settings menu, press the **Send** button in the OUTPUT panel to write the commands (values) included on the PMBus stack. Then, the values of the parameters for all the thresholds will be replaced with the values entered in the text boxes. The value from the "VOUT" box is the voltage set or the value that was sent via the PMBus stack on the last update. If VOUT has never been changed, the default value will be displayed in the "VOUT" box.

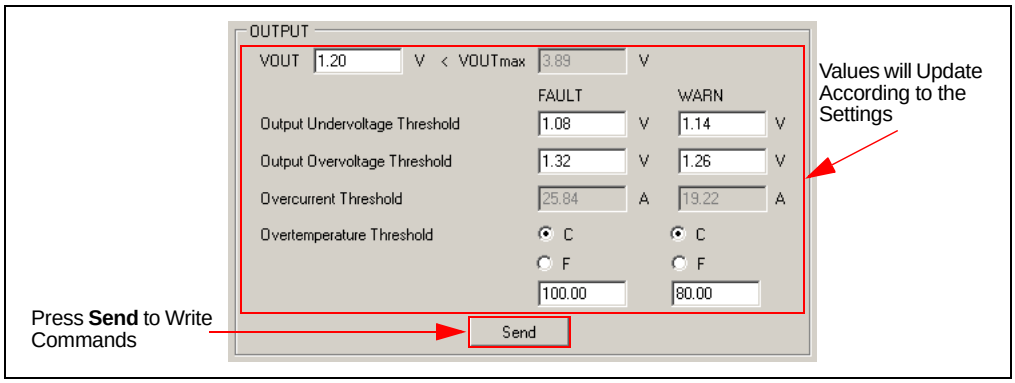


FIGURE 4-4: *Basic Settings Menu – OUTPUT Panel.*

9. Press **Send** in the INPUT THRESHOLDS panel to write the commands (values) included in this panel on the PMBus stack.

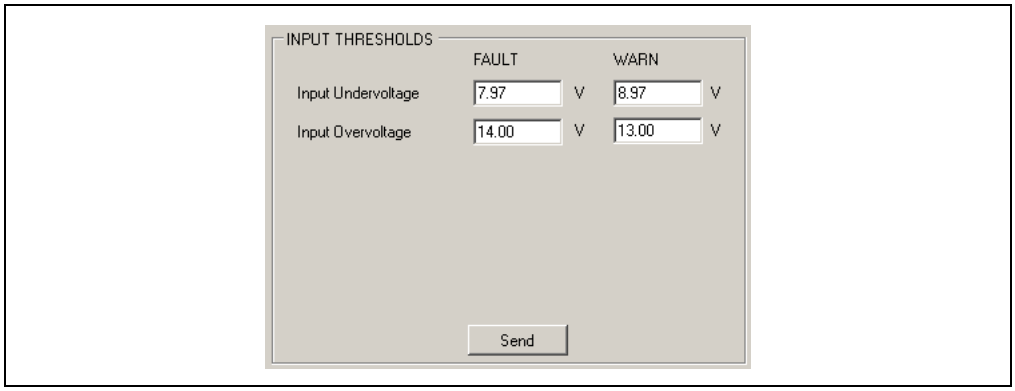


FIGURE 4-5: *Basic Settings Menu – INPUT THRESHOLDS Panel.*

10. In the Advanced Settings menu, change any parameter, as applicable, and click the **Send** button from the corresponding panel with the changed data.
11. In the Statistics menu (Figure 4-6), select one of the options in the "Coordinate1" selection box to display the corresponding graph. The following options are available:
    - When clicking the **Start** button, the time coordinate will be displayed on the X axis in seconds and the selected coordinate will be displayed on the Y axis using the corresponding measurement unit.

Note:	The **Start** button will be disabled until the **Stop** or **Clear** buttons are pressed.

    - Clicking the **Save** button will allow capturing the current image of the graph.
    - Clicking the **Stop** or **Clear** button will allow selecting another coordinate for generating the graph.

Note:	While the graph is generated, the **Read** buttons from the **Calibration** tab in the Developer menu are disabled. Click the **Stop** or **Clear** button to stop scrolling the graph and to enable the **Read** buttons in the **Calibration** tab.

