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ZMOTIONL100ZCOG

ZMOTION™ Detection and Control Development Kit

User Manual

UM023002-0112

zilog®
Embedded in Life
An◼IXYS Company

⚠ **Warning:** DO NOT USE THIS PRODUCT IN LIFE SUPPORT SYSTEMS.

Revision History

Each instance in the table below reflects a change to this document from its previous edition. For more details, refer to the corresponding pages and appropriate links in the table below.

Date	Revision Level	Description	Page
Dec 2011	02	Updated to include lens attachment instructions, ZDS II installation, a discussion about the sample project, plus modified schematic diagrams.	11, 18, 24, 34
Nov 2010	01	Original issue	All

Table of Contents

Introduction

Zilog's ZMOTION Development Kit provides a general-purpose platform for evaluating the capabilities and operation of the ZMOTION Detection and Control Family of microcontrollers featuring Zilog's passive infrared (PIR) technology. The family includes a series of high-performance microcontrollers with integrated motion detection algorithms. A variety of included lenses and pyroelectric sensors demonstrate the flexibility of the integrated motion detection algorithms to provide the best possible performance for a range of lighting, detection and control applications.

> **Note:** This user manual acquaints users with Zilog's ZMOTION Detection and Control Development Kit Revision D.

The Z8FS040 MCU, a prominent member of the ZMOTION Detection and Control Family, combines the programmability and rich peripheral set of Zilog's Flash Z8 Encore! XP® Family of MCUs with built-in motion detection software algorithms to provide the functions necessary for PIR motion detection applications. These motion detection algorithms comprise Zilog's PIR technology and run in the background while control and status of the motion detection engine is accessed through a software Application Programmer Interface (API). As a result, the designer can create his or her own application-specific software while taking advantage of Zilog's ZMOTION Motion Detection Technology.

Within this kit, API settings are provided to match the Engine operation to each of the lens and pyroelectric sensor combinations provided.

For more details about the ZMOTION MCU, refer to the ZMOTION Detection and Control Product Specification (PS0285), available free for download from the Zilog website.

Kit Contents

The ZMOTION Detection and Control Development Kit contains the following hardware, software and documentation:

Hardware

- ZMOTION Development Board

- USB Smart Cable Debugger

- 0.9" Focal Flat Lens Holder

- 0.77" Focal Circular Lens Holder

- Selection of lenses

- Selection of pyroelectric sensors, including a RE200B-P sensor installed on the Board

- Mini-USB serial cable

- Wall-mount mini-USB 5 V DC power supply[1]

- An assortment of mounting hardware

The contents of the kit are shown in Figure 1.

