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ZGATE™ Technologies

ZGATE™ Embedded Security Development Kit

User Manual

UM024502-1012



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Revision History

Each instance in the Revision History table below reflects a change to this document from its previous version. For more details, click the appropriate links in the table.

Date	Revision Level	Description	Page
Oct 2012	02	Corrected figures for improved image quality.	17 , 35 , 36 , 37 , 39 , 41 , 42
Oct 2012	01	Original issue.	n/a

Safeguards

The following precautions 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).

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The ZGATE Embedded Security Development Kit

ZGATE technology incorporates the eZ80F91 MCU and Zilog's full-featured TCP/IP stack with a world-class embedded firewall. This highly-configurable firewall protects the ZTP networking layers from attack by discarding suspicious packets before they reach ZTP and your embedded application. The ZGATE firewall includes a static packet filtering engine that filters packets according to user-defined configuration rules and a stateful packet inspection engine that can automatically filter suspicious packets based on unusual activity. Additionally, select ZGATE products include threshold-filtering mechanisms that can minimize the affect of packet floods.

Zilog's ZGATE Embedded Security Development Kit, part number ZGATE000100ZCOG, provides a general-purpose platform for creating a design based on this eZ80F91 microcontroller, which has been preprogrammed with a ZGATE security code. The eZ80F91 MCU is a member of Zilog's eZ80Acclaim*Plus!* product family, which offers an on-chip EMAC and Flash memory.

This document provides instructions for setting up and configuring your ZGATE Embedded Security Development Board and includes schematic diagrams and a discussion of Board features and ZDSII.

The first sections of this document guide you through the following tasks:

- [Download and Install the ZDSII Software and Documentation](#) on page 4
- [Installing the USB Smart Cable Driver](#) on page 4
- [Installing the FTDI USB-to-UART Driver](#) on page 7
- [Connecting the ZGATE Embedded Security Development Board to your PC](#) on page 8
- [Starting the ZGATE Demo Sample Program](#) on page 11

Further details, including memory configurations, jumper settings and a listing of sample projects can be found in [Appendix A. ZGATE Embedded Security Development Board](#) on page 105.

Figure 1 shows an image of the ZGATE Embedded Security Development Kit.



Figure 1. The ZGATE Embedded Security Development Kit

Kit Contents

Table 1 lists the contents of the ZGATE Embedded Security Development Kit.

Table 1. ZGATE000100ZCOG Contents

Item	Description	Quantity
1	ZGATE Embedded Security Development Board	1
2	USB Smart Cable	1
3	6-Circuit Ribbon Cable	1
4	A (male) to Mini-B USB Cable	1
5	ZGATE Embedded Security Development Kit Flyer (FL0145)	1

Kit Features

The key features of the ZGATE Embedded Security Development Kit are:

- ZGATE Embedded Security Development Board, which includes:
 - eZ80F91 MCU operating at 50MHz, with 256KB of internal Flash memory and 8KB of internal SRAM memory
 - On-chip Ethernet Media Access Controller (EMAC)
 - 8MB of Flash memory
 - Up to 1MB of off-chip SRAM memory
 - A USB interface that provides:
 - Power to the Board with overcurrent protection
 - Connection to the eZ80F91 MCU's UART0 block
 - DB9 connected to the eZ80F91 MCU's UART1 block
 - Optional external power connection
 - Ethernet port and PHY
 - Real-Time Clock support
 - One 64-pin header with all available GPIO ports connected to it
- USB Smart Cable
- ZDSII Software and Documentation (free download)

Supported Operating Systems

The ZGATE Embedded Security Development Board supports the following operating systems:

- Microsoft Windows 7 (32-bit/64-bit)
- Microsoft Windows Vista (32-bit/64-bit)
- Microsoft Windows XP

Download and Install the ZDSII Software and Documentation

Observe the following steps to install your ZDSII software and documentation.

-
- **Note:** If you have already installed *ZDSII – eZ80Acclaim! <version>* and have downloaded the ZGATE software and documentation by following the procedure on the paper insert in your kit (FL0145), skip ahead to the [Installing the USB Smart Cable Driver](#) section.
-

1. Prior to connecting the ZGATE Embedded Security Development Board to your development PC, download ZDS II for eZ80Acclaim! v5.2.1 (or later) from the **Downloadable Software** category in the [Zilog Store](#).
2. Run the software installation file and follow the on-screen instructions to install ZDSII.

Download and Install the Source Code and Documentation

ZGATE software and documentation is available as a downloadable file from the Zilog Store. Observe the following brief procedure to download and install your ZGATE software.

