User's Guide

I²C Bus Monitor Plus

(#MIIC-102)

Version 3.1

Micro Computer Control Corporation
www.mcc-us.com

The MCC I²C Bus Monitor Plus™ (#MIIC-102) I²C Bus Monitor is a laboratory grade instrument that allows a Windows PC to monitor, analyze, log, and display I²C Bus and derived bus protocol activity.

What is new for Version 3.1:

- **Windows OS Support**
  Windows XP (x86), and Vista/7/8/8.1 (x86/x64) supported.
- **USB Interface Support**
  USB interface works with new or existing I²C Bus Monitor Plus pods.
- **Trace Data Spooling**
  Capture more high-intensity I²C Bus data. Trace data is now held in a user specified high-speed RAM or Disk based spool buffer (up to 1GB) until logged, filtered, analyzed, and displayed.
- **Trace Data Display Control**
  Capture now, display later. Displaying trace data in real-time can limit the amount of bus data captured in high-intensity I²C Bus applications. Now bus data can be captured and logged without a trace display time penalty.
- **Display File Read**
  Display files generated from a real-time, or log file, trace, can be displayed and searched for specific bus activity.
- **Log File Read Auto-Pause Control**
  Optional log file display control. Enable or disable automatic display screen pause when reading a pre-recorded log file..

This user's guide describes the installation and operation of the I²C Bus Monitor Plus hardware and software.

15-MAY-2015

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WARNING - Life Support Applications: MCC products are not designed for use in life support appliances, devices, or systems where the malfunction of the product can reasonably be expected to result in a personal injury.

WARNING - Radio Frequency Emissions: This equipment can radiate levels of radio frequency energy that may cause interference to communications equipment. Operation of this equipment may cause interference with radio, television, or other communications equipment. The user is responsible for correcting such interference at the expense of the user.

WARNING - Electrostatic Discharge (ESD) Precautions: Any damage caused by Electrostatic Discharge (ESD) through inadequate earth grounding is NOT covered under the warranty of this product. See the “Electrostatic (ESD) Precautions” section of this guide for more information.

Product of the United States of America

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Limited Warranty

Micro Computer Control Corporation warrants this product against defects in material and workmanship for a period of ninety (90) days from the original date of purchase.

This limited warranty is not applicable to:

1. Normal wear and tear.
2. Abuse, unreasonable use, mistreatment or neglect.
3. Damage caused by the equipment or system with which the product is used, or
4. Damage caused by modifications or repair not authorized by MCC.

THIS WARRANTY IS EXTENDED TO THE ORIGINAL PURCHASER ONLY AND IS IN LIEU OF ALL OTHER WARRANTIES, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

In no event will MCC be liable for any incidental or consequential damages.

During the warranty period, MCC will repair, replace or refund the purchase price of any product found defective at its option. Returned items require an RMA (Return Material Authorization) issued by MCC, must be carefully packaged, insured for the full replacement value, with shipping charges prepaid, before the return will be accepted.

System Requirements

To use the I²C Bus Monitor Plus, your PC must meet the following requirements:

- Windows-based PC System.
- Minimum 4 MB of RAM.
- Minimum 20 MB Free Hard Disk Space.
- Internet Access to download application/driver software.
- Microsoft Windows XP (x86), Vista/7/8/8.1 (x86/x64).
- Free USB port when using USB Interface.
- Free Card Slot when using Card Interface (PCIe 1x, PCI, PC-CARD, or ISA).

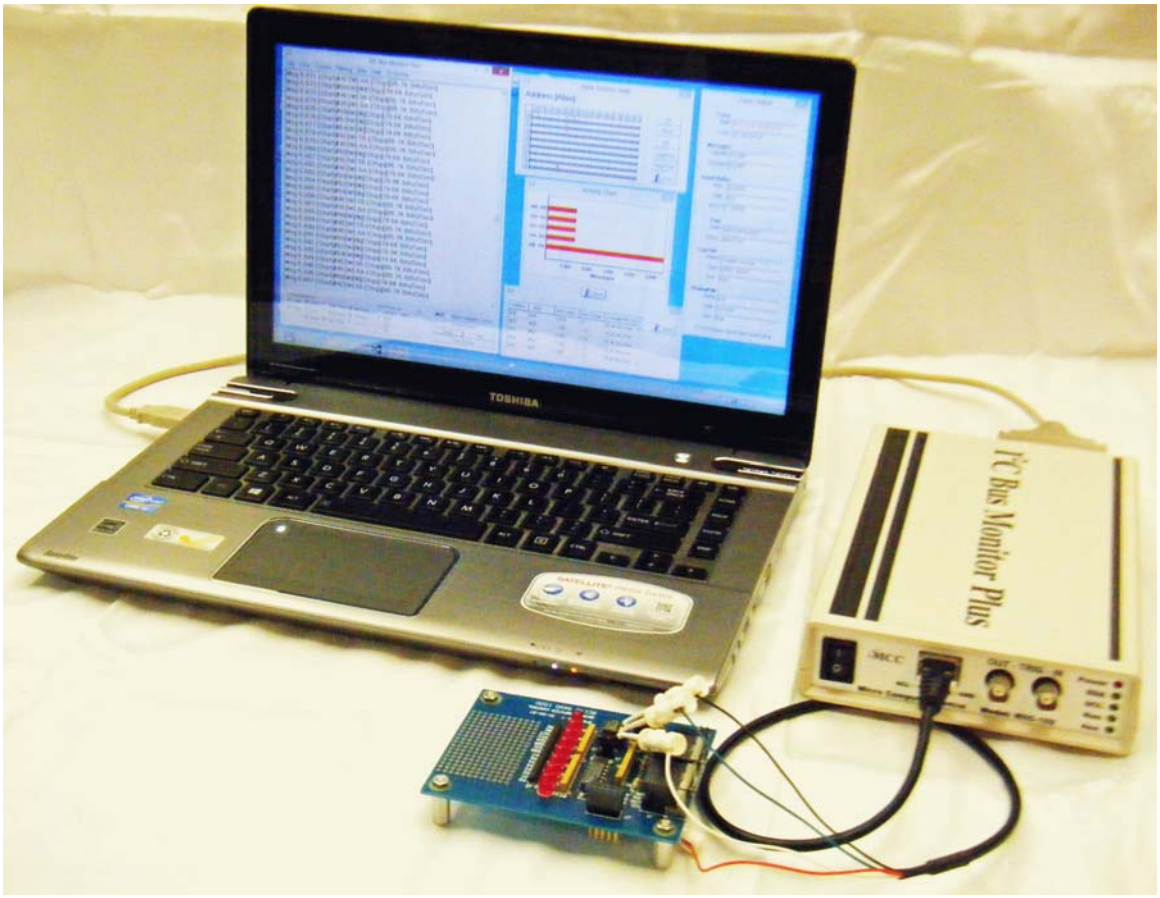
System Components

The I²C Bus Monitor Plus package includes the following components:

1. I²C Bus Monitor Plus Pod.
2. Host Computer Interface:
   a. USB Interface with integrated Cable, or
   b. PCIe 1x, PCI, PC-CARD*, or ISA* Interface Card and Cable.
3. I²C Bus Clip Lead Cable (2 foot) (#CABCL).
4. I²C Bus Cable (4 foot) (#CAB4).
5. BNC to Clip Lead Trigger (IN or OUT) Cable.
6. International Power Supply (#MWT-5VAG).
7. USB or Interface Card Driver (Online Download).
8. I²C Bus Monitor Plus Software (Online Download).

*NOTE: PC-CARD and ISA not supported on Vista/7/8.

I²C Bus Monitor Plus
(#MIIC-102)



Introduction

The **I²C Bus Monitor Plus** (#MIIC-102) is a laboratory grade troubleshooting instrument for the Inter-Integrated Circuit (I^2C) Bus developed by Philips Semiconductors. When connected to an I^2C Bus and a host computer, the I^2C Bus Monitor Plus captures and displays I^2C Bus or derived bus protocol communications.

The complete I^2C Bus Monitor Plus package consists of an external pod, host computer interface, connecting cables, and Windows based software.