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1. Zilog recommends using only the power supply provided in the ZMOTION Detection and Control Development Kit.
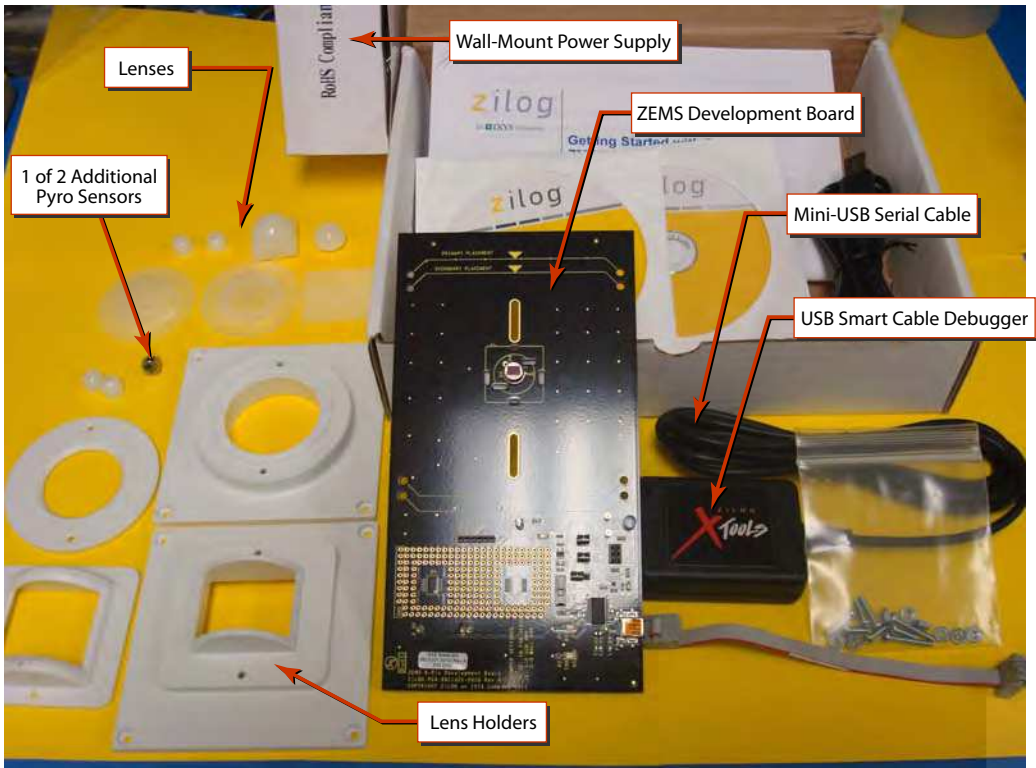
Figure 1. ZMOTION Detection and Control Development Kit Contents

Software (on CD-ROM)

- ZDS II – Z8 Encore! IDE with ANSI C-Compiler

- USB to Serial Driver

- Sample Code:
    - ZMOTION_Serial_Config
    - ZMOTION_Serial_Command

– ZMOTION_Low_Scan

Documentation

The CD-ROM provided in the ZMOTION Detection and Control Development Kit contains the following documentation:

- ZMOTION Detection and Control Product Brief (PB0225)

- ZMOTION Detection and Control Development Kit Quick Start Guide (QS0076)

- ZMOTION Detection and Control Product Specification (PS0285)

- This ZMOTION Detection and Control Development Kit User Manual (UM0230)

- Board schematic, assembly drawing and artwork

The CD-ROM also contains the following related ZMOTION documentation:

- ZMOTION Detection Module:
  - ZMOTION Detection Module Product Brief (PB0223)
  - ZMOTION Detection Module Product Specification (PS0284)

- ZMOTION Intrusion Detection:
  - ZMOTION Intrusion Detection Product Brief (PB0230)
  - ZMOTION Intrusion Detection Product Specification (PS0288)

- Supporting Documentation:
  - ZMOTION Lens and Pyroelectric Sensor Product Specification (PS0286)
  - ZMOTION – A New PIR Motion Detection Architecture White Paper (WP0017)
  - ZMOTION Detection Lens and Pyro Sensor Configuration Guide (WP0018)

– Power Management and Customer Sensing with Zilog's ZMO-TION Detection Module (AN0301)

– ZMOTION Detection Module Application Walkthrough (AN0307)

– Controlling Power with the ZMOTION Detection Module and Clare Solid State Relays Application Note (AN0319)

System Requirements

An IBM PC (or compatible computer) with the following minimum configurations is required:

- Microsoft Windows 7/Windows XP Professional SP1/ Windows 2000 SP3/Windows Vista 32-bit/Windows NT 4.0 SP6

- Pentium II/233 MHz processor or higher up to Pentium IV, 2.8 GHz

- 96 MB RAM or more

- 25 MB hard disk space or more

- Super VGA video adapter

- CD-ROM drive

- USB 2.0 interface port

Installation

For details about installation and setup, refer to the Using the ZMOTION Detection and Control Development Kit Quick Start Guide (QS0076).

Safeguards

The following precaution must be observed when working with the devices described in this document.

⚠ **Caution:** Always use a grounding strap to prevent damage resulting from electrostatic discharge (ESD).