1. In a web browser, visit the [Zilog Store](#). At the top left, under **Categories**, click **Downloadable Software** to present a list of the Zilog software available in the Store. In this list, click **ZGATE Software and Documentation**; the *Product ID* for this software is SD00019. On the **Product Details** page, click the **Add to Cart** button to download the ZGATE Software and Documentation files to your hard drive.¹
2. When the download is complete, unzip the file to your hard drive. Double-click the installation file named ZGATE000100ZCOG_<version>.exe, and follow the on-screen instructions.

Installing the USB Smart Cable Driver

The USB Smart Cable can be installed on PCs that run on Windows 7 (32- and 64-bit), Windows Vista (32- and 64-bit) and Windows XP operating systems. The procedures in this section will guide you through the USB Smart Cable installation process.

1. If you're a first-time visitor to the Zilog Store, you will first be required to register as a Zilog Store user before downloading your software. Returning visitors must log in to purchase or download.

Windows 7 32/64 Systems

Observe the following steps to install the USB Smart Cable on a Windows 7 system.

1. Connect the USB Smart Cable to a USB port on your development PC. When the PC detects the new hardware, it will display the Installing device driver software dialog.
2. Windows automatically searches for the driver; this process can take a few moments. Because there is no option to terminate this search process, wait for the search to complete.

If the driver was previously installed, Windows will automatically install the USB Smart Cable driver. If this is the case, skip ahead to [Step 9](#). If Windows cannot find the driver, close the search dialog and proceed to the next step.

3. From the **Start** menu, navigate via the **Search Programs and files** menu, and enter **Device Manager** in the Search field to cause the Device Manager to appear in a list of search results.
4. From this search list, click **Device Manager** to open the Device Manager dialog, which presents a list of devices that operate on your PC. Find **Other devices**, toggle it to view a sublist of additional devices, and right-click your mouse on **USB Smart Cable**.
5. In the submenu that appears, click **Update Driver Software....**
6. In the **Update Driver Software – USB Smart Cable** dialog that appears, click the **Browse my computer for driver Software** option.
7. Click the **Browse...** button to browse to one of the following driver directories, depending on the configuration of your PC.

On 32-bit Windows 7 systems, navigate to:

```
<ZDSII Installation Directory>\device drivers\USB\x32  
<ZDSII Installation CD>\device drivers\USB\x32
```

On 64-bit Windows 7 systems, navigate to:

```
<ZDSII Installation Directory>\device drivers\USB\x64  
<ZDSII Installation CD>\device drivers\USB\x64
```

8. Click **Next** to install the driver. On 32-bit: Windows systems, a security dialog will appear; select **Install this driver software anyway**.
9. Click **Close** after the Wizard finishes the installation.

Windows Vista 32/64 Systems

Observe the following steps to install the USB Smart Cable on a Windows Vista system.

1. Connect the USB Smart Cable to a USB port on the development PC.

2. After the PC detects the new hardware, it will display the Found New Hardware Wizard dialog box. Click **Locate and install driver software (recommended)**.
3. Depending on your development PC's User Account Control settings, Windows may ask for permission to continue the installation. Click **Continue**.
4. When the Insert the Disc dialog appears, select **I don't have the disc. Show me other options**. Click the **Next** button to display the **Windows couldn't find driver** dialog.
5. Select **Browse my computer for driver software (advanced)** to display the Browse For Driver dialog, which prompts you to key in or browse for the location of the driver's .inf file. Depending on the type of computer you use (32-bit or 64-bit), use the **Browse...** button to navigate to one of the following paths, then click the **Next** button.

On 32-bit Vista systems, navigate to:

```
<ZDSII Installation>\device drivers\USB\x32  
<ZDSII Installation CD>\device drivers\USB\x32
```

On 64-bit Vista systems, navigate to:

```
<ZDSII Installation>\device drivers\USB\x64  
<ZDSII Installation CD>\device drivers\USB\x64
```

6. When the Windows Security dialog prompts you whether to install or not install, click **Install this driver software anyway** and wait until the installation is completed (Windows may prompt you more than once).
7. When the software has been installed successfully, click **Close**.

Windows XP Systems

Observe the following steps to install the USB Smart Cable on a Windows XP system.

1. Connect the USB Smart Cable to a USB port on the development PC. When the PC detects the new hardware, it will display the Found New Hardware Wizard dialog.
2. In the Wizard, select **Install from a list or specific location (Advanced)**, and click **Next**.

► **Note:** If the Windows Hardware Installation dialog appears, click **Continue Anyway**.