Features

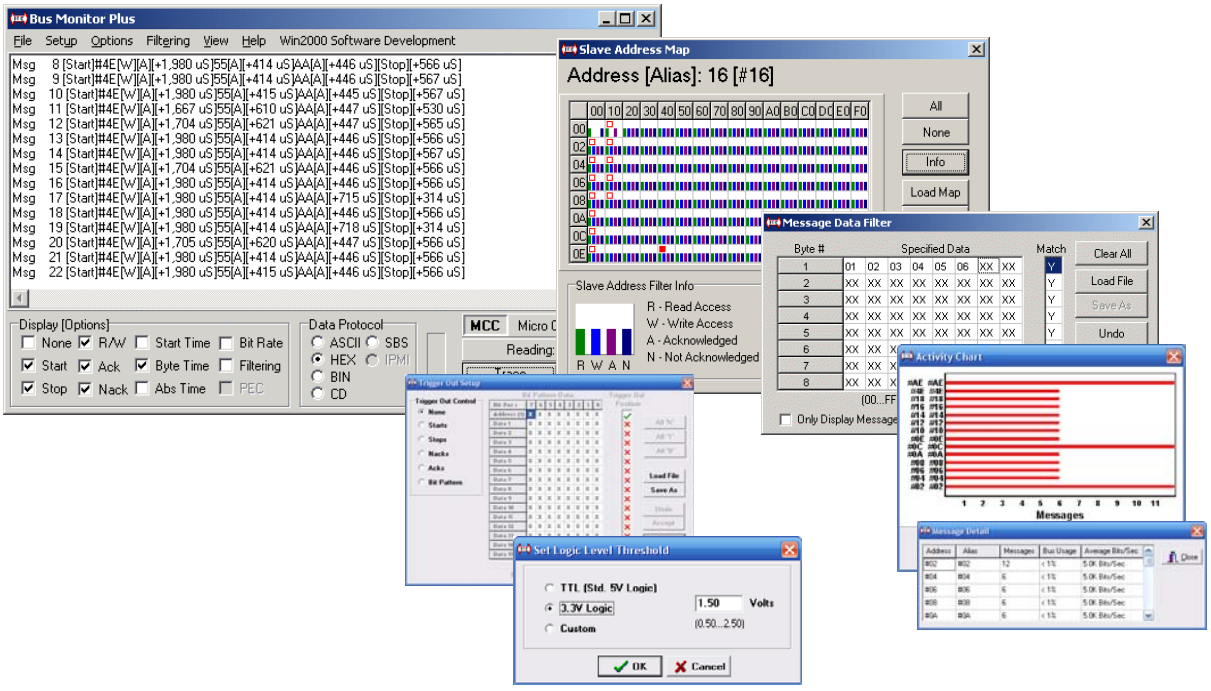
The I^2C Bus Monitor Plus includes the following features:

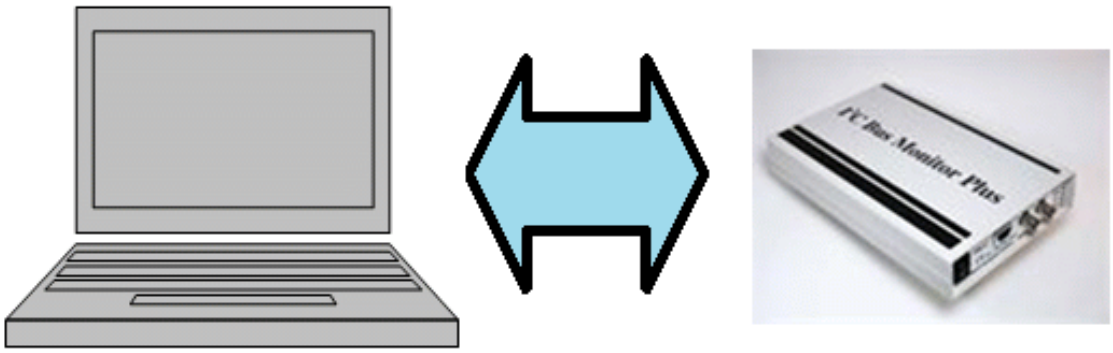
- Non-intrusive trace of bus traffic to 400KHz.
- Compatible with low voltage logic.
- Microsecond time stamping on bus events and bit, byte, or message data.
- Captures Start/Stop events, device addresses, read/write requests, acknowledgments, and data.
- Display filtering on message Slave Address, R/W Access, Acknowledgment, and up to 8 data bytes.
- Log all bus activity to file.
- Log all displayed messages to a file.
- Trigger Input for synchronization with external event.
- Trigger Output on bus events or pattern match for triggering external test equipment.
- Smart Battery System (SBS) protocol display and violation detection.

I²C Bus Monitor Plus Software

The I²C Bus Monitor Plus software provides an integrated set of tools that interface with the I²C Bus Monitor Plus pod. These tools allow a user to control the capture, logging, filtering, display, and analysis of message traffic on an I²C Bus.

Although the software requires the I²C Bus Monitor Plus pod to capture I²C Bus data, the software can be operated in Software-Only mode to analyze pre-record log files. Since log files record all bus activity, log files recorded by one user via a pod, can be sent to another local or remote user for detailed filtering, display, and analysis.





Installation

> WARNING - The instructions that follow require certain technical skills in the field of computer electronics. If you feel that you are not qualified to perform the required setup and installation procedures, we recommend the you seek assistance from a qualified technician.

ESD (Electrostatic Discharge) Precautions

Electrostatic discharge is defined as the transfer of charge between bodies at different electrical potentials. Electrostatic discharge can change the electrical characteristics of a semiconductor device, degrading or destroying it. Electrostatic discharge also may upset the normal operation of an electronic system, causing equipment malfunction or failure.

When connecting the I^2C Bus Monitor to a host computer and a target system, extreme care must be taken to avoid electrostatic discharge. Failure to follow ESD protection procedures when using the I^2C Bus Monitor could damage the host computer, I^2C Bus Monitor, or the target system, and void product warranty coverage.

Host Computer Grounding

Case 1 - Desktop and Single-board Computers. The chassis on a desktop or single-board host computer must be connected to earth ground to comply with safety regulations. If the computer chassis is NOT connected to earth ground for some reason (i.e., use of a two-prong power mains plug), the host computer power supply ground will float to some unknown voltage potential.

Case 2 - Laptop Computers. Laptop computers present special ESD problems. Most laptop computers use an external double-insulated mains power supply which is NOT connected to the mains earth ground. This means that the laptop chassis is floating at some unknown voltage potential.

In either case, upon connection to the I^2C Bus Monitor and the target system, the host computer can discharge energy through its interface card to the I^2C adapter, and on to the target system. This discharge could damage the host computer, I^2C Bus Monitor, and the target system.

Grounding Solutions

To avoid damage to the host computer, I^2C Bus Monitor, or target system, follow these instructions:

- Wear an earth grounded wrist strap, or discharge any static charge build-up, when handling the I^2C Bus Monitor or any target system devices.
- Ensure that both the host computer and target system are connected to a common earth ground point.

- Make sure that all interconnections are made BEFORE applying power to the host computer, I^2C Bus Monitor, and target system.
- If you are using a laptop computer or host computer that is NOT connected to mains earth ground, make a hard-wired connection from the host computer (i.e., port connector shell) and the target system ground connector to a common earth ground point.
- Avoid plugging and unplugging system components while the host computer or target system is powered.
- Ensure that any devices connected to the target system are properly grounded to the common earth ground point.
- If unsure how to properly ground system components, seek electrical expert help.

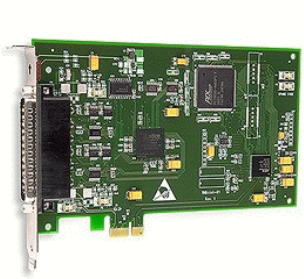
WARNING: Any damage caused by Electrostatic Discharge (ESD) through inadequate earth grounding is NOT covered under the warranty of this product.

Installation - Host Computer Interface

The I^2C Bus Monitor Plus pod connects to the host computer via a host computer interface. Several host computer interfaces are available. Instructions on installing the interface hardware and driver software are covered in the appendix sections:

- USB - See Appendix A

- PCIe - See Appendix B



- PCI - See Appendix C

- PCMCIA - See Appendix D

- ISA - See Appendix E

Installing - I²C Bus Monitor Plus Software

This section covers software installation procedures for the I²C Bus Monitor Plus software.

Installing - Software

The I²C Bus Monitor Plus software includes full support to capture and display bus messages. The software is available online.

www.mcc-us.com/i2cBMPlus

Software installation instructions:

1. Previous versions of this software DO NOT need to be uninstalled before installing this software
2. Make sure you have installed the latest Windows updates and service packs.
3. Click the link above to download and save the .ZIP file to a temporary folder on your computer.
4. Right-click the downloaded .ZIP file and select “Extract All”.
5. Double-click the extracted Setup.exe file to begin the installation.
6. Follow on-screen instructions.
7. The software can be started from the start menu or screen.

The I²C Bus Monitor Plus software can be used two ways:

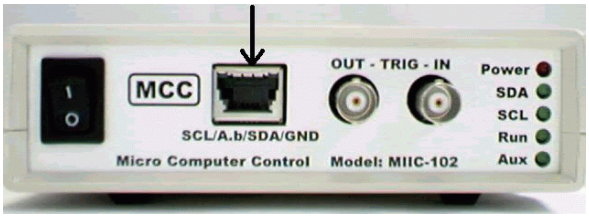
Normal Mode - With an attached I²C Bus Monitor Plus pod, I²C Bus data can be collected, logged, filtered, analyzed, and displayed.

Software-Only Mode - Without an attached I²C Bus Monitor Plus pod, pre-recorded I²C Bus log files can be filtered, analyzed, and displayed.

Connecting to the Device Under Test

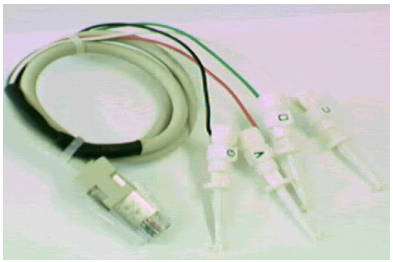
The I²C Bus Monitor Plus pod includes several ports for connecting the pod to a device under test. These ports include:

1. I²C Bus Port



The I²C Bus port is used to connect the pod to the I²C Bus under test. This port is located on the front of the pod, and uses an AMP Shielded Data Link type connector. Input lines are provided for I²C Clock, Data, and Ground, and optional bus power voltage measurement.

Connect the pod to the I²C Bus under test using the I²C Bus clip lead cable or I²C Bus cable provided.



