



## PIC32CX-BZ2 Calibration User's Guide

## Introduction

This user guide describes the test setup and the list of calibrations required to be performed on the DUT (Device Under Test) PIC32CX-BZ2 device before running an RF test either during prototype validation or in a production test line.

# **Table of Contents**

Intr	oducti	ion	1		
1.	Quick References				
	1.1.	Hardware Prerequisites	3		
	1.2.	Software Requirements			
	1.3.	Acronyms and Abbreviations	3		
2.	Test	Setup	5		
3.	. HUT Firmware Download				
4.	Calibration Flow Sequence				
	4.1.	RF Coaxial Cable Loss	10		
	4.2.	DUT Mode Selection	10		
	4.3.	PMU Mode Selection	10		
	4.4.	Information Block (IB) Selection	10		
	4.5.	Calibration Test	10		
5.	Docu	ument Revision History	13		
Mic	rochip	o Information	14		
The Microchip Website					
	Prod	luct Change Notification Service	14		
	Cust	tomer Support	14		
	Microchip Devices Code Protection Feature		14		
	Legal Notice		14		
	Trad	emarks	15		
	Qual	lity Management System	16		
	Worldwide Sales and Service				

## 1. Quick References

## 1.1 Hardware Prerequisites

- External Programmer/Debugger MPLAB® ICD 4 In-Circuit Debugger to Flash HUT firmware
- USB to UART converter (MCP2200 Breakout Board or equivalent)

## 1.2 Software Requirements

- MPLAB Integrated Programming Environment (IPE) To flash the firmware to the DUT
- · Test Tool Package:
  - MCHPRT3 Microchip Radio Testing Tool:
    - MCHPRT3 tool supports many devices including PIC32CX-BZ2
    - · MCHPRT3 tool package consists of:
      - PIC32CX-BZ2 HUT Firmware
      - MCHPRT3 GUI
      - MCHPRT3 CLI
      - MCHPRT3 DLL

**Note:** It is recommended that the MCHPR3 GUI be used for manual testing and the MCHPRT3 CLI/DLL for an automated test.

## 1.3 Acronyms and Abbreviations

Table 1-1. Acronyms/Abbreviations

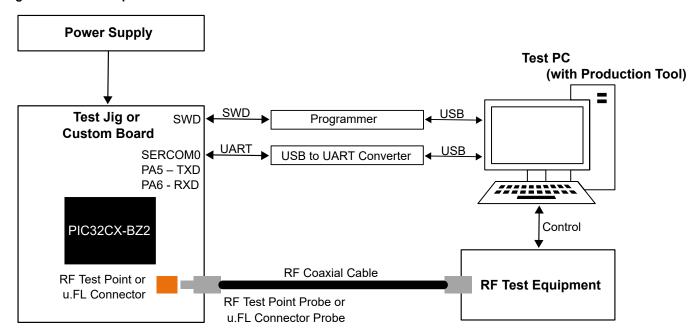
Acronyms/Abbreviations	Description
API	Application Programming Interface
CLI	Command Line Interface
DLL	Dynamic Link Library
DUT	Device Under Test
ED	Energy Detect
GUI	Graphical User Interface
HUT	Hardware Under Test
IB	Information Block
IC	Integrated Circuit
IRR	Image Rejection Ratio
LPA	Low Power Amplifier
MCHPRT3	Microchip Radio Test Tool 3 <sup>rd</sup> Generation
MPA	Medium Power Amplifier
OTP	One Time Programmable
PCB	Printed Circuit Board
PMU	Power Management Unit

continued			
Acronyms/Abbreviations	Description		
RF	Radio Frequency		
RX	Receiver		
SAR	Successive Approximation Register		
SWD	Serial Wire Debug		
TPC	Transmit Power Control		
TX	Transmitter		
UART	Universal Asynchronous Receiver-Transmitter		
USB	Universal Serial Bus		
VTA	Voltage Adjustment		

## 2. Test Setup

The following figure illustrates the reference test setup.

Figure 2-1. Test Setup



### Test Jig or Custom Board:

PCB designed with the PIC32CX-BZ2 can be directly interfaced to the Test PC and RF test equipment. The user can also design their own test jig that interconnects the DUT to the PC and the RF Test equipment. Refer to the PIC32CX-BZ2 based module - WBZ451/WBZ450 Curiosity Board for the I/O interface to develop a test jig.