ZMOTION Detection and Control Development Board

Zilog's ZMOTION Detection and Control Development Board is a development and prototyping platform for the ZMOTION silicon and software, as well as for its lens/pyroelectric sensor/silicon and software bundled solutions. The Board provides the user with a tool to evaluate the many features of ZMOTION PIR technology as well as the actual performance of each lens and pyro combination.

Features

The ZMOTION Detection and Control Development Board features the following elements:

- Z8FS040 ZMOTION Detection and Control MCU (8-pin SOIC)

- Mini-USB power connector and serial interface

- Power-On and Detection LED

- On-chip debugger interface

- Board openings for an assortment of lens holders and clip-on lens attachments

- Prototyping area

- 2.7 V–3.6 V operating voltage with 5 V-tolerant inputs

MCU Features

The Z8FS040 ZMOTION Detection and Control MCU combines the programmability and rich peripheral set of Zilog's Flash Z8 Encore! XP Family of MCUs with built-in motion detection software algorithms to provide the functions necessary for PIR motion detection applications.

The Z8FS040 MCU includes the following features:

- High-performance eZ8$^®$ MCU core
- 4KB in-circuit programmable Flash memory available for application code
- Single-pin debug with unlimited breakpoints
- Flexible clocking scheme
- Internal precision oscillator running at 5.53 MHz
- External oscillator operating up to 20 MHz
- Sigma Delta ADC
- Up to 6 single-ended channels or 3 differential channels available
- On-chip analog comparator with independent programmable reference voltage
- Full-duplex UART with dedicated BRG
- Two 16-bit timers with input capture, output compare and PWM capability (11 modes total)
- Watchdog timer (WDT) with dedicated internal oscillator
- Up to 20 vectored interrupts
- 6 to 25 I/O pins depending upon package
- 2.7 V to 3.6 V operating voltage with extended operating temperature range –40°C to +105°C
- Zilog PIR technology controlled and monitored via software API registers
- Selection capability from an assortment of lenses and pyroelectric sensors to best fit your application
- API settings provided for each lens and pyroelectric sensor combination
- Directly supports 1 or 2 pyroelectric sensors
- Sensitivity control, range control and directionality detection
- Extended detection modes for occupancy sensing
- Low power modes

ZMOTION Detection and Control Development Kit Lenses and Pyroelectric Sensors

The ZMOTION Detection and Control Development Kit includes five different types of lenses and pyroelectric sensors and three different types of pyroelectric sensors to fill a wide variety of lighting control, occupancy sensing, HVAC, display, proximity and power management applications. These applications also demonstrate the flexibility, and superior performance of Zilog's PIR motion detection technology.

Please refer to the <u>ZMOTION Lens and Pyroelectric Sensor Product Specification (PS0286)</u> for part-specific details about the individual lenses and pyroelectric sensors. Refer to the <u>ZMOTION Detection and Control Development Kit Quick Start Guide (QS0076)</u> for specific installation instructions for the lenses and pyroelectric sensors.

Pyroelectric Sensor Options

The ZMOTION Detection and Control Development Kit includes the following three pyroelectric sensors:

- RE200B-P: a basic dual element sensor installed on the board

- SDA02-54-P, a premium dual-element sensor

- SBDI46-504AA, a quad-element sensor

Figure 2. Two Additional Pyroelectric Sensors (L–R): SDA02-54-P and SBDI46-504AA

> ➤ **Note:** The type of sensor you use depends on your application requirements; however, not all sensors are suitable for all lenses.

Lens Mounting Options

The ZMOTION Detection and Control Development Board supports four lens-mounting options, as indicated in Table 1. For lens installation instructions, please refer to the sections that follow.

Table 1. Four Supported Lens-Mounting Options

Lens Mounting	Supported Lens
PIR Sensor Clip-On	NCL-9(26)
	NCL-3B
	NCL-3R
	NCL-10S
	NCL-10IL
Circuit Board Clip-In	CWM 0.5 GI V1
Circular Lens Holder 0.77 Focal	CM 0.77 GI V3
	CM 0.77 GI V5
Flat Lens Holder 0.9 Focal	AA 0.9 GI T1

Attaching the PIR Sensor Lens

Each of the clip-on lenses slide atop the PIR sensor, and the notch on the PIR sensor aligns with the notch in the base of the lens, as shown in Figure 3.