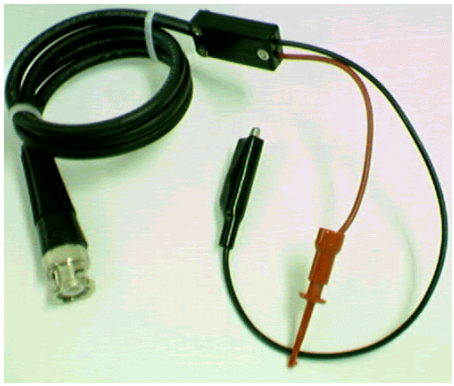
2. Trigger In Port (Optional)

The Trigger In port is optionally used to synchronize I²C Bus data

collection with an external event. This port is located on the front of the pod, and uses a BNC type connector. Input lines are provided for signal and ground.

When Trigger In is enabled with the software Trace Control dialog, data capture begins on the first I^2C Bus Start condition after a high to low transition on the Trigger In signal line.

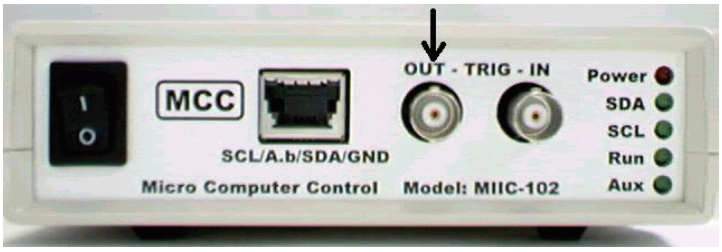
Connect the pod to an external trigger circuit using the BNC to clip lead cable provided.



Connecting to External Test Equipment (Optional)

The I^2C Bus Monitor Plus pod includes two ports for connecting the pod to external test equipment. These ports include:

1. Trigger Out Port (Optional)



The Trigger Out port is optionally used to synchronize external equipment with I^2C Bus events or data match pattern. This port is

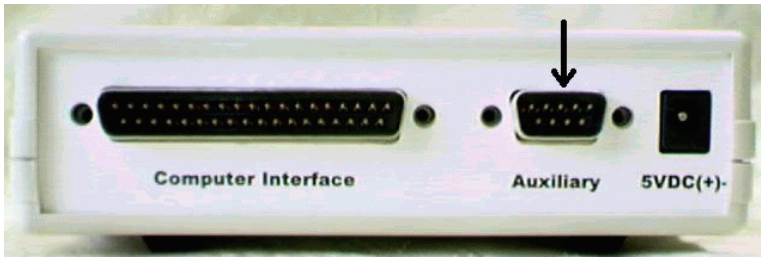
located on the front of the pod, and uses a BNC type connector. Output lines are provided for signal and ground.

When Trigger Out is enabled and configured with the software Trigger Out dialog, a high to low transition on the signal line occurs on:

a. I^2C Bus Start events.
b. I^2C Bus Stop events.
c. I^2C Bus Acknowledge event.
d. I^2C Bus Negative Acknowledge event.
e. Bit Pattern Match.

Connect the pod to external equipment using a BNC to external equipment cable (not provided).

2. Auxiliary Port (optional)



The Auxiliary port is used to connect the I^2C Bus Monitor pod to external equipment. This port is located on the rear of the pod, and uses a DB-9M type connector. Auxiliary lines include:

Pin 1 - I^2C Bus Data (SDA)	Pin 6 - Trigger Out (TOUT)
Pin 2 - I^2C Bus Clock (SCL)	Pin 7 - Trigger In (TIN)
Pin 3 - TTL I^2C Bus Clock (TSCL)	Pin 8 - Optional I/O (OIO)
Pin 4 - TTL I^2C Bus Data (TSDA)	Pin 9 - Vcc +5 Output (VOUT)
Pin 5 - Ground (GND)	

Starting the I²C Bus Monitor Plus Software

The best way to get familiar with the I²C Bus Monitor Plus software is to start it up. The software can be started from the Start menu or Start screen.

The I²C Bus Monitor Plus software can be used with, or without, the external pod connected. With the pod connected, live bus data can be captured, analyzed and displayed. Without the pod, pre-recorded log files can be analyzed and displayed. Several sample log files are installed with the software.

Viewing Sample Log Files

1. From the Windows Start menu, select Programs|I²C Bus Monitor Plus x.x|I²C Bus Monitor Plus.

2. Select "Open Log File for Read" in the "Setup" menu, and select a pre-recorded log file.

Viewing Live Messages

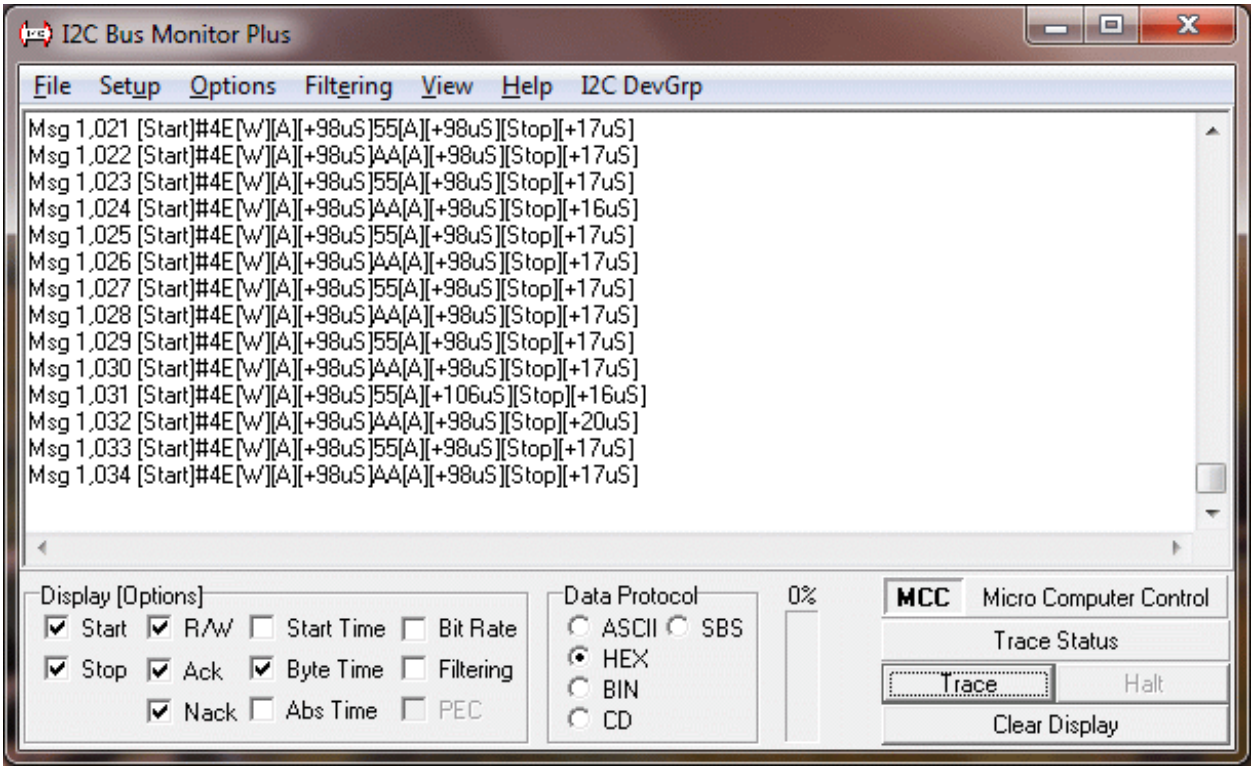
1. Install the I²C Bus Monitor Plus software and hardware as indicated in the Installation section of this user's guide.

2. From the Windows Start menu or Start screen, select Programs|I²C Bus Monitor Plus x.x|I²C Bus Monitor Plus.

3. Select the desired Display (Options) and Data Protocol. Click "Trace", and follow the instructions on screen. Any active bus messages will be displayed with your options.

Program Controls

The I²C Bus Monitor Plus software provides a rich set of features designed to collect, time-stamp, analyze, and display I²C Bus messages. User control of these features is provided by a graphical user interface consisting of Trace Controls, Display Options, Data Protocol selections, Pull-Down Menus, and Pop-Up Menus.



Main Screen - HEX Data Protocol

The operation of these controls are described below:

Trace Controls:

Trace Status - Display Trace Status real-time information including Trace State and Time, Messages Captured and Displayed, Spool Status, Pod Status, Log and Display file status.

Trace - Enter Trace mode. The Bus Monitor Plus displays I²C Bus traffic or log file data using the selected display format and filtering

in the main display window. If a log file is Open for Read, log data will be displayed.

More - Continue display of log file data when main display is full.

Halt - Stop display of data and enter Halt mode.

Clear - Clear the main display window.

Display [Options]

Start, Stop, Ack, NAck and R/W - Controls display of I^2C events.

Start Time, Byte Time, and Bit Rate - Controls display of message timing information.

Filtering - Enables Slave Address and Message Data filtering. See Address Map dialog and Message Data dialog for information on establishing filtering parameters.

Abs Time - Message Start, Byte, and Bit timing can be displayed in Relative Time or Absolute Time mode.

Relative Time Mode

Relative Mode displays timing information relative to the previous I^2C Bus event. Displayed Start timing is the time since the previous Stop. Displayed Byte or Bit timing is the time since the previous Start, Byte, or Bit event.

Absolute Time Mode

Absolute Mode displays timing information from a fixed I^2C Bus event. Displayed Start timing is the time since the first I^2C Bus Start event. Displayed Byte or Bit timing is the time since the current message I^2C Bus Start event.

