



# Open4

**Using Open4 and EvoPrimers  
(fun, easy introduction kits  
for microcontrollers)**

**User Manual**

**Document version**  
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## Open4 Base

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## 1. Introduction

Open4 provides a versatile solution for exploring a variety of new microcontrollers, thanks to its rich set of hardware features and interchangeable target microcontrollers. Because of this versatility, the Open4 is the foundation of a range of "Primer" products that will help users quickly explore, learn and start applications for:

Microcontroller line	ST EvoPrimer	Raisonance Primer
STM8L Ultra-Low Power	EvoPrimer for STM8L Ultra-Low Power Line	Open4 STM8L Ultra-Low Power
STM32F Performance	EvoPrimer for STM32F Performance Line	Open4 STM32F Performance
STM32F Connectivity	EvoPrimer for STM32F Connectivity Line	Open4 STM32F Connectivity

All these Primers are made up of an Open4-derived "Base" platform and compatible "Target Board" featuring a target microcontroller:

STMicroelectronics:

MCU Line	ST Target Board	Raisonance Target Board
STM8L Ultra-Low Power	STM8L152C6 EvoPrimer Target Board	STM8L152C6 Open4 Target Board
STM32F Performance Line	STM32F103VE EvoPrimer Target Board	STM32F103VE Open4 Target Board
STM32F Connectivity Line	STM32F107VC EvoPrimer Target Board	STM32F107VC Open4 Target Board

Regardless of the commercial product that the user has bought (EvoPrimer or Open4) these Target Boards are compatible with and may be used on any of these Base platforms:

- Open4 base,
- EvoPrimer base (debug limited to 64 Kbytes in target RAM or Flash memory)

### 1.1 Purpose of this manual

This manual gives an installation procedure and overview of the Open4 Base.

Armed with the knowledge in this manual, Open4 Primer users can quickly start using a Primer and exploring a target MCU.

### 1.2 Scope of this manual

This manual is applicable to all Open4 Primer versions and derived products. It describes the basic use and hardware features.

Some technical information about your Primer is available from the Ride7 interface:

- The 3D MEMS inertial sensor data sheet
- specific MCU documentation
- specific MCU reference manual

This document provides descriptions and user instructions that are common to all Open4-derived Primers. Instructions that are specific to a target microcontroller are found in the specific Target Board documentation. Documentation for all Open4-derived Primers is provided at [www.mcu-circle.com](http://www.mcu-circle.com).

### 1.3 Additional help or information

Please visit the Raisonance website: <http://www.raisonance.com/> and its support forum or contact Raisonance.

Address: Raisonance S.A.S.  
17, Avenue Jean Kuntzmann,  
38330 Montbonnot Saint Martin  
France

Telephone: +33 4 76 61 02 30

Fax: +33 4 76 41 81 68

Email: ***support@raisonance.com***

If you find any errors or omissions, or if you have suggestions for improving this manual, please let us know by email.

## 2. Presentation

The Open4 is an enhancement of the STM32-Primer (released in 2007) and the STM32-Primer2. An Open4 Primer or derived Primer products consists of an base and a Target Board. The base includes user interface and target evaluation features, plus the debugging and programming features which are driven from the Raisonance software tools. The Target Board includes the target MCU and may have some additional evaluation features.

### 2.1 Base features

The base has the following capabilities:

- USB debug/programming connection
- QVGA (320x240) backlit color LCD, with touch screen capability
- Joystick and 4 push buttons
- Micro SD card connector
- Audio circuit with Microphone/Loudspeaker/Jack
- 3D MEMS accelerometer
- Li-Ion battery with charge management circuitry
- Add-on connectors (USART, SPI, I2C, ADC,...)