**Figure 3. NCL-9(26) Lens and PIR Sensor Installed
on the ZMOTION Development Board**

Attaching the Circuit Board Lens

This clip-in lens style clips directly into the circuit board over the top of the PIR sensor. There are 4 mounting clips on the lens that are aligned with the slots in the circuit board. Note the locating tab on the side of the lens is to be aligned with the silkscreened tab, as indicated in Figure 4.

Figure 4. Assembled Clip-In Lens Installed on the ZMOTION Development Board

Assembling the Circular Lens Holder

The circular lens holder, shown in Figure 5, is a 2-piece assembly that provides a 0.77" focal length mounting.

Figure 5. Circular 0.77" Lens Holder (Cap and Base)

To assemble the lens and lens holder, observe the following brief procedure.

1. Place the circular lens into the base of the lens holder, aligning the notch on the lens with the inside notch on the base.

2. Place the circular cap over the lens and the base ensuring the outside tab on the cap aligns with the outside tab on the base. Use the provided ¾" machine screws (2) with a nut to secure the cap in place.

3.   Place the lens and lens holder assembly on the to ZMOTION Devel-
     opment Board aligning the primary placement arrow on the lens
     holder with the primary placement arrow on the circuit board, as
     shown in Figure 6. The 4 screw holes in the circuit board should line
     up with the four center-mounting holes in the lens holder.

Figure 6. Top of Lens Holder on the ZMOTION Development Board

4.   Use the provided ⅜" machine screws (4) with a nut to secure the lens
     holder in place. See Figure 7.

**Figure 7. Assembled Circular 0.77" Lens Holder and Circular Lens Installed
on the ZMOTION Development Board**

Assembling the Flat Lens Holder

The flat lens holder, shown in Figures 8 and 9, is a two-piece assembly that provides a 0.9" focal length mounting.

Figure 8. Flat 0.9" Lens Holder (Cap and Base)
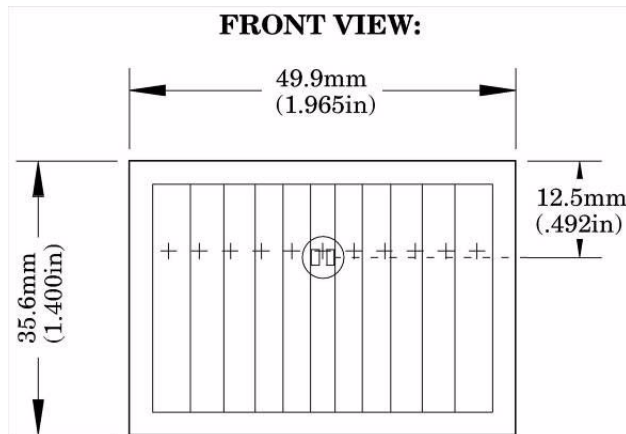
FRONT VIEW:

Figure 9. Flat Lens: AA 0.9 GI T1

To assemble this flat lens and holder, observe the following brief procedure.

1. Place the lens into the inside of the cap, ensuring that the grooves of the lens are facing inward.

2. Place the cap over the base, ensuring that the top of the lens is toward the arrow on the base. Use the provided ½" machine screws (2) with a nut to secure the cap in place.

3. Place the lens and lens holder assembly onto the ZMOTION Development Board with the arrow on the lens holder aligned with the primary placement arrow on the circuit board, as shown in Figure 10. The four screw holes in the circuit board should line up with the four center-mounting holes in the lens holder.

4. Use the provided ⅜" machine screws (4) with a nut to secure the lens holder in place. See Figure 10.

Figure 10. Assembled Flat 0.9" Lens Holder and Flat Lens

Installing ZDS II and the USB Smart Cable

Observe the following the steps to install Zilog Developer Studio (ZDS II) and its associated documentation.