Data Protocols

Captured message data can be displayed using several standard protocols. These protocols include:

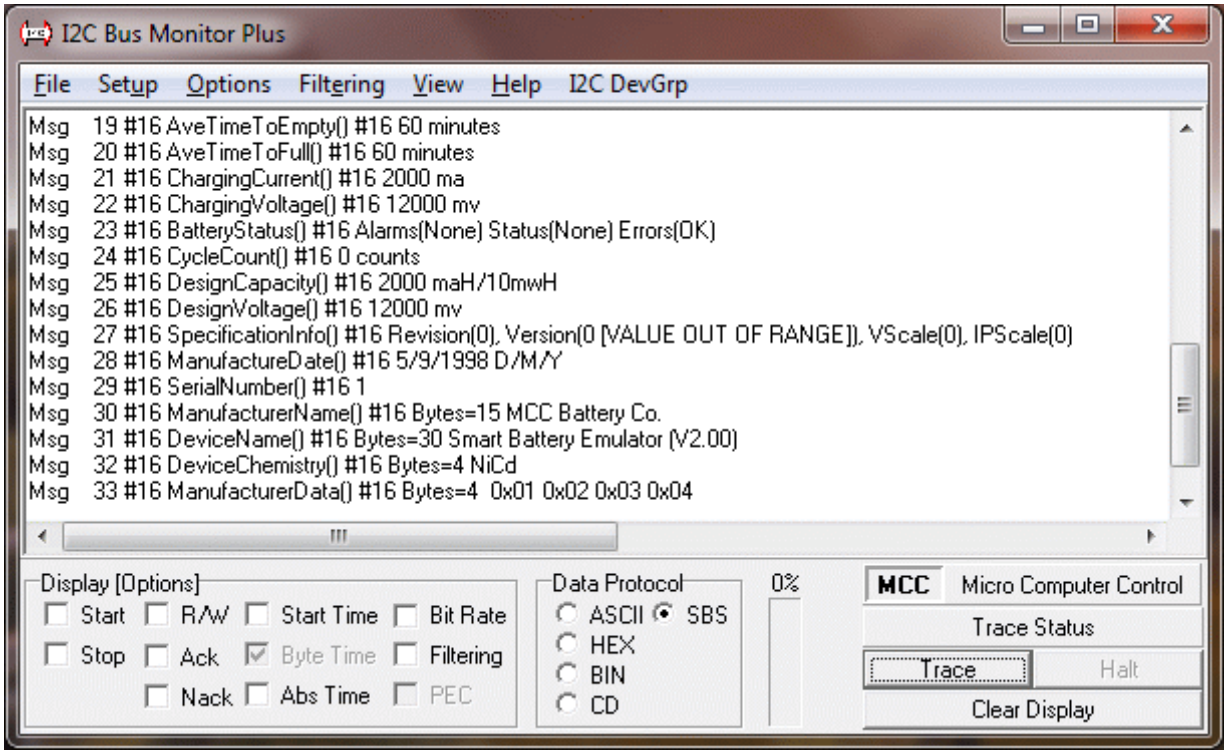
ASCII - Display printable data in ASCII format.

HEX - Display data in Hexadecimal format.

BIN - Display data in Binary format.

CD - Display data in Comma Delimited format.

SBS - Display SBS data in Smart Battery System format.



Main Screen - Smart Battery System Protocol

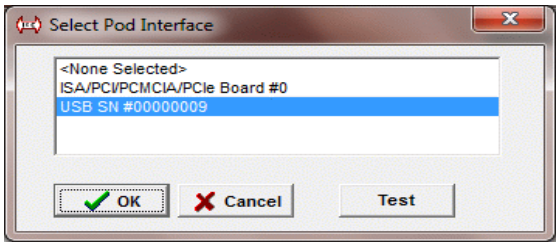
Pull-Down Menu Controls:

File|Print Setup - Setup printer.

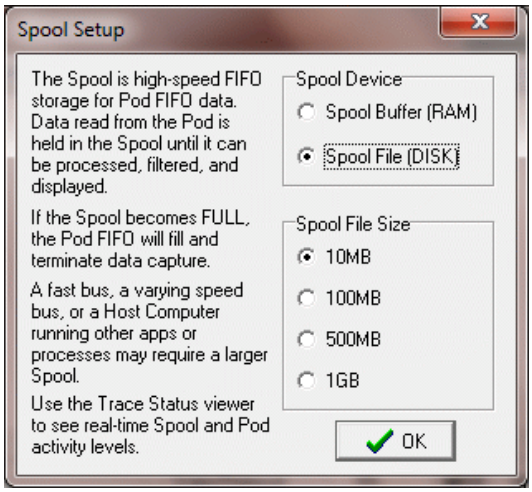
File|Print - Print Displayed Data with option to print selected text only.

File|Exit - Terminate program.

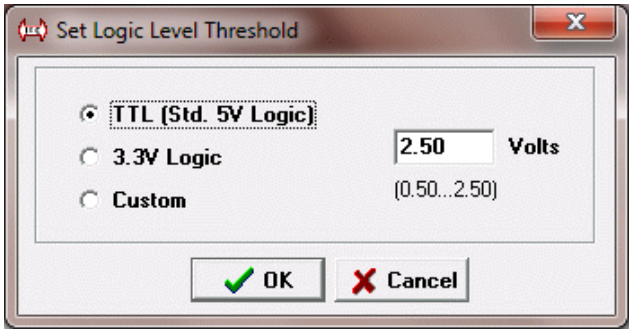
Setup|Select Pod Interface - Displays the Select Pod Interface dialog box. Use this dialog box to select the host computer interface connected to the external pod.



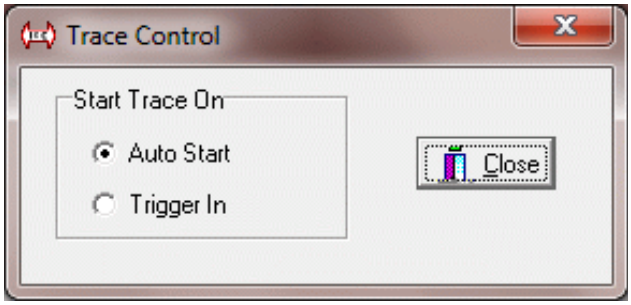
Setup|Spool Setup - Displays the Spool Setup dialog box. Use this dialog box to select the spool device and size. The spool temporarily holds captured bus data until it can be processed and displayed.



Setup|Logic Level Threshold - Displays the Logic Level Threshold dialog box. Use the Logic Level Threshold dialog box to set the logic level threshold on the I^2C Clock and Data lines. Logic levels for TTL (5V Logic), 3.3V Logic, and Custom levels for 0.50V to 2.50V are supported.



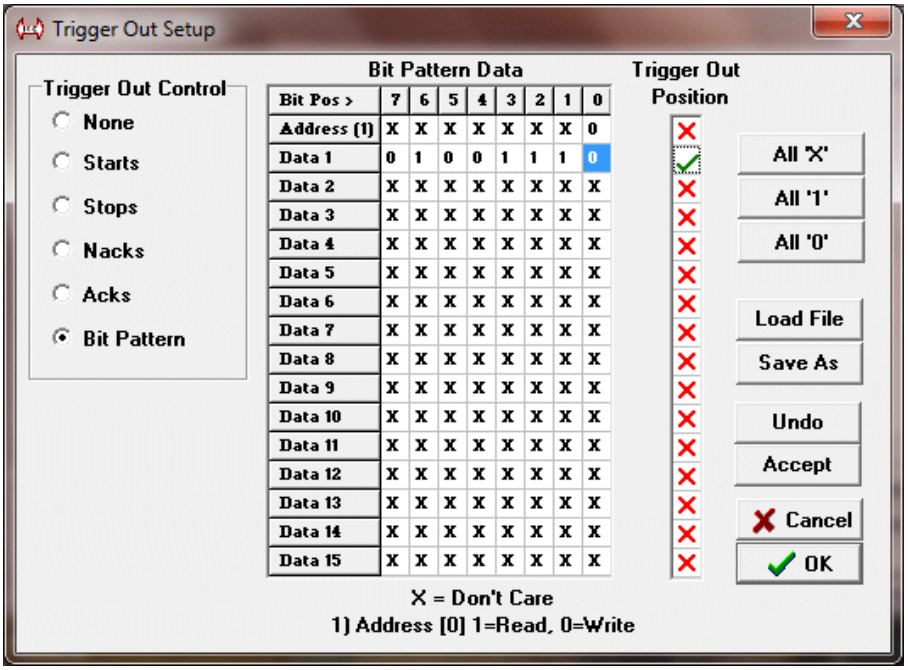
Setup|Trace Control - Displays the Trace Control dialog box. Use the Trace Control dialog box to set Trace start conditions.



Select "Auto Start" to start tracing messages on the first I²C Bus Start event.

Select "Trigger In" to start tracing messages on the first I²C Bus Start event after the Trigger In port goes low. Use this setting to synchronize data collection with external signals.

Setup|Trigger Out - Displays the Trigger Out dialog box. Use the Trigger Out dialog box to set Trigger Out port low pulse conditions.



Select "Start", "Stop", "Ack", or "Nack" to generate a low pulse on the Trigger Out port each time the selected I²C Bus event occurs.

Select "Bit Pattern" to generate a low pulse on the Trigger Out port when the Bit Pattern Data match and Trigger Out Position conditions occurs.