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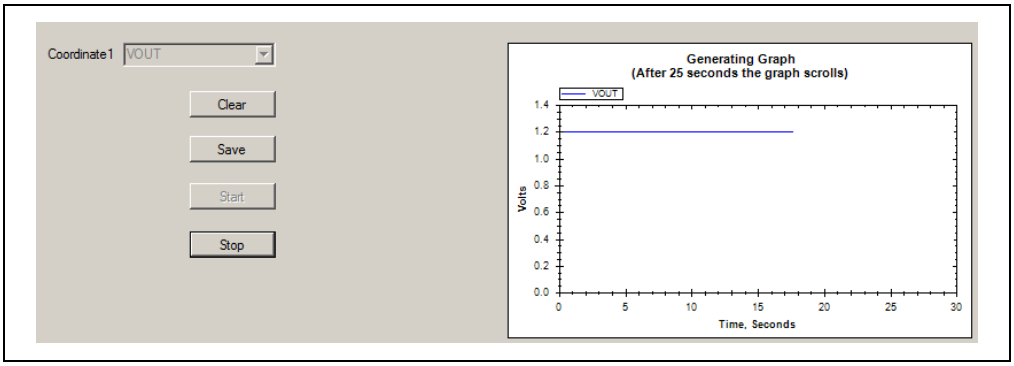


FIGURE 4-6: *Statistics Menu.*

12. Check the Alarms Details menu to see if the green icon on the left of each bit has turned red. The red icon indicates that a warning, a Fault or an error has occurred. If the icon on the left of any bit is red, identify and solve the cause of the alarm.
13. Go to the **Settings** tab in the Developer menu. Under the MANUFACTURER panel, set the specific values (SPECIFIC_OCCON, SPECIFIC_CSGSCON, SPECIFIC_CSDGCON, SPECIFIC_CMPZCON, SPECIFIC_SLPCRCON, SPECIFIC_DEADCON).

    Click **Send** to transmit these values to the PMBus.

WARNING

It is recommended to read the *"MCP19110/11 Data Sheet"* (DS20002331) and the *"TB3139, MCP19111 PMBus™ Firmware Technical Brief"* (DS90003139) before changing any values in the MANUFACTURER panel.

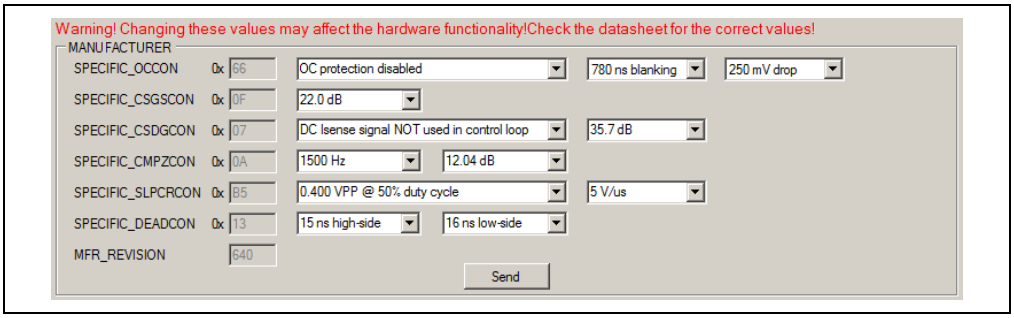


FIGURE 4-7: *Settings Tab – MANUFACTURER Panel.*

14. Before setting the overcurrent warning and Fault values, go to the **Calibration** tab and type the current values in the Current column in the IOUT panel. Perform the following tasks:
    - Click the **Read** button corresponding to the current value for which the measurement has been performed.
    - Set all points for IOUT calibration, then click on the **Calculate** button.
    - Click the **Send** button at the bottom of the IOUT panel to transmit the values to the PMBus.