### · Programming and Control Interface:

PCB designed with the PIC32CX-BZ2 must have the following interfaces to connect to the PC:

- · SWD (for firmware programming).
- SERCOM0 (PA5-TXD and PA6-RXD) UART interface to connect the DUT to the test tool on the PC, to control the test mode of the device

### · RF Test Interface:

The type of interface to the DUT for RF testing can determine the accuracy and repeatability of the measurements. Ensure the right RF test interface is used with the DUT because of the sensitivity of these signals.

For example, a product with a  $50\Omega$  terminated Sub-miniature Type A (SMA) or u.FL connector populated on the board can be connected directly to a coaxial cable with a known loss. Repeatability in this scenario is very good.

Another example is a product with an embedded antenna that is designed with test points for RF and ground that can be connected with an RF probe with ground ring as shown in the following figure.

Figure 2-2. RF Probe with Ground Ring



The path loss from the RF test point to the cabled connections of the setup needs to be calibrated, and, also, the path loss for the test fixture due to the radiating antenna loading might be calibrated to determine accurate performance. Place a ground metal plate close to the device antenna to detune the antenna and/or open circuit the antenna to improve the power measurement accuracy in the case of a board with an embedded antenna.

The repeatability of this setup is dependent on the board layout. The RF and ground signals should have test points in close proximity to one another. The repeatability is also more dependent on the shielded enclosure in this case because the RF signal is exposed at the test point and radiating through the antenna rather than enclosed within an SMA or u.FL connector as in the first example.

### Test Equipment:

Bluetooth® Low Energy and Zigbee tester like LitePoint® IQxel

### Production Test Tool:

Use the MCHPRT3 GUI during the initial prototype validation. For production, develop the test script based on the MCHPRT3 CLI or DLL.

### Programmer:

ICD4 programmer/debugger to flash the device

### Power Supply:

To provide the required supply to the test jig or a custom board designed with the PIC32CX-BZ2 device

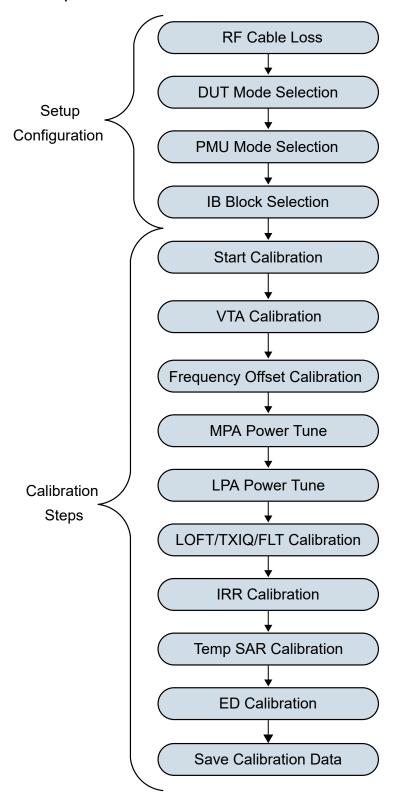
## 3. HUT Firmware Download

Before running the calibration steps, flash the PIC32CX-BZ2 HUT firmware into the DUT using MPLAB X IPE. **Note:** The PIC32CX-BZ2 HUT firmware is included in the MCHPRT3 Radio Test Tool package.

Се
(

The calibration sequence is mandatory to be same as follows:

Figure 4-1. Calibration Flow Sequence



#### RF Coaxial Cable Loss 4.1

Before running the calibration, estimate the cable loss of the RF co-axial cable and RF test point/probe, or u.FL probe loss by testing.

#### 4.2 **DUT Mode Selection**

The PIC32CX-BZ2 has both MPA and LPA RF output. Select the appropriate mode (LPA Only or MPA+LPA) based on the PIC32CX-BZ2 silicon variant used in the design before running the calibration. For the selection of mode, refer to the Table 4-1 and Table 4-2.

#### 4.3 **PMU Mode Selection**

The PIC32CX-BZ2 PMU operates in two modes:

- Buck mode
- MLDO mode

The MLDO mode is the preferred mode for calibration.

#### 4.4 Information Block (IB) Selection

The Information Block (IB) is used to store all the calibration and system configuration information.