Bit Pattern data and Trigger Position selection is provided for the I^2C Bus address and first 15 data bytes within a message. Bits may be specified as 0, 1, or Don't Care.

The Trigger Out port low pulse occurs if the Bit Pattern match is true when the Trigger Out position occurs. Trigger Out low pulse occurs on the I^2C Bus Acknowledge bit following the Trigger Out position byte.

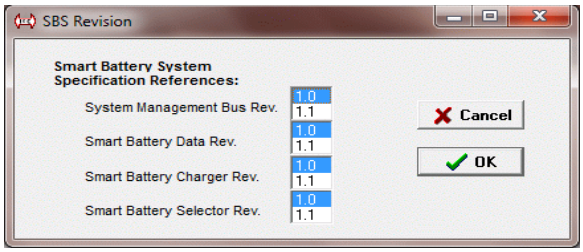
The Trigger Out signal can be used to synchronize external data collection devices such as storage scopes or logic analyzers with I^2C Bus events.

Setup|Enable Bit Timing - Enable collection of I^2C Bus Bit Timing information. Bit timing information is available in the "Show Message Timing" pop-up menu described below.

Bit Timing causes the external pod to generate a 9 times increase in data, and can result in pod data recording memory overflow on high bandwidth or high speed bus traffic.

Setup|Enable Trace Display - Enable message parsing and display activities. Disable this option to maximize bus data collection and logging. Use with a large spool and “Open Log File for Write” to maximize pod recording memory utilization.

Setup|Select SBS Revision - Displays the Smart Battery System (SBS) Revision dialog box.



Use this dialog box to select the SBS revision used by system components. When displaying messages in SBS protocol, the I^2C Bus Monitor Plus software will detect and display the following protocol violations using the selected specification revision.

SBS Protocol violation detection includes:

[VALUE RANGE VIOLATION]
[STRING LENGTH < MINIMUM]
[STRING LENGTH > MAXIMUM]
[BLOCK LENGTH < MINIMUM]
[BLOCK LENGTH > MAXIMUM]
[RESERVED BIT VIOLATION 0xXXXX]
[NO CHARGER ALARM VIOLATION]
[NO HOST ALARM VIOLATION]
[INVALID ERROR CODE 0xXXXX]
[RESERVED ERROR CODE 0xXXXX]
[RESERVED VALUE VIOLATION 0xXXXX]
[VALUE VIOLATION 0xXXXX]
[SINGLE BIT VIOLATION 0xXXXX]
[SLAVE ADDRESS NACK]
[0xXX RESERVED FUNCTION]
[READ ONLY ACCESS VIOLATION]
[PEC=XX CRC=XX ERR]
[PEC ACK ERROR]
[PEC NACK ERROR]
[MSG TOO LONG]
[WRITE ONLY ACCESS VIOLATION]
[UNITIALIZED READ OPERATION]
[MSG BYTES MISSING]
[INVALID REPEATED START ADDRESS]

For details on the SBS protocol, visit the Smart Battery Implementors Forum at www.sbs-forum.org

Setup|Open Log File for Write - Open a log file (*.log) to record data from I^2C Bus Monitor Plus pod. Log files record all captured bus activity. Pre-recorded log files can be processes with the Setup|Open Log File for Read menu item below.

Setup|Open Log File for Read - Load a pre-recorded log file for processing and display. The I^2C Bus Monitor Plus can process log files (*.log) previously collected from the external pod. Log files are displayed with the currently selected display, filtering and protocol options. Use "Options|Log File Read Auto-Pause" to control the display of log file messages.

Setup|Open Display File for Write - Open a text file to record all displayed messages. Use alone to record displayed messages, or in combination with the Comma Delimited data protocol option to generate comma delimited files suitable for importing into a spreadsheet program for additional analysis.

Setup|Open Display File for Read - Open a text file to display pre-recorded displayed messages. Can be used to search for specific I^2C Bus events (message numbers, slave addresses, slave data).

Setup|Initialize External Pod - Select Initialize External Pod to initialize or re-initialize the I^2C Bus Monitor Plus external pod. Initialization also automatically occurs when performing activities that require the pod.

Setup|Program Settings|Save/Load/Restore Default - Select this menu item to Save, Load, or Restore Default I^2C Bus Monitor Plus software parameters. Setting are automatically reloaded at startup.

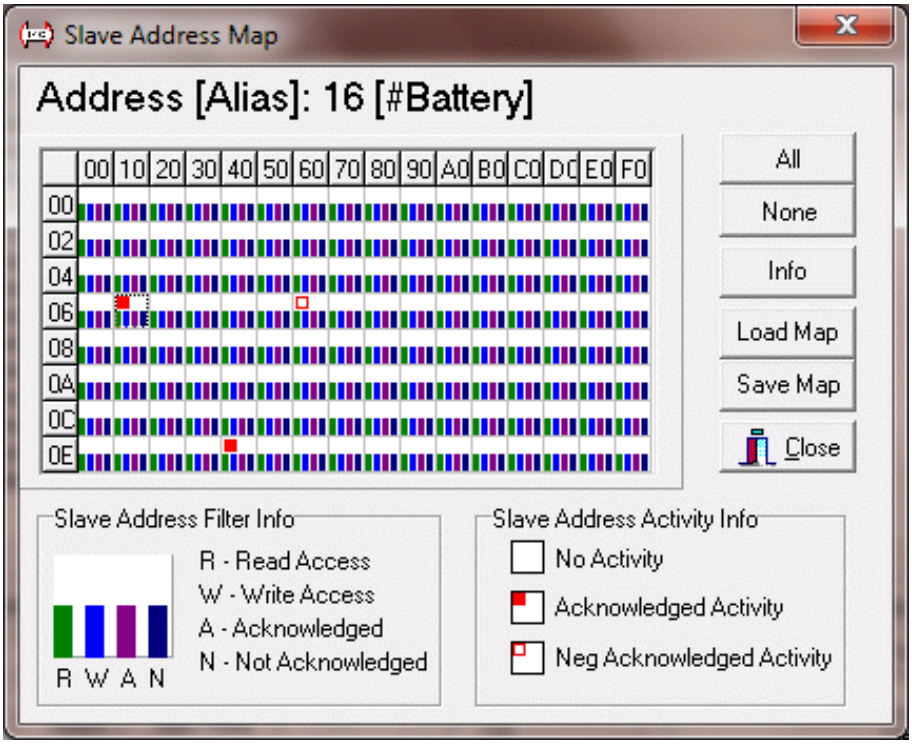
Setup|System Diagnostics - Select System Diagnostics displays system diagnostic data used for product support.

Options|Show Hints - Enable display of cursor sensitive help.

Options|Log File Read Auto-Pause - Enable Log File Read Auto-Pause to control the display of log file messages. When enabled, the log file display will pause for user input every 10,000 displayed messages, before deleting the oldest 5,000 messages.

Options|Set Font - Select display font and size.

Filtering|Slave Address - Displays the Slave Address Map dialog box.



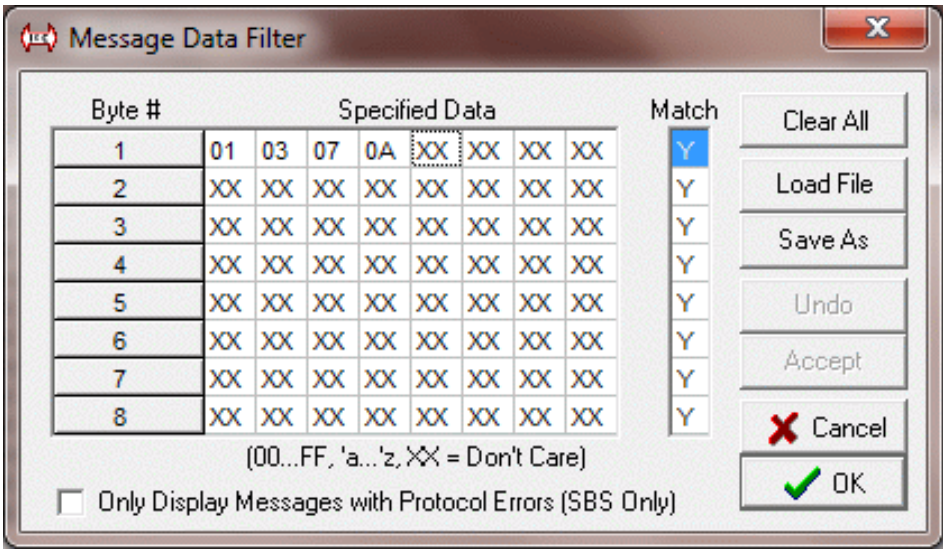
Use the Slave Address Map dialog box to select I^2C messages to display by Slave Address, Read/Write Access, and Slave Device Acknowledgment, and to globally monitor all address activity.

Click on grid cells to access Slave Address Filter editor.

Slave Address Activity Info shows acknowledged bus messages with a solid dot. Negative acknowledged bus messages with a hollow dot. Selecting a grid cell clears the activity indicator.

Slave Address Map display filtering is enabled with the Filtering check box on the main screen.

Filtering|Message Data - Displays the Message Data Filter dialog box.



