



# I<sup>2</sup>C Bus Specification, Revision 3

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## 1 Description

The I<sup>2</sup>C Bus Specification, Revision 3 Compliance Test for M1 Oscilloscope Tools™ will test timing and voltage parameters from the specification.

For each test section, M1 will provide a results screen containing every parameter tested and its pass/fail status, as well as the condition or value the parameter was tested against and the margin of pass or fail. Upon completion of all tests, M1 will produce a final results window summarizing the result information for every test performed. Results can be notated as needed, saved directly to a text or MS Excel format, and/or directly printed in a readable format.

If any parameter does not meet the specification, M1 will allow the user to cancel testing and bring up the measurement containing the statistic that failed to allow immediate debug and analysis.

## 2 General Comments

Historically, compliance specifications will contain ambiguous or contradictory statements that require a test developer to make assumptions and interpret what the spec is trying to accomplish.

It is frequently the case that solution implementation decisions must be made at a level of specificity that far exceeds that which is specified, creating the possibility that different test implementers will create solutions that are all valid implementations but which all can result in different results. ASA has discovered errors and significant ambiguities in many of the compliance specifications. Where it is felt that an assumption may have a significant bearing on the process, that assumption will be explained in this document.

## 3 System Requirements

### 3.1 Hardware and OS

Your hardware and Windows® Operating System (OS) should meet the requirements specified on the [M1 OT website](#).

### 3.2 M1 Version

You must have **M1 OT™ Standard** or **M1 OT™ Ultimate, v6.05.3** or higher to run this compliance test.

### 3.3 Oscilloscope Requirements

Please ensure you use an oscilloscope that has adequate technical specifications to perform the measurements required.

## 4 Installation

After downloading the .zip file containing the compliance test, extract the files in the .zip file to your M1 installation directory. If you are using Windows XP, this will be the **Shared Documents/My M1-OT/TestScripts** directory.

Some compliance tests require special measurements that are not part of M1. If there are any files with a .dll extension in the .zip file, copy those files into the **User\_Defined** directory (**Shared Documents/M1 M1-OT/User\_Defined**).

## 5 Instructions

Start M1, and turn on your scope. In M1, make sure all views are closed, then select the **Measurement Tools** menu. Click on **Compliance/TestScript**. Browse to select **i2c.xml**, then click on **Play**. You will be prompted as to what probes to use, and what signals to probe, as the test progresses. The [I<sup>2</sup>C Compliance Test User's Guide](#) is intended to guide the end user through the use of the Compliance Test.

## 6 Included Measurements

The compliance test will check the following measurements from the **I<sup>2</sup>C Bus Specification**, Revision 3, dated June 19, 2007. The compliance tests support Standard, Fast, Fast+, and High Speed modes of operation. Voltage levels, rise and fall times, and data timing are tested.

All table numbers refer to the tables in the specification.

### 6.1 Input/Output Tests

These tests are performed at the pins of the device, as opposed to somewhere on the bus itself. Not all parameters are tested at all speeds, as the specification does not define some parameters for all speeds.

- $t_{of}$  max, min, SDA output
- $V_{IH}$  min, max, SCL input
- $V_{IH}$  min, max, SDA input
- $V_{IL}$  min, max, SCL input
- $V_{IL}$  min, max, SDA input

### 6.2 Bus Timing

These tests are performed on the bus itself, as opposed to testing at the pins of the device. Not all parameters are tested at all speeds, as the specification does not define some parameters for all speeds.

- $f_{SCL}$  max
- $t_{HIGH}$  max
- $t_{SU,STA}$  min
- $t_{BUF}$  min
- $t_{LOW}$  min
- $t_{SU,STO}$  min
- $t_f$  max, min, SDA and SCL
- $t_f$  max, min, SDA and SCL
- $t_{VD,ACK}$  max
- $t_{HD,STA}$  min
- $t_{SU,DAT}$  min
- $t_{VD,DAT}$  max

## 7 Required Equipment

Two single-ended probes are required for conducting this compliance test. Additional equipment, such as compliance test boards, signal generators, probes, etc. may be required to perform the compliance test, as described in the relevant specification. ASA does not supply this equipment.

## 8 Revision History

Revision	Date	Description
1.1	22 June 2010	Updated version test to rev 3 of the specification, and added images to aid in probe placement.

## 9 References

Date	Title	Author
19-June-2007	I <sup>2</sup> C Bus Specification Revision 3	NXP Semiconductors – <a href="http://www.nxp.com/documents/user_manual/UM10204.pdf">http://www.nxp.com/documents/user_manual/UM10204.pdf</a>

## 10 Additional Resources

To download the I<sup>2</sup>C TestScript for use with M1 Oscilloscope Tools, please visit:  
[www.M1OT.com/i2c.htm](http://www.M1OT.com/i2c.htm)

For a tutorial video on performing a compliance test with M1 Oscilloscope Tools, please visit:  
[www.M1OT.com/compliance-test-video.htm](http://www.M1OT.com/compliance-test-video.htm)

To download the User's Guide for the I<sup>2</sup>C Compliance Test, please go to:  
<http://www.m1ot.com/pdf/i2c-users-guide.pdf>

To see what other compliance TestScripts ASA has provided for M1 users, please visit:  
[www.M1OT.com/m1complianceapps](http://www.M1OT.com/m1complianceapps)

To learn more about M1 Oscilloscope Tools, please visit:  
[www.M1OT.com](http://www.M1OT.com)