### 2.2 Development software

The development software offered with the any Target Board provides everything you need to program the microcontroller and debug applications, including:

- Rlink USB driver for USB host connection providing in-circuit programming and debugging.
- Ride7 integrated development environment for code editing, device programming and application debugging.
- Raisonance toolchain for different microcontrollers.
- CircleOS Operating System and base services. An online community available at <http://www.mcu-circle.com/> makes it possible to share your Primer experience with others on the forums, retrieve useful resources, application notes, firmware, demos (C sources and projects) and applications, all available for free download.



Open4 Primer

### 3. Primer hardware

#### 3.1 Package contents

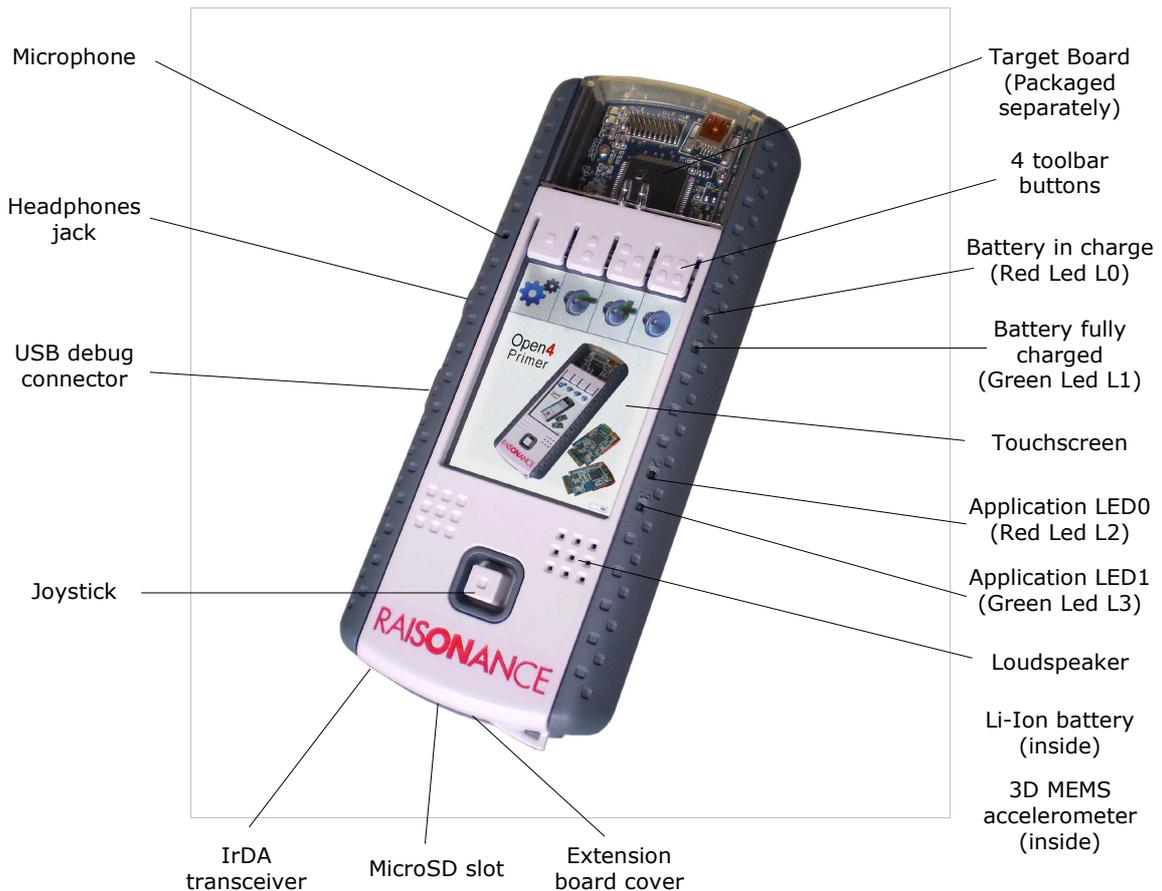
Your Primer base unit has been carefully packed. Examine the equipment for damage that may have occurred during shipment. If you find any damage, or if any of the items are not included, please contact Raisonance. Your package should contain the following items:

1. The base in its plastic case.
2. A USB cable for host PC connection that can be used to program and debug the target microcontroller.
3. Plastic cover to protect the Target Board once installed.