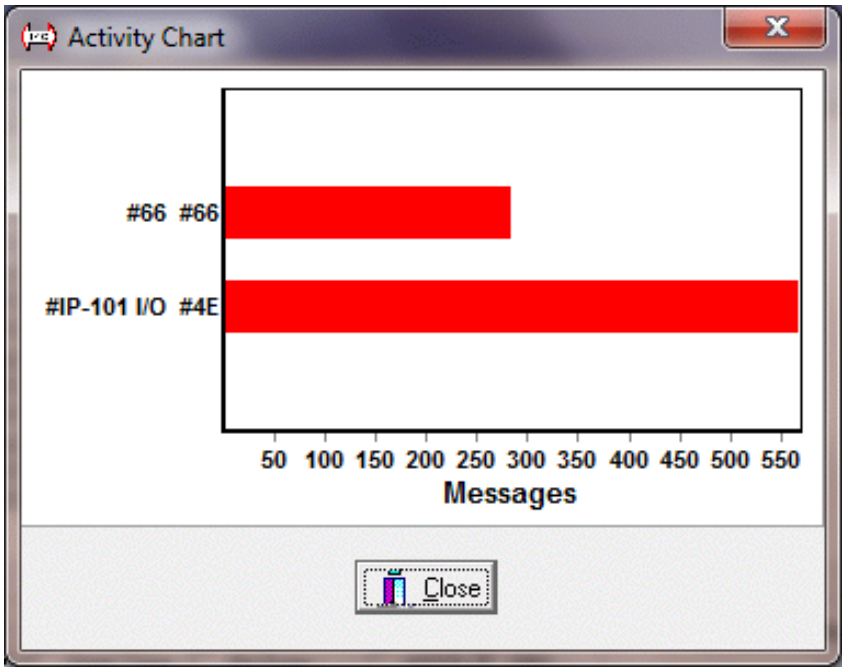
Use the Message Data Filter dialog box to select I^2C messages to display by data content and by protocol error detection.

Click on a grid cell to enter match data in hexadecimal digits (00...FF), ASCII codes (i.e. 'a for the letter a), or XX for don't care. Enter up to 8 match data per message byte. Click “Match” to display message on Match (Y) or Non-Match (N) condition.

Check the Protocol Error checkbox to display only messages with detected Smart Battery System (SBS) protocol errors for the currently selected SBS specification revision.

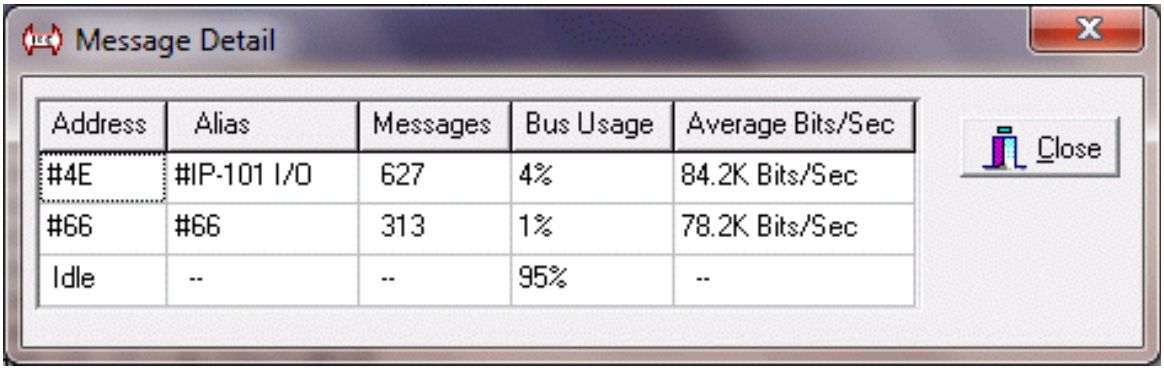
Message Data display filtering is enabled with the Filtering check box on the main screen.

View|Activity Chart - Displays the Activity Chart dialog box.



Use the Activity Chart dialog box to display a bar chart of message activity for the top 16 most frequently used slave addresses.

View|Message Detail - Displays the Message Detail dialog box.



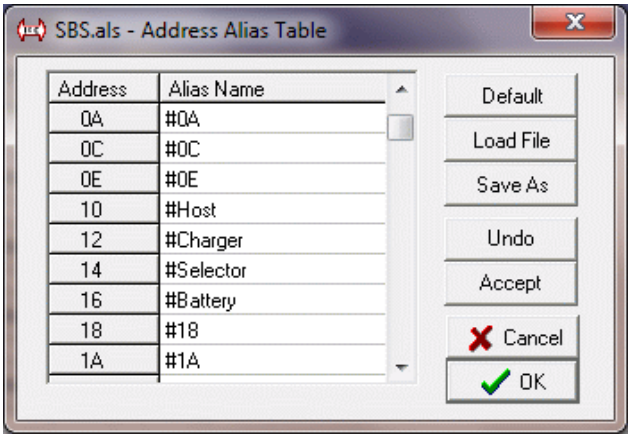
Use the Message Detail dialog box to display a report of message activity for all active slave addresses.

View|Byte Mode Viewer - Displays the Byte Mode Viewer.

The main message screen displays filtered I^2C messages upon detecting an I^2C Bus STOP event at end of message.

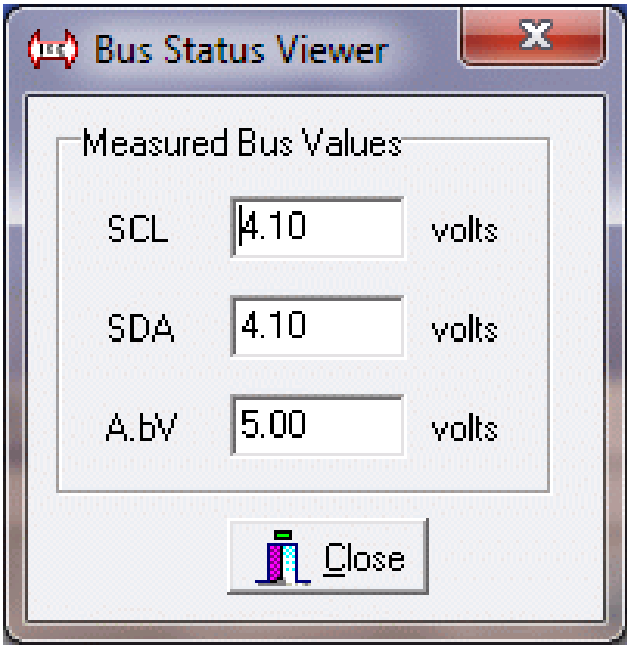
The Byte Mode Viewer displays unfiltered I^2C Bus events as they cross the bus, displaying message data even if the bus stalls within a message.

View|Address Alias Table - Displays the Address Alias Table dialog box.



Use the Address Alias Table dialog box to specify an alias name for slave addresses. Alias names are used to customize the display of slave addresses.

View|Bus Status Viewer - Displays the Bus Status Viewer dialog box.



Use the Bus Status Viewer dialog box to view the current voltage levels on the I^2C Bus Clock, Data, and bus power lines. This viewer is useful in determining if the Clock or Data lines are stuck low.

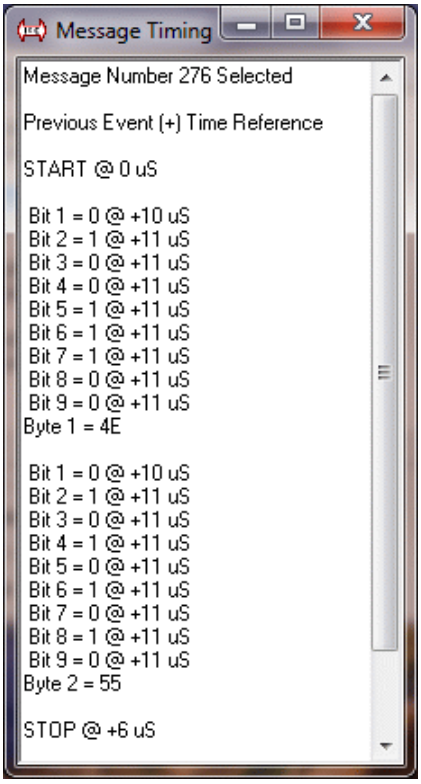
Pop-Up Menu Controls:

The Pop-Up Menu is used to view details on a specific displayed message. This menu is available on the main screen when displayed I^2C Bus messages are present and the system is in Halt or Pause mode.

To access the Pop-Up Menu, left mouse click to select a message, then right mouse click to pop-up the menu. Left mouse click to select a menu item.

Show Message Timing

Select the Message Timing menu item to display timing information on the currently selected message. I^2C Bus Start/Stop events and Data bytes are displayed. Bit timing data is displayed if "Enable Bit Timing" (see Setup Menu) was enabled when the message data was collected.



Show Message Diagnostics

Select the Message Diagnostics menu item to display diagnostic data used for product support.

Filename Convention:

The I^2C Bus Monitor Plus uses a variety of file types to save or record information. These file types include:

*.als	Address Alias Table File - This file type is used to save Slave Address name aliasing information.
*.bps	Setup File - This file is used to save software setup parameters.
*.dmf	Data Match File - This file type is used to save Message Filter match data.
*.log	Log File - This file type is used to record data packets from the external pod.
*.map	Slave Address Map File - This file type is used to save Slave Address Map filter information.
*.pod	Pod Configuration File - This file contains pod configuration data.
*.trg	Trigger Out File - This file type is used to store Trigger Out setup information.

Appendix A

Installation - USB Adapter Interface Cable Version

The following instructions apply to installing and configuring the USB version of the I^2C Bus Plus interface.