The calibration parameters can be stored in either Flash memory or OTP memory:

- As the OTP memory is not sufficient, consider using Flash memory during initial prototype validation because it allows for multiple rewrites. Finally, when all of the testing is complete, save the calibration to the OTP memory. **Note:** The IB content stored in the Flash will be erased when programming another firmware.
- Use OTP memory to store the calibration parameter during production.

#### 4.5 Calibration Test

#### 4.5.1 **Start Calibration**

While starting the calibration, the MCHPRT3 DLL/HUT firmware performs the VCO calibration automatically.

#### 4.5.2 VTA Calibration

VTA calibration is a Voltage Adjustment of searching a minimum voltage setting of PLL circuit that can detect PLL is locked internally. The purpose of this calibration is to save current consumption with PLL lock assurance minimum voltage.

The user needs to initiate this test and wait for completion. The algorithm inside the MCHPRT3 DLL/HUT firmware performs the calibration automatically.

#### 4.5.3 **Frequency Offset Calibration**

By initiating this test, the PIC32CX-BZ2 DUT will transmit Bluetooth Low Energy packets at 2440 MHz. The user or the production tool has to check the carrier frequency measured by the RF test equipment and fine tune the transmit frequency until the measured carrier frequency offset is minimal.

Note: This fine tuning is intended for only correcting the frequency offset due to the process variation of crystal and IC. During prototype validation, the user has to validate the frequency offset and adjust the external crystal load capacitance to optimal values.

#### 4.5.4 **MPA Power Tune**

MPA support is available in two variants for the PIC32CX-BZ2 device as detailed in the following table. The following table also lists the maximum MPA TX power and calibration target power.

Note: For higher accuracy in power control, the MPA target power is set at +8 dBm ±0.5 dB. In contrast, the maximum MPA transmit power of the device is still+12 dBm.

### Table 4-1. MPA Power Tune

Device	MPA	MPA Max. TX power	Calibration Target Power
PIC32CX1012BZ25048	Yes	+12 dBm ±0.5 dB	+8 dBm ±0.5 dB

Initiate this test. Then, read the power level in the RF test equipment. Then, feed the measured power back to the test tool (MCHPRT3 DLL/HUT firmware). Then, re-initiate the power measurement/update until the power level reaches the target power.

#### 4.5.5 **LPA Power Tune**

The maximum LPA TX power and calibration target power is detailed in the following table.

### Table 4-2. LPA Power Tune

Device	LPA	LPA Max. TX Power	Calibration Target Power
PIC32CX1012BZ25048	Yes	+4 dBm ±0.5 dB	Same as LPA maximum TX Power

Initiate this test. Then, read the power level in the RF test equipment. Then, feed the measured power back to the test tool (MCHPRT3 DLL/HUT firmware). Then, feed the MPA power tune instruction until the power level reaches the target power.

#### 4.5.6 LOFT/TXIQ/FLT Calibration

- · LOFT Local Oscillator Feed Through calibration
- TXIQ TX path IQ imbalance correction
- FLT Bandwidth and Center frequency adjustment of the TX and RX filter

The user does this to initiate this test and waits for completion. The algorithm inside the HUT firmware performs the calibration automatically.

#### 4.5.7 **IRR Calibration**

Perform the Image Rejection Ratio Calibration (IRR) as per the following steps.

Note: The test may end in-between and the IRR Cal Done might appear early if the device finds a calibration in a fewer number of loops.

- Initiate the IRR calibration test.
- Generate the 2440 MHz CW tone with the power level of -75 dBm from the RF test equipment and feed it to the DUT and then initiate the IRR -75 Loop Test 1.
- Generate the 2436 MHz CW tone with the power level of -50 dBm from the RF test equipment and feed it to the DUT and then initiate the IRR -50 Loop Test 1.
- Generate the 2440 MHz CW tone with the power level of -75 dBm from the RF test equipment and feed it to the DUT and then initiate the IRR -75 Loop Test 2.
- Generate the 2436 MHz CW tone with the power level of -50 dBm from the RF test equipment and feed it to the DUT and then initiate the IRR -50 Loop Test 2.
- Generate the 2440 MHz CW tone with the power level of -75 dBm from the RF test equipment and feed it to the DUT and then initiate the IRR -75 Loop Test 3.
- Generate the 2436 MHz CW tone with the power level of -50 dBm from the RF test equipment and feed it to the DUT and then initiate the IRR -50 Loop Test 3.
- Generate the 2440 MHz CW tone with the power level of -75 dBm from the RF test equipment and feed it to the DUT and then initiate the IRR -75 Loop Test 4.
- Generate the 2436 MHz CW tone with the power level of -50 dBm from the RF test equipment and feed it to the DUT and then initiate the IRR -50 Loop Test 4.