Your Primer's Target Board is packaged separately. Refer to Target Board documentation for its package contents.

#### 3.2 Components overview

Here is a brief overview of the main components of the Open4 Primer:



### 3.3 Opening the base

Normally, it is not necessary, in any case, to open the base. But, opening the plastic casing is easy. Just unscrew the 4 screws to separate the top and bottom of the casing.

Note that the board is screwed onto the top plastic half of the case. This should not be removed as the display connector (flex) is very sensitive and may be damaged during this maneuver.



Warning: In order to avoid harming your Open4 Primer, the board should not be unscrewed from the transparent plastic case.

### 3.4 Features of the base unit

#### 3.4.1 LCD

The base is equipped with a QVGA (320 x 240) LCD with touchscreen capability.

#### 3.4.2 3D MEMS accelerometer

The Open4 Primer base is equipped with a MEMS inertial sensor (LIS3LV02DL from STMicroelectronics). This device can be used as a human interface device to select commands in coordination with a graphic pointer. When you start a Primer for the first time, you will see a small ball moving according to the orientation of the Primer. The information about the 3D position is provided by the MEMS.

#### 3.4.3 Audio capabilities

The base is equipped with a loudspeaker, a microphone and a 3,5 mm headphones jack. Nevertheless, the audio generation is not embedded, and is provided by the target board (audio codec embedded or PWM buzzer).

#### 3.4.4 Power supply

The base features a 400mAh Li-Ion rechargeable battery, equipped with a voltage regulator and a battery charger.

When the USB connector is linked to a PC, the host voltage (supplied by the PC) is used to recharge the battery. When no USB host is connected, the battery is used to supply the power for the Primer. When the battery is fully charged, the Primer can be used for about 6 hours. The duration of the batteries depends on the activity.

### 3.4.5 Extension connector

The base has a 20-pin HE14 female right-angle extension connector that you can access when removing the bottom part of the case.

The extension connector permits the usage of generic peripherals, depending on the Target Board that is inserted into the Base.

#### Peripherals :

- power supply (regulator and battery),
- 1 x SPI,
- 1 x I2C,
- 1 x UART,
- 2 x ADC inputs,
- 1 x timer,
- 1 x CAN.

#### Detail of the connector :

Pin	Printed name	Description
1	V2V8	Connected to the output of the U6 regulator (3.1V). This source can provide approximately 100mA to the extension board.
2	GND	Ground
3	SCL	I2C clock
4	SDA	I2C data
5	MISO	SPI MISO
6	SD	SPI MOSI or I2S Serial Data
7	SCK	SPI Clock or I2S Clock
8	WS	I2S Word Select
9	CANH	CAN transceiver outputs
10	CANL	
11	ADC1	Analog input 1
12	ADC2	Analog input 2
13	A_TIM	Timer ouput
14	CTS	UART CTS
15	RTS	UART RTS
16	TX	UART Tx
17	CK	Push button input. Can wakeup the daughterboard.
18	RX	UART Rx

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Pin	Printed name	Description
19	VEXT	Base battery voltage provided as input for the extension board
20	GND	Ground

**Note:**

\* The signals on the extension connector are directly provided by the Target Board, via the base 70 pins connector, without any treatment.