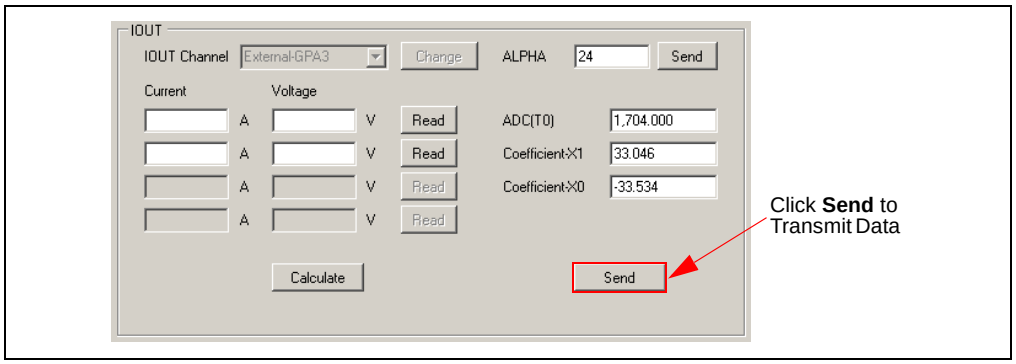


FIGURE 4-8: *Calibration Tab – IOUT Panel.*

For a better understanding and usage of calibration procedure, refer to the *"MCP19111 PMBus™ Protocol-Enabled Point-of-Load (POL) Converter Reference Design User's Guide"* (DS50002379) document.

15. To set the overcurrent warning limit and Fault, return to the **Settings** tab and type the current values in the WARNING and FAULT fields corresponding to the Volt values in the IOUT_OC panel. Click the **to A** button to have a value on the left field in Volts, filled in by the user, and a calculated value in the right field in Amperes.

    Click the **Send** button in the IOUT_OC panel to transmit the values to the PMBus.

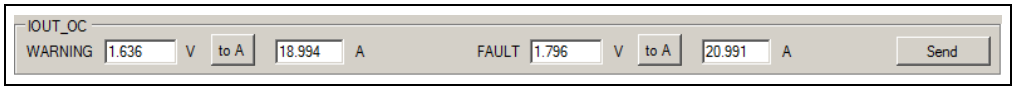


FIGURE 4-9: *Settings Tab – IOUT_OC Panel.*

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16. Go to the **Calibration** tab under the Developer menu to calibrate VOUT. Perform the following tasks:
    - Click the **Read** button in the VOUT panel.
    - Measure the real VOUT and type the value in the “Measured” field.
    - Click the **Send** button in the VOUT panel to write calibration values for VOUT.

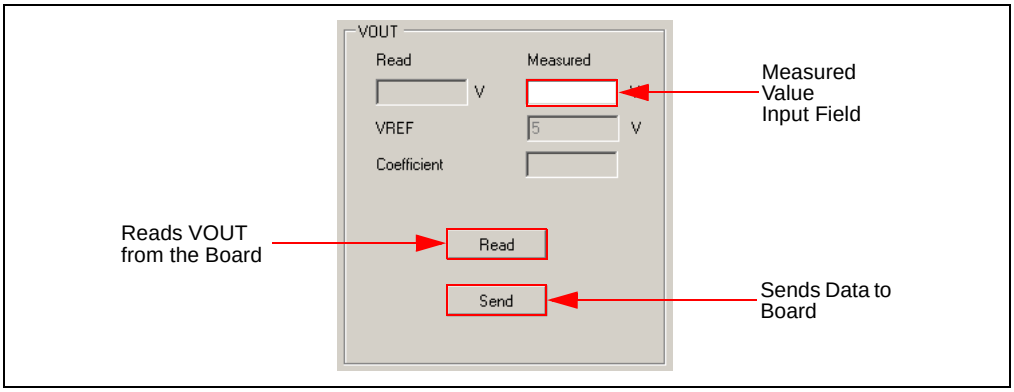


FIGURE 4-10: *Calibration Tab – VOUT Panel.*

Note:	For the 667 and 668 firmware revision boards, the current can be calibrated only in two points, and taken into consideration a temperature coefficient instead of a second-order coefficient, and four calibration points for the 666 firmware revision. The procedure is basically the same as above, except that it is necessary to wait for the temperature equilibrium to be reached.

17. The device calibration is now complete. Click the **StoreALL** button in the Status menu to retain the values after the device has been powered off, or on the **RestoreALL** button to return to the default values.
18. Disconnect the board from the PC to end the communication.

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