1. Installing the USB Interface Cable and Driver Software

The USB Interface Cable Driver Software is available at:

www.mcc-us.com/i2cBMPlus

1. Administrative Privilege Required.
2. Download and save-as the ZIP file into a folder.
3. Right-Click the downloaded ZIP file and Extract All (Uncompress).
4. Read and accept the enclosed End User License Agreement.
5. Unplug the MCC I^2C Bus Monitor Plus USB Adapter(s) from your PC USB port or USB hub.
6. To add the driver to your system, open the extracted folder and:
   a. For 64-bit Windows OS: Double-click MCC_USB_iBMPUA_Installer_x64.exe.
   b. For 32-bit Windows OS: Double-click MCC_USB_iBMPUA_Installer_x86.exe.

7. To load the new driver, plug the I²C Bus Monitor Plus USB Cable into a USB port or self-powered hub.
8. Windows will automatically load the driver.

2. Installing the USB Interface Cable

This interface is completely plug and play capable. To install the interface board:

1. Plug the I²C Bus Monitor Plus USB Interface Cable into a USB port or self-powered hub.
2. Windows will automatically detect the USB Interface and automatically load the driver software.

Connecting Your PC to the Pod

The I²C Bus Monitor Plus pod contains the electronic circuitry required to capture and record bus events, and communicate these events with the interface card and software installed in your PC.

This section describes how to connect your PC to the I²C Bus Monitor Plus pod.

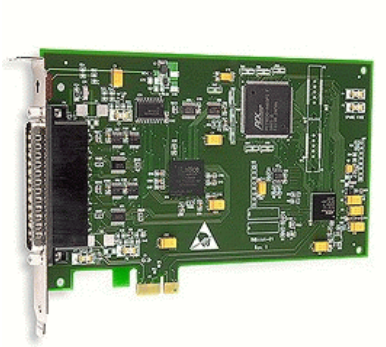
1. Connect the previously installed interface card to the DB-37 connector at the rear of the I²C Bus Monitor Plus pod using the interfacing cable provided.
2. Connect the included regulated 5VDC power supply cable to the power connector on the rear of the pod.
3. Plug the power supply into a 120/240VAC 50/60Hz outlet.
4. Turn the pod power on. The red power light on the front of the pod should illuminate.
5. To test the pod connection to your PC, run the I²C Bus Monitor Plus Software described below and select "Setup|Initialize External Pod" from the main menu. When pod

initialization is complete, the Run light on the front of the pod will blink.

The pod is now ready to be connected to the device under test and optionally to external test equipment. Proceed to the section, "Installing - I^2C Bus Monitor Plus Software".

Appendix B

Installation - PCI Express (PCIe) Interface Card Version



The following instructions apply to installing and configuring the PCI Express (PCIe) version of the I^2C Bus Plus interface card in most PCs. Refer to the manual that accompanied your PC for detailed instructions on installing cards in your PC.

The I^2C Bus Monitor Plus uses a PCIe-DIO24 PCI interface board and InstaCal driver software to access the external pod.

1. Installing the PCIe Card Driver Software

The PCIe Interface Card Driver Software is available at:

www.mcc-us.com/i2cBMPlus

1. Administrative Privilege Required.
2. Download and save-as the ZIP file into a folder.
3. Right-Click the downloaded ZIP file and Extract All (Uncompress).
4. Read and accept the enclosed End User License Agreement.
5. To add the driver to your system, open the extracted folder and double-click icalSetup.exe.
6. Follow the on-screen instructions.

NOTE: Once the InstaCal driver software is installed, you must restart your computer to complete the installation.

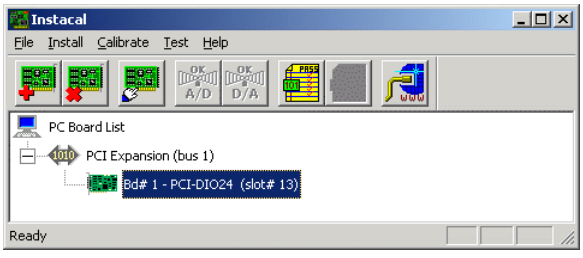
2. Installing the PCIe Card and Driver

This board is completely plug and play capable. To install the interface board:

1. Following instructions provided with your computer, turn your computer off, unplug the power, open the case, and insert the PCIe-DIO24 board into an available PCI-e slot.
2. Close your computer case, plug in power, and turn it on.
3. Windows will automatically detect the board as it starts up and will install the driver software.

3. Configuring the PCIe Card

Configure your interface board by running the InstaCal program via the Start|Programs|Measurement Computing|InstaCal menu. InstaCal will automatically detect the new board. Follow the instructions on screen to complete the board configuration and testing.



Connecting Your PC to the Pod

The I^2C Bus Monitor Plus pod contains the electronic circuitry

required to capture and record bus events, and communicate these events with the interface card and software installed in your PC.

This section describes how to connect your PC to the I²C Bus Monitor Plus pod.

1. Connect the previously installed interface card to the DB-37 connector at the rear of the I²C Bus Monitor Plus pod using the interfacing cable provided.
2. Connect the included regulated 5VDC power supply cable to the power connector on the rear of the pod.
3. Plug the power supply into a 120/240VAC 50/60Hz outlet.
4. Turn the pod power on. The red power light on the front of the pod should illuminate.
5. To test the pod connection to your PC, run the I²C Bus Monitor Plus Software described below and select "Setup|Initialize External Pod" from the main menu. When pod initialization is complete, the Run light on the front of the pod will blink.

The pod is now ready to be connected to the system under test and optionally to external test equipment. Proceed to the section, "Installing - I²C Bus Monitor Plus Software".

Appendix C

Installation - PCI Interface Card Version

The following instructions apply to installing and configuring the PCI version of the I^2C Bus Plus interface card in most PCs. Refer to the manual that accompanied your PC for detailed instructions on installing cards in your PC.

The I^2C Bus Monitor Plus uses a PCI-DIO24 PCI interface board and InstaCal driver software to access the external pod.

1. Installing the PCI Card Driver Software

The PCIe Interface Card Driver Software is available at:

www.mcc-us.com/i2cBMPlus

1. Administrative Privilege Required.
2. Download and save-as the ZIP file into a folder.
3. Right-Click the downloaded ZIP file and Extract All (Uncompress).
4. Read and accept the enclosed End User License Agreement.
5. To add the driver to your system, open the extracted folder and double-click icalSetup.exe.
6. Follow the on-screen instructions.

NOTE: Once the InstaCal driver software is installed, you must restart your computer to complete the installation.

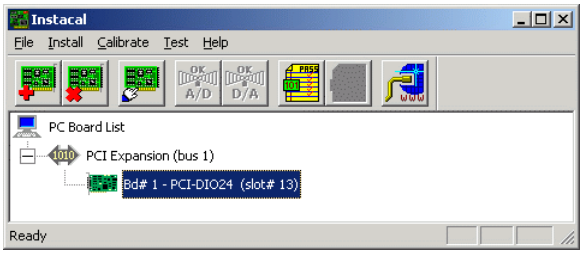
2. Installing the PCI Card and Driver

This board is completely plug and play capable. To install the interface board:

1. Following instructions provided with your computer, turn your computer off, unplug the power, open the case, and insert the PCI-DIO24 board into an available PCI slot.
2. Close your computer up, plug in power, and turn it on.
3. Windows will automatically detect the board as it starts up and will install the driver software.

3. Configuring the PCI Card

Configure your interface board by running the InstaCal program via the Start|Programs|Measurement Computing|InstaCal menu. InstaCal will automatically detect the new board. Follow the instructions on screen to complete the board configuration and testing.



Connecting Your PC to the Pod

The I^2C Bus Monitor Plus pod contains the electronic circuitry required to capture and record bus events, and communicate these

events with the interface card and software installed in your PC.

This section describes how to connect your PC to the I²C Bus Monitor Plus pod.

1. Connect the previously installed interface card to the DB-37 connector at the rear of the I²C Bus Monitor Plus pod using the interfacing cable provided.
2. Connect the included regulated 5VDC power supply cable to the power connector on the rear of the pod.
3. Plug the power supply into a 120/240VAC 50/60Hz outlet.
4. Turn the pod power on. The red power light on the front of the pod should illuminate.
5. To test the pod connection to your PC, run the I²C Bus Monitor Plus Software described below and select "Setup|Initialize External Pod" from the main menu. When pod initialization is complete, the Run light on the front of the pod will blink.

The pod is now ready to be connected to the system under test and optionally to external test equipment. Proceed to the section, "Installing - I²C Bus Monitor Plus Software".

Appendix D

Installation - PC-CARD Interface Version (XP x86 ONLY)

The following instructions apply to installing and configuring the PC-CARD version of the I^{2}C Bus Plus interface card in most PCs. Refer to the manual that accompanied your PC for detailed instructions on installing PC-CARDs in your PC.

The I^{2}C Bus Monitor Plus uses a PC-CARD-D24CTR3 interface board and InstaCal driver software to access the external pod.

1. Installing the PC-CARD Driver Software

The PCIe Interface Card Driver Software is available at:

www.mcc-us.com/i2cBMPlus

1. Administrative Privilege Required.
2. Download and save-as the ZIP file into a folder.
3. Right-Click the downloaded ZIP file and Extract All (Uncompress).
4. Read and accept the enclosed End User License Agreement.
5. To add the driver to your system, open the extracted folder and double-click icalSetup.exe.
6. Follow the on-screen instructions.

NOTE: Once the InstaCal software is installed, you must restart

your computer to complete the installation.