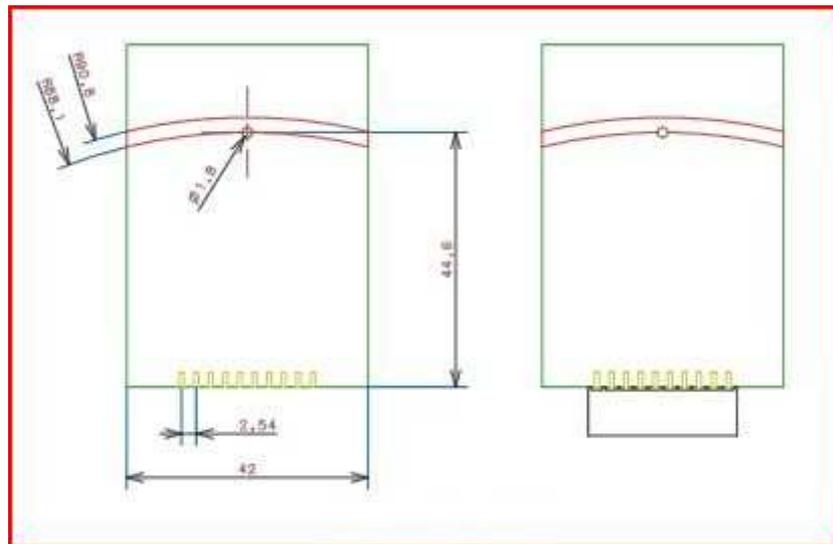
\* Printed names on the Open4 Primer extension board may not accurately match the pin names that exist for the Target Board. This is because the Open4 base is a generic design that supports several processor families (namely STM32, STM8...), and inherits specifications from the Primer1, which do not share the same feature set.

### 3.4.6 Application-specific daughter boards

The Open4 Primer base has been designed to be extended through application-specific daughter boards.

Such daughter boards connect to the extension connector and are compatible (mechanically and electronically) with the previous STM32-Primer2, so you should be able to reuse your previous designs without modification to the daughter board. However, some limitations may apply, for instance if you use specific processor/peripheral capabilities that are not portable between designs.

You can design your own daughter board if your application requires it. The following picture shows the mechanical constraints that you should respect so that your daughterboard fits inside the base case.



Daughterboard mechanical specifications

## 4. Getting started

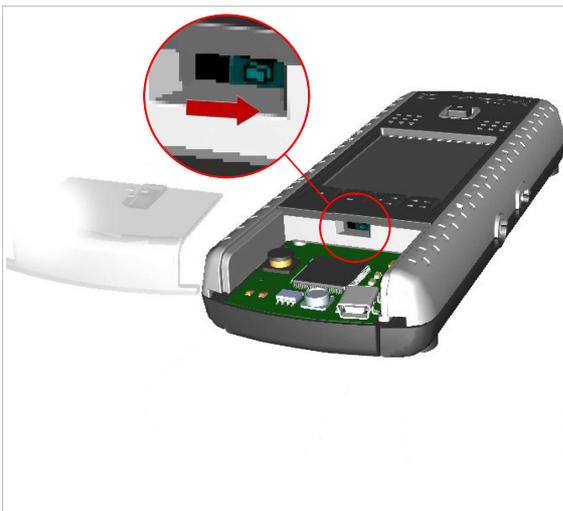
The procedure for getting started is reduced to four simple operations:

1. Insert a Target Board into the Primer base (see below).
2. Switch the Power Switch to provide current to the Target Board (see below).
3. Slide the transparent cover in place.
4. Press the Joystick to power up the Primer.

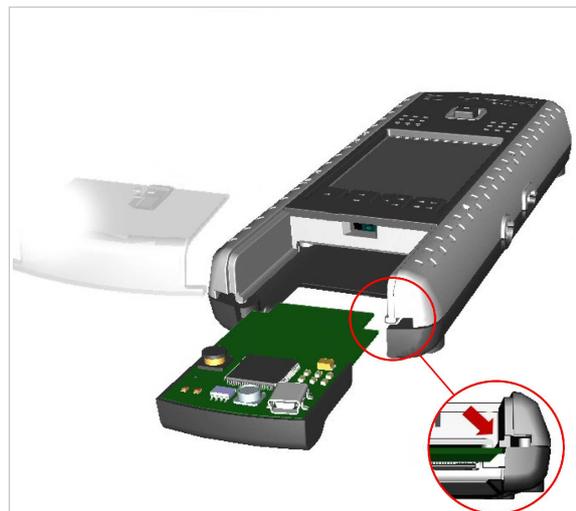
### 4.1 Insert a target board

The first thing to do is to insert a microcontroller target board:

1. Remove the transparent cover.
2. Switch off the battery.
3. Insert the Target Board into the base, as shown on the image, ensuring that the PCB is against the guides.
4. Push until the top of the Target Board fit with the side of the base.