**User Guide** 

Initiate IRR Cal. Done instruction.

## **Calibration Flow Sequence**

The four iterations are for calibrating the IRR for different duty cycle configurations. After every test iteration, check if the test code returns PASS or FAIL. If it returns PASS, consider the IRR test complete. If FAIL, go for the next test iteration in the Test 1-4. While finishing these four iterations of the IRR calibration test, the MCHPRT3 DLL/HUT FW calculates the IRR calibration settings.

## 4.5.8 Temperature SAR Calibration

This is to calibrate the temperature sensor and the SAR ADC used to read the internal temperature sensor. **Note:** This internal temperature sensor is used only for the Transmit Power Control (TPC) feature and is not accessible for external application use cases.

The user needs to initiate this test and wait for completion. The algorithm inside the HUT firmware does the calibration automatically.

## 4.5.9 Energy Detect Calibration

Generate the CW tone at 2440 MHz with a power level of -70 dBm from the RF test equipment and feed it to DUT. Then, initiate the Energy Detect (ED) Calibration test.

### 4.5.10 Save Calibration Data

At the end of the calibration, the calibration data has to be committed to a Flash/OTP Information Block.

### **Document Revision History 5**.

Revision	Date	Section	Description
Α	08/2022	Document	Initial revision

## **Microchip Information**

## The Microchip Website

Microchip provides online support via our website at www.microchip.com/. This website is used to make files and information easily available to customers. Some of the content available includes:

- Product Support Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
- General Technical Support Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip design partner 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

## Product Change Notification Service

Microchip's product change notification service helps keep customers current on Microchip products. Subscribers will receive email notification whenever there are changes, updates, revisions or errata related to a specified product family or development tool of interest.

To register, go to www.microchip.com/pcn and follow the registration instructions.

## Customer Support

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Embedded Solutions Engineer (ESE)
- **Technical Support**

Customers should contact their distributor, representative or ESE for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in this document.

Technical support is available through the website at: www.microchip.com/support

## Microchip Devices Code Protection Feature

Note the following details of the code protection feature on Microchip products:

- Microchip products meet the specifications contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is secure when used in the intended manner, within operating specifications, and under normal conditions.
- Microchip values and aggressively protects its intellectual property rights. Attempts to breach the code protection features of Microchip product is strictly prohibited and may violate the Digital Millennium Copyright
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of its code. Code protection does not mean that we are guaranteeing the product is "unbreakable". Code protection is constantly evolving. Microchip is committed to continuously improving the code protection features of our products.

## Legal Notice

This publication and the information herein may be used only with Microchip products, including to design, test, and integrate Microchip products with your application. Use of this information in any other manner violates these terms. Information regarding device applications is provided only for your convenience and may be superseded

by updates. It is your responsibility to ensure that your application meets with your specifications. Contact your local Microchip sales office for additional support or, obtain additional support at <a href="https://www.microchip.com/en-us/support/design-help/client-support-services">www.microchip.com/en-us/support/design-help/client-support-services</a>.

THIS INFORMATION IS PROVIDED BY MICROCHIP "AS IS". MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE, OR WARRANTIES RELATED TO ITS CONDITION, QUALITY, OR PERFORMANCE.

IN NO EVENT WILL MICROCHIP BE LIABLE FOR ANY INDIRECT, SPECIAL, PUNITIVE, INCIDENTAL, OR CONSEQUENTIAL LOSS, DAMAGE, COST, OR EXPENSE OF ANY KIND WHATSOEVER RELATED TO THE INFORMATION OR ITS USE, HOWEVER CAUSED, EVEN IF MICROCHIP HAS BEEN ADVISED OF THE POSSIBILITY OR THE DAMAGES ARE FORESEEABLE. TO THE FULLEST EXTENT ALLOWED BY LAW, MICROCHIP'S TOTAL LIABILITY ON ALL CLAIMS IN ANY WAY RELATED TO THE INFORMATION OR ITS USE WILL NOT EXCEED THE AMOUNT OF FEES, IF ANY, THAT YOU HAVE PAID DIRECTLY TO MICROCHIP FOR THE INFORMATION.

Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights unless otherwise stated.

### **Trademarks**

The Microchip name and logo, the Microchip logo, Adaptec, AVR, AVR logo, AVR Freaks, BesTime, BitCloud, CryptoMemory, CryptoRF, dsPIC, flexPWR, HELDO, IGLOO, JukeBlox, KeeLoq, Kleer, LANCheck, LinkMD, maXStylus, maXTouch, MediaLB, megaAVR, Microsemi, Microsemi logo, MOST, MOST logo, MPLAB, OptoLyzer, PIC, picoPower, PICSTART, PIC32 logo, PolarFire, Prochip Designer, QTouch, SAM-BA, SenGenuity, SpyNIC, SST, SST Logo, SuperFlash, Symmetricom, SyncServer, Tachyon, TimeSource, tinyAVR, UNI/O, Vectron, and XMEGA are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

AgileSwitch, APT, ClockWorks, The Embedded Control Solutions Company, EtherSynch, Flashtec, Hyper Speed Control, HyperLight Load, Libero, motorBench, mTouch, Powermite 3, Precision Edge, ProASIC, ProASIC Plus, ProASIC Plus logo, Quiet- Wire, SmartFusion, SyncWorld, Temux, TimeCesium, TimeHub, TimePictra, TimeProvider, TrueTime, and ZL are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Adjacent Key Suppression, AKS, Analog-for-the-Digital Age, Any Capacitor, Anyln, AnyOut, Augmented Switching, BlueSky, BodyCom, Clockstudio, CodeGuard, CryptoAuthentication, CryptoAutomotive, CryptoCompanion, CryptoController, dsPICDEM, dsPICDEM.net, Dynamic Average Matching, DAM, ECAN, Espresso T1S, EtherGREEN, GridTime, IdealBridge, In-Circuit Serial Programming, ICSP, INICnet, Intelligent Paralleling, IntelliMOS, Inter-Chip Connectivity, JitterBlocker, Knob-on-Display, KoD, maxCrypto, maxView, memBrain, Mindi, MiWi, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, MultiTRAK, NetDetach, Omniscient Code Generation, PICDEM, PICDEM.net, PICkit, PICtail, PowerSmart, PureSilicon, QMatrix, REAL ICE, Ripple Blocker, RTAX, RTG4, SAM-ICE, Serial Quad I/O, simpleMAP, SimpliPHY, SmartBuffer, SmartHLS, SMART-I.S., storClad, SQI, SuperSwitcher, SuperSwitcher II, Switchtec, SynchroPHY, Total Endurance, Trusted Time, TSHARC, USBCheck, VariSense, VectorBlox, VeriPHY, ViewSpan, WiperLock, XpressConnect, and ZENA are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

The Adaptec logo, Frequency on Demand, Silicon Storage Technology, and Symmcom are registered trademarks of Microchip Technology Inc. in other countries.

GestIC is a registered trademark of Microchip Technology Germany II GmbH & Co. KG, a subsidiary of Microchip Technology Inc., in other countries.

All other trademarks mentioned herein are property of their respective companies.

© 2022, Microchip Technology Incorporated and its subsidiaries. All Rights Reserved.

ISBN: 978-1-6683-0879-0

# **Quality Management System**

For information regarding Microchip's Quality Management Systems, please visit www.microchip.com/quality.