3. In the Please choose your search and installations dialog, select **Search for the best driver in these locations and include this location in search**.
4. Use the **Browse...** button to navigate to one of the following paths:.
<ZDSII Installation>\device drivers\USB\x32
<ZDSII Installation CD>\Device Drivers\USB\x32

5. Click **Next** to locate the appropriate driver.
6. Click **Next**, then click **Finish** to complete the installation.

Installing the FTDI USB-to-UART Driver

An FTDI USB-to-UART driver is required to allow your PC to communicate through its USB port to the on-chip UART of the ZGATE Embedded Security MCU. Observe the following procedure to perform these connections.

1. Ensure that the USB cable is not plugged in to the ZGATE Embedded Security Development Board's P3 connector.
2. Navigate to the following filepath and double-click the CDM20802_setup.exe file to begin the driver installation.

```
<ZDS II Installation>\device drivers\FTDI Uart  
<ZDS II Installation CD>\Device Drivers\FTDI Uart
```

3. The installation process will begin and you should observe output similar to the following messages on the screen of your PC:

```
32-bit OS detected  
<installation path>\dpinstx86.exe  
Installation driver  
FTDI CDM driver installation process completed...
```

4. When the installation is complete, plug in the Mini-B connector of the second USB cable into the Board, and the larger A connector into the USB port of your PC.
5. If the driver installation was successful, the Ports (COM & LPT) section of the Device Manager will display USB Serial Port (COMx) or similar message, as highlighted in Figure 2.



Figure 2. A Successful USB-to-UART Driver Installation

► **Note:** To launch the Device Manager on Windows 7 systems, launch the Start menu, enter device manager in the Search programs and files field, and press the Enter key.

To open the Device manager on earlier Windows systems, navigate via the following path:

Start → Control Panel → System → Hardware → Device Manager → Ports (COM& LPT)

Connecting the ZGATE Embedded Security Development Board to your PC

Observe the following procedure to connect the ZGATE Embedded Security Board to your PC.



Caution: Disconnect or turn off the power to the ZGATE Embedded Security Development Board before connecting or disconnecting the USB Smart Cable.

1. Ensure that the following default jumper settings are configured (see [Table 4](#) on page 108 for reference):

J11	OUT
J12	1–2
J26	IN
J25	2–3
J24	1–2
J23	1–2

2. Connect one end of the 6-conductor ribbon cable provided in your Kit to the USB Smart Cable unit, ensuring that the ribbon's male connector is aligned correctly with the female connector on the unit, as indicated by the red stripe in Figure 3.

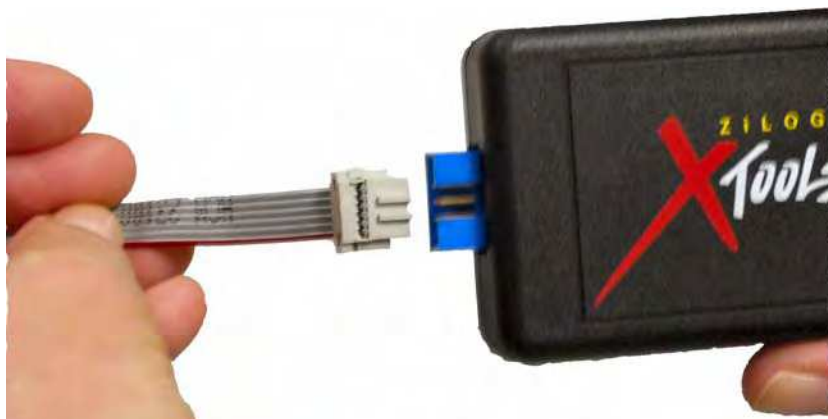


Figure 3. Connecting the Six-Conductor Ribbon Cable to the Serial or USB Smart Cable

3. Connect the other end of the ribbon cable to Debug Connector J1 on the Development Board. Ensure that Pin 1 on the ribbon cable is aligned with Pin 1 on the target connector, as highlighted in Figure 4.