Switching OFF the Primer

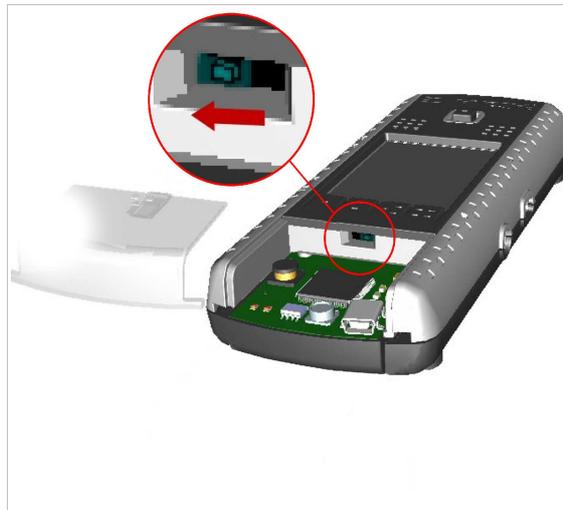


Inserting a Target Board

## 4.2 Connect the battery, charge and power up

Your Primer is initially shipped with the battery disconnected, in order to prevent discharging and potentially harming the battery. You need to connect the battery before operating your Primer:

1. Open the Primer's case by removing the transparent cover which covers the target board.
2. Switch the button as shown on the image to power on your device.
3. Close the case.
4. Connect the Primer to the USB port on a PC to charge its battery. Only the Red LED (L0) will be lit if the battery is charging. The Green LED (L1) is lit when fully charged.
5. After charging the battery, press the push button to activate the Primer.

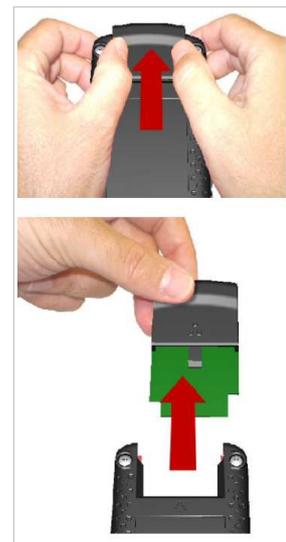


Switching ON the Primer

## 4.3 Removing a target board

If you want to change the Target Board in order to explore the capabilities of another microcontroller, follow these steps:

5. Power off the Primer base.
6. Remove the transparent cover that is over the Target Board.
7. Switch off the battery.
8. Turn the base so the display is facing downward.
9. Holding the base with both hands, push upward on the Target Board with both thumbs pressing evenly on the Target Board's plastic drawer.
10. When the Target Board dislodges from the connector, remove it completely by pulling on the plastic drawer.



### 4.4 Inserting and removing a MicroSD card

The base is equipped with a MicroSD (Micro Secure Digital) card slot, which can be used for storing data.

The slot is located at the front of the base, between the IrDA transmitter.

Insert your MicroSD card into the slot (card contacts on the bottom), then gently slide it. Be careful not to harm your MicroSD card nor connector on the base!

**Note:** To remove the MicroSD card, do not pull it away from the slot, but push it deeper into the slot. A spring mechanism automatically extracts it.

### 4.5 Use your Primer applications

Target Boards include preinstalled applications (games like Maze or Breakout, test applications...).

You can start an application by selecting it from your Primer's main menu (just press the button).

You can add more applications to your Primer by downloading them on the web site <http://www.mcu-circle.com>. Refer to the Target Board specific User manual.