# **Worldwide Sales and Service**

AMERICAS	ASIA/PACIFIC	ASIA/PACIFIC	EUROPE
Corporate Office	Australia - Sydney	India - Bangalore	Austria - Wels
2355 West Chandler Blvd.	Tel: 61-2-9868-6733	Tel: 91-80-3090-4444	Tel: 43-7242-2244-39
Chandler, AZ 85224-6199	China - Beijing	India - New Delhi	Fax: 43-7242-2244-393
Tel: 480-792-7200	Tel: 86-10-8569-7000	Tel: 91-11-4160-8631	Denmark - Copenhagen
Fax: 480-792-7277	China - Chengdu	India - Pune	Tel: 45-4485-5910
Technical Support:	Tel: 86-28-8665-5511	Tel: 91-20-4121-0141	Fax: 45-4485-2829
www.microchip.com/support	China - Chongqing	Japan - Osaka	Finland - Espoo
Web Address:	Tel: 86-23-8980-9588	Tel: 81-6-6152-7160	Tel: 358-9-4520-820
www.microchip.com	China - Dongguan	Japan - Tokyo	France - Paris
Atlanta	Tel: 86-769-8702-9880	Tel: 81-3-6880- 3770	Tel: 33-1-69-53-63-20
Duluth, GA	China - Guangzhou	Korea - Daegu	Fax: 33-1-69-30-90-79
Tel: 678-957-9614	Tel: 86-20-8755-8029	Tel: 82-53-744-4301	Germany - Garching
Fax: 678-957-1455	China - Hangzhou	Korea - Seoul	Tel: 49-8931-9700
Austin, TX	Tel: 86-571-8792-8115	Tel: 82-2-554-7200	Germany - Haan
Tel: 512-257-3370	China - Hong Kong SAR	Malaysia - Kuala Lumpur	Tel: 49-2129-3766400
Boston	Tel: 852-2943-5100	Tel: 60-3-7651-7906	Germany - Heilbronn
Westborough, MA	China - Nanjing	Malaysia - Penang	Tel: 49-7131-72400
Tel: 774-760-0087	Tel: 86-25-8473-2460	Tel: 60-4-227-8870	Germany - Karlsruhe
Fax: 774-760-0088	China - Qingdao	Philippines - Manila	Tel: 49-721-625370
Chicago	Tel: 86-532-8502-7355	Tel: 63-2-634-9065	Germany - Munich
Itasca, IL	China - Shanghai	Singapore	Tel: 49-89-627-144-0
Tel: 630-285-0071	Tel: 86-21-3326-8000	Tel: 65-6334-8870	Fax: 49-89-627-144-44
Fax: 630-285-0075	China - Shenyang	Taiwan - Hsin Chu	Germany - Rosenheim
Dallas	Tel: 86-24-2334-2829	Tel: 886-3-577-8366	Tel: 49-8031-354-560
Addison, TX	China - Shenzhen	Taiwan - Kaohsiung	Israel - Ra'anana
Tel: 972-818-7423	Tel: 86-755-8864-2200	Tel: 886-7-213-7830	Tel: 972-9-744-7705
Fax: 972-818-2924	China - Suzhou	Taiwan - Taipei	Italy - Milan
Detroit	Tel: 86-186-6233-1526	Tel: 886-2-2508-8600	Tel: 39-0331-742611
Novi, MI	China - Wuhan	Thailand - Bangkok	Fax: 39-0331-466781
Tel: 248-848-4000	Tel: 86-27-5980-5300	Tel: 66-2-694-1351	Italy - Padova
Houston, TX	China - Xian	Vietnam - Ho Chi Minh	Tel: 39-049-7625286
Tel: 281-894-5983	Tel: 86-29-8833-7252	Tel: 84-28-5448-2100	Netherlands - Drunen
Indianapolis	China - Xiamen		Tel: 31-416-690399
Noblesville, IN	Tel: 86-592-2388138		Fax: 31-416-690340
Tel: 317-773-8323	China - Zhuhai		Norway - Trondheim
Fax: 317-773-5453	Tel: 86-756-3210040		Tel: 47-72884388
Tel: 317-536-2380			Poland - Warsaw
Los Angeles			Tel: 48-22-3325737
Mission Viejo, CA			Romania - Bucharest
Tel: 949-462-9523			Tel: 40-21-407-87-50
Fax: 949-462-9608			Spain - Madrid
Tel: 951-273-7800 Raleigh, NC			Tel: 34-91-708-08-90
• .			Fax: 34-91-708-08-91
Tel: 919-844-7510 New York, NY			Sweden - Gothenberg Tel: 46-31-704-60-40
Tel: 631-435-6000			Sweden - Stockholm
San Jose, CA			Tel: 46-8-5090-4654
Tel: 408-735-9110			UK - Wokingham
Tel: 408-436-4270			Tel: 44-118-921-5800
Canada - Toronto			Fax: 44-118-921-5820
Tel: 905-695-1980			1 ax. 77-110-321-0020
Fax: 905-695-2078			
1 ax. 505-555-2010			