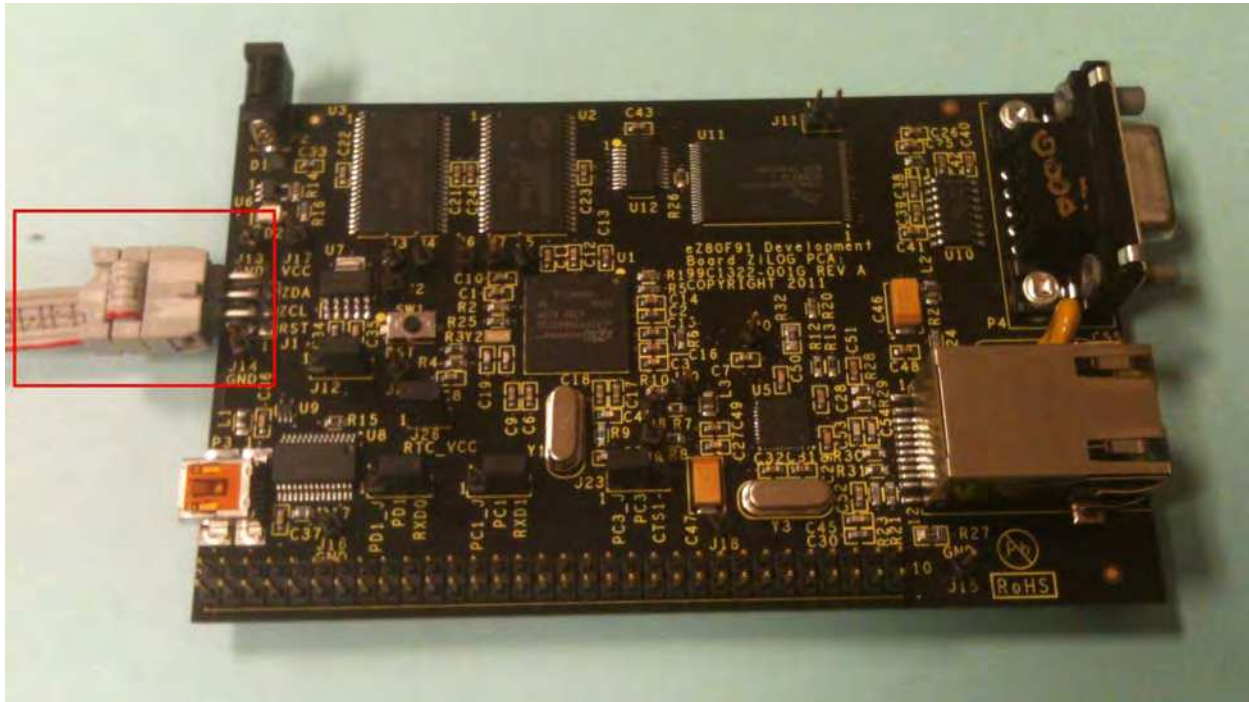


Figure 4. Debug Connector J1

4. Connect an Ethernet CAT5 cable to P1 and to your Ethernet hub.
5. With the USB A (male) to Mini-B cable, connect Port P3 on the ZGATE Embedded Security Development Board to a USB port on the development PC to apply power to the Development Board, as highlighted in Figure 5.