1. Insert the ZDS II CD into the CD-ROM drive. The DemoShield installer launches automatically. If DemoShield does not launch automatically, open Windows Explorer, browse to your CD-ROM drive and double-click `launch.exe` to launch DemoShield.

2. From the product installer list, you can choose to install ZDS II alone, or both ZDS II and its associated documentation. You can also copy the documentation directly from your CD-ROM drive to your hard disk using Windows Explorer, or read the documentation directly from the CD-ROM itself.

For customer service and technical support, Zilog recommends that you create an account at support.zilog.com.

Installing the USB Smart Cable

This section describes how to install the USB Smart Cable and associated driver software for your particular operating system.

Windows 7 32/64

Observe the following steps to install the USB Smart Cable for Windows Vista 32-bit systems.

1. Connect the USB Smart Cable to the Host PC. A window message stating **Driver Software Installation** appears.

2. Windows automatically searches the driver; this process can sometimes take a few minutes to complete. In this case, wait for the search to complete, since there is no option to terminate this process immediately. If the driver was previously installed, Windows automatically installs the USB Smart Cable driver. If this is the case, proceed to <u>Step 9</u>. If Windows cannot find the driver, close the Search dialog and continue to Step 3.

3. In the Windows Start menu's **Search programs and files** field, enter Device Manager and click the Enter key. A **Device Manager** link will appear in the Start menu's resulting Program list; click to launch it.

4. In the Device Manager, under **Other devices**, right-click **USB Smart Cable**.

5. Select **Update Driver Software**.

6. In the **Update Driver Software – USB Smart Cable** dialog, select the **Browse my computer for driver Software** option.

7. Browse to one of the following driver directories:

For 32-bit versions:

```
<ZDS II Installation Directory>\device drivers\USB\x32
<ZDS II Installation CD>\device drivers\USB\x32
```

For 64-bit versions:

```
<ZDS II Installation Directory>\device drivers\USB\x64
<ZDS II Installation CD>\device drivers\USB\x64
```

8. Click **Next** to install the driver. On 32-bit systems, a **Windows Security** dialog will appear; select **Install this driver software anyway**.

9. After the Wizard finishes the installation, click the **Close** button.

Windows Vista, 32-bit OS

Observe the following steps to install the USB Smart Cable for Windows Vista 32-bit systems.

1. Connect the USB Smart Cable to the host PC. The **Found New Hardware** dialog box is displayed.

2. Select **Locate and install the driver software (recommended)**. The **Driver Software Installation** window is displayed, followed by the **Found New Hardware-USB Smart Cable** dialog box.

3. When prompted, select **I don't have the disc. Show me other options**.

4. When prompted, select **Browse my computer for driver software (advanced)**.

5. Browse to the following driver directory:

```
<ZDS II Installation Directory>\device drivers\USB
```

6. The Windows Security dialog box is displayed; select **Install this driver software anyway**.

7. Upon successful installation, click **Close**.

Windows XP

Observe the following steps to install the USB Smart Cable for Windows XP systems.

1. Connect the Zilog USB device to the host PC. The **Found New Hardware** wizard should activate automatically after connecting the Zilog USB device for the first time. If prompted to connect to Windows Update, select **No, not at this time**.

2. Select **[Install from a list or specific location (Advanced)]**; then click **Next**.

> **Note:** If the Windows Logo testing dialog appears, select **Continue Anyway**.

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3. Select **Search for the best driver in these locations and Include this location in search**.

4. Browse to the following driver directory, then click **Next**.

   ```
   <ZDS installation>\device drivers\USB\
   ```

5. After you find the appropriate driver, click **Next**.

6. Click **Finish** to complete the installation.

Windows 2000

Observe the following steps to install the USB Smart Cable for Windows 2000 systems.

1. Connect the Zilog USB device to the host PC. The **Found New Hardware** wizard should activate automatically after connecting the Zilog USB device for the first time.