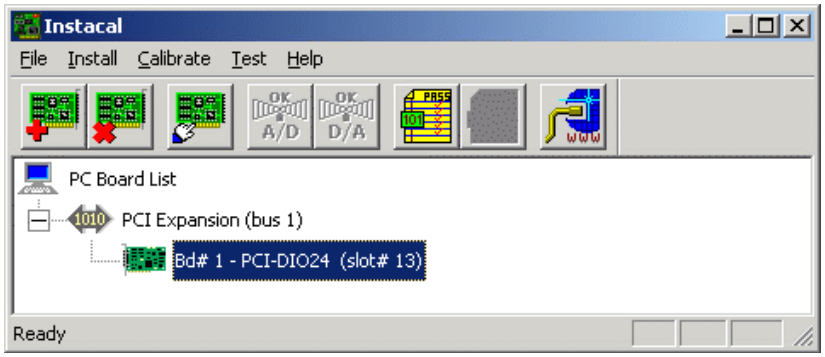
2. Installing the PC-CARD and Driver

This board is completely plug and play capable. To install the interface board:

1. Insert the PC-CARD-D24CTR3 board into any available PC-CARD slot.
2. Windows will automatically detect the board as it is inserted and will install the driver software.

3. Configuring the PC-CARD

Configure your interface board by running the InstaCal program via the Start|Programs|Measurement Computing|InstaCal menu. InstaCal will automatically detect the new board. Follow the instructions on screen to complete the board configuration and testing.



Connecting Your PC to the Pod

The I^2C Bus Monitor Plus pod contains the electronic circuitry required to capture and record bus events, and communicate these events with the interface card and software installed in your PC.

This section describes how to connect your PC to the I²C Bus Monitor Plus pod.

1. Connect the previously installed interface card to the DB-37 connector at the rear of the I²C Bus Monitor Plus pod using the interfacing cable provided.
2. Connect the included regulated 5VDC power supply cable to the power connector on the rear of the pod.
3. Plug the power supply into a 120/240VAC 50/60Hz outlet.
4. Turn the pod power on. The red power light on the front of the pod should illuminate.
5. To test the pod connection to your PC, run the I²C Bus Monitor Plus Software described below and select "Setup|Initialize External Pod" from the main menu. When pod initialization is complete, the Run light on the front of the pod will blink.

The pod is now ready to be connected to the system under test and optionally to external test equipment. Proceed to the section, "Installing - I²C Bus Monitor Plus Software".

Appendix E

Installation - ISA Interface Card Version (XP x86 ONLY)

The following instructions apply to installing and configuring the ISA version of the I^2C Bus Plus interface card in most PCs. Refer to the manual that accompanied your PC for detailed instructions on installing cards in your PC.

The I^2C Bus Monitor Plus uses a CIO-DIO24 ISA interface board and InstaCal driver software to access the external pod.

1. Installing the ISA Card Configuration Software

The PCIe Interface Card Driver Software is available at:

www.mcc-us.com/i2cBMPlus

1. Administrative Privilege Required.
2. Download and save-as the ZIP file into a folder.
3. Right-Click the downloaded ZIP file and Extract All (Uncompress).
4. Read and accept the enclosed End User License Agreement.
5. To add the driver to your system, open the extracted folder and double-click icalSetup.exe.
6. Follow the on-screen instructions.

NOTE: Once the InstaCal software is installed, you must restart

your computer to complete the installation.

2. Setting ISA Card Address

Each ISA I/O card installed in a PC uses one or more I/O address locations within your computer's I/O address space. These address locations are used by software running on the PC's processor in communicating with electronics on the card.

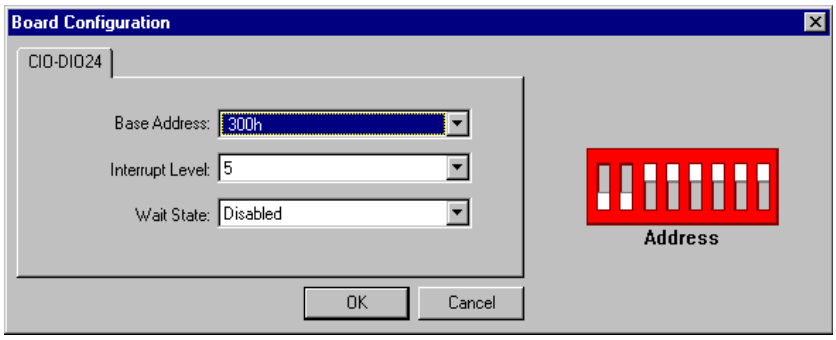
In order to not interfere with other installed cards in the PC, each card must use unique addresses. The interface card address determines the card's location within your computer's I/O address space.

Certain I/O addresses are used by the PC, others are free and may be used by the interface card. Refer to the manual that accompanied your PC for information regarding available address location in your PC.

The CIO-DIO24 ISA interface card uses 4 consecutive addresses starting with the base address selected with the ADDRESS switch on interface card . The factory default setting for the interface card is 300H. We recommend the default factory setting be tried first.

The ADDRESS switch may be set for addresses in the range of 000H to 3FCH. It should not be hard to find a free address area for the card in your PC. Addresses 300H to 31FH are is a prototype card area, and is often available for add-in cards. Addresses 390H to 39F may also be available.

The InstaCal software provides a graphical representation of ADDRESS switch settings. We recommend that you install and run InstaCal software before installing the interface card in your PC.



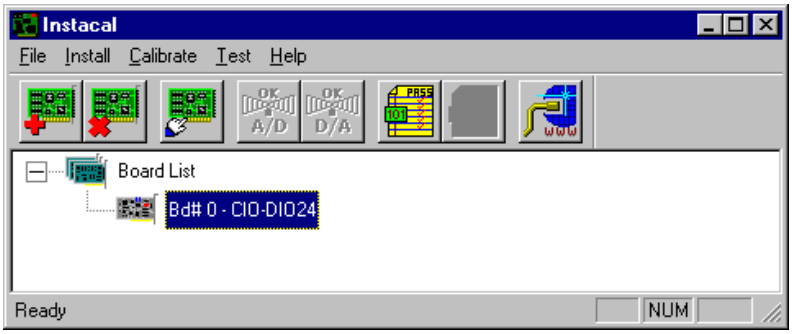
3. Installing the ISA Card

To install the interface board:

1. Following instructions provided with your computer, turn your computer off, unplug the power, open the case, and insert the CIO-DIO24 board into any available ISA slot.
2. Close your computer case, plug in power, and turn it on.

4. Configuring the ISA Card

Configure your interface board by running the InstaCal program via the Start|Programs|Measurement Computing|InstaCal menu. InstaCal will automatically detect the new board. Follow the instructions on screen to complete the board configuration and testing.



Connecting Your PC to the Pod

The I²C Bus Monitor Plus pod contains the electronic circuitry required to capture and record bus events, and communicate these events with the interface card and software installed in your PC.

This section describes how to connect your PC to the I²C Bus Monitor Plus pod.

1. Connect the previously installed interface card to the DB-37 connector at the rear of the I²C Bus Monitor Plus pod using the interfacing cable provided.
2. Connect the included regulated 5VDC power supply cable to the power connector on the rear of the pod.
3. Plug the power supply into a 120/240VAC 50/60Hz outlet.
4. Turn the pod power on. The red power light on the front of the pod should illuminate.
5. To test the pod connection to your PC, run the I²C Bus Monitor Plus Software described below and select "Setup|Initialize External Pod" from the main menu. When pod initialization is complete, the Run light on the front of the pod will blink.

The pod is now ready to be connected to the system under test and optionally to external test equipment. Proceed to the section, "Installing - I²C Bus Monitor Plus Software".

Direct Comments/Feedback to:

Attn: Product Support (#MIIC-102)
Micro Computer Control Corporation
P.O. Box 275
Hopewell, NJ 08525 USA

Voice - (609) 466-1751
Fax - (609) 466-4116
Email - info@mcc-us.com
WWW - http://www.mcc-us.com

Declaration of Conformity

This Declaration of Conformity is issued by the indicated company which is solely responsible for the declared compliance.

Product: I2C/SMBus Monitor Plus
Product Part Number: MIIC-102
Product Description: I2C/SMBus Monitor

Applicable Directive(s): EC Directive 89/336/EEC

Compliant Standards:
EN 55022 : 1998
Emissions Standard
Conducted Emissions (Class B)
Radiated Emissions (Class B)

EN 55024 : 1998
Immunity Standard
Immunity to Radiated Electromagnetic Fields
Immunity to Fast Transient Bursts - AC Power Lines
Immunity to Conducted Field - AC Power Lines
Immunity to Voltage Dips - AC Power Lines
Immunity to Electrostatic Discharge

Test Laboratory Information:
Cass Industries Ltd., Blackbrook Trading Estate, Weybrook Road, Manchester M19 2QD, ENGLAND.
Test Report Number: CI02486c
Test Report Date: April 27th, 2005
Technical file held by: Micro Computer Control Corporation, 83 Princeton Avenue / PO Box 275, Hopewell, New Jersey 08525 USA, or its applicable authorized distributor or representative.

Responsible Company: Micro Computer Control Corporation, 83 Princeton Avenue / PO Box 275, Hopewell, New Jersey 08525 USA, or its applicable authorized distributor or representative.

Signature of Authorized Representative:

Edward Thompson

Name: Edward Thompson
Title: President, Micro Computer Control Corporation
Date: 13-DEC-10