### 4.6 Resetting your Primer

#### 4.6.1 Hardware reset

A hardware reset will restart your Primer (restoring it to a clean state), but will not remove its ROM contents.

- Remove any USB cable.
- Remove the plastic case protecting the target board.
- Change the switch to its open state (this will disconnect the internal battery) then replace the switch as it was.
- Put the plastic case back in place.
- Restart your Primer by pressing its joystick/push button.

#### 4.6.2 Software reset

A software reset will erase all the flash memory in your Primer and all applications will be suppressed. The procedure is depending on the microcontroller Target Board, we invite you to refer to the specific User Manual.

### 4.7 Sharing with the Circle community

You can share your Open4 experience with the other members through the <http://www.mcu-circle.com/> community.

Here you will find the resources to help you get started with your Primer, and stimulate new creative application ideas, including:

- The latest **products**, such as the new Target Boards,
- **Applications & projects** from Raisonance and other users,
- **Design resources** including software, board schematics, documentation...,
- **Forums** where users can share their experience, ideas, and projects.

## 5. Conformity and recycling

For more information on conformity and recycling, please visit the Raisonance website [www.raisonance.com](http://www.raisonance.com)



### **ROHS Compliance (Restriction of Hazardous Substances)**

Raisonance products are certified to comply with the European Union RoHS Directive (2002/95/EC) which restricts the use of six hazardous chemicals in its products for the protection of human health and the environment.

The restricted substances are as follows: lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB), and polybrominated diphenyl ethers (PBDE).



### **CE Compliance (Conformité Européenne)**

**Raisonance products are certified to comply with the European Union CE Directive.**

In a domestic environment, the user is responsible for taking protective measures from possible radio interference the products may cause.



### **FCC Compliance (Federal Communications Commission)**

Raisonance products are certified as Class A products in compliance with the American FCC requirements. In a domestic environment, the user is responsible for taking protective measures from possible radio interference the products may cause.



### **WEEE Compliance (The Waste Electrical & Electronic Equipment Directive)**

As part of our continuing efforts to provide the best service to our users and communities, Raisonance is actively defining take-back and recycling programs for EU customers as part of the implementation of the European WEEE directive. The WEEE symbol is a reminder not to dispose of your electronic equipment in standard trash receptacles.

For more information about disposal and recycling of electronic goods, please refer to <http://www.raisonance.com/support/weee.php>.

Raisonance disposes of its electrical equipment according to the WEEE Directive (2002/96/EC).

Upon request, Raisonance can recycle customer's redundant products.

## 6. Glossary

Term	Description
Open4	Open4 Primer, a base for microcontroller evaluation & development platform
EvoPrimer	Commercial products which are derived from the Raisonance Open4 and distributed by STMicroelectronics for exploring, evaluating, developing and fine tuning applications for a variety of ST 8 and 32-bit microcontrollers. Certain use limitations may apply to these commercial products
Open4	Raisonance versatile hardware platform, which is used in a variety of commercial products that allow users to explore, evaluate, develop and fine tune applications for a range of microcontrollers that are mounted on Open4 compatible Target Boards. Also referred to as the "Base platform." Also distributed under the name EvoPrimer base
Base	For all operations and features concerning just the Open4 / EvoPrimer base
Primer	For all operations and features requiring both base and Target Board
Target board	Boards featuring target microcontrollers which, when installed on an Open4-derived base allow execution of applications, programming of the target microcontroller and debugging of the applications running on the target microcontroller. Hardware features of Target Boards will vary depending on the target MCU and its features. Some features of the base platform may not be available depending on the features and capabilities of the target microcontroller
Daughter board	Application-specific daughterboard, connected to the extension connector.

## 7. Index

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## 8. History

Date	Modifications
June 2010	Initial version.

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This manual exists both in paper and electronic form (pdf).

Please check the printed version against the .pdf installed on the computer in the installation directory, for the most up-to-date version.

The examples of code used in this document are for illustration purposes only and accuracy is not guaranteed. Please check the code before use.

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