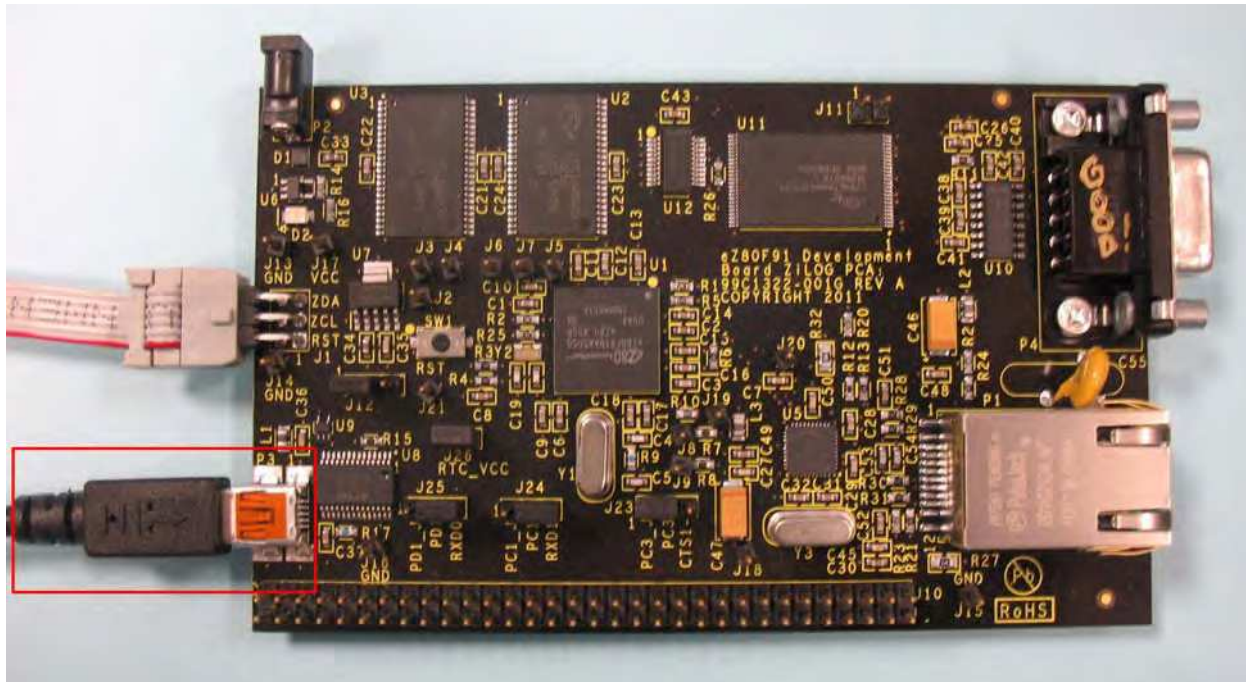


Figure 5. USB-to-UART Port 3 Connector

► **Note:** To use the USB port as a power source, adjust the shunt on J12 to the 1–2 position.

Starting the ZGATE Demo Sample Program

The ZGATE Embedded Security Development Kit includes a sample program that demonstrates how the ZGATE API can be used to enhance the security of a ZTP application. The ZGATE Demo program includes source code to implement several shell commands that modify the filtering behavior of ZGATE at run time. In addition the ZGATE Demo program includes a sample web page with dynamically generated content that can be used to modify ZGATE's configuration using a web browser.

Before starting the ZGATE Demo it is necessary to first complete the installation of ZDSII and the Zilog TCP/IP Software Suite (ZTP). In addition to run the ZGATE Demo shell commands it will be necessary to setup a terminal emulation program (such as HyperTerminal or Tera Term). The terminal program should be configured for 8N1 with no flow control.

To get started with the ZGATE Demo use the following procedure.

1. Launch ZDS II by navigating from the Windows Start menu to **Programs** → **Zilog ZDSII – eZ80Acclaim! <Version>** → **ZDSII – eZ80Acclaim! <Version>**.
2. From the **File** menu in ZDSII, select **Open Project**, and navigate to the following file-path:
`<ZDS Install>\ZTP\ZTP<version>_Lib\ZTP\SamplePrograms\ZGATE_Demo`
3. Select the `ZGATE_Demo_ZGATE000100ZCOG.zdsproj` project from within the `ZGATE_Demo` folder and click **Open**. A list of source files will appear in the Workspace panel section.
4. From the **Build** menu, select **Set Active Configuration** to open the Select Configuration dialog box.
5. Select **RAM**, then click **OK** to close the Select Configuration dialog box.
6. From the **Project** menu in ZDSII, select **Settings** to open the Project Settings dialog box. In the Project Settings dialog box, click the **Debugger** tab.
7. On the Debugger page, select **ZGATE000100ZCOG_RAM** from the Target list, then select **USB Smart Cable** from the **Debug Tool** drop-down menu.
8. Click **OK** to close the Project Settings dialog box.
9. If you are prompted to rebuild any affected files, click **Yes**. Otherwise, choose **Build** from the menu bar, then click **Rebuild All**.
10. To run the application, select **Go** from the **Debug** menu.
11. After the application has started, console output should be visible in the terminal emulation program.

For information about how to use the `ZGATE_Demo` sample program, please refer to the [Using the ZGATE Demo Sample Program](#) section on page 13.

Recovering the ZGATE Image in eZ80F91 Internal Flash

The ZGATE demo program will not function unless the ZGATE binary image is present in eZ80F91 internal Flash memory. If the ZGATE internal Flash image is accidentally erased or overwritten, please [contact the Zilog Technical Support team](#) for assistance in reprogramming the ZGATE binary image into eZ80F91 internal Flash.

After the ZGATE binary image has been restored, it may be necessary to reprogram the ZGATE demo application into the ZGATE Embedded Security Development Board. To learn more, refer to the [Starting the ZGATE Demo Sample Program](#) section on page 11.

Using the ZGATE Demo Sample Program

When the ZGATE Demo program starts, the standard ZTP start-up messages are displayed on the console, along with the ZGATE start-up information, as the following example shows.

```
.100 Mbps Full-Duplex Link established

Querying DHCP Server...

DHCP OK

Initializing network stack...

IF  IP addr          Def Gtway          state  type      H/W addr

0   192.168.2.29     192.168.2.1       UP     Ethernet 0 :90:23:0 :1 :1
1   192.168.2.1     192.168.2.2       DOWN   PPP       --

Initializing File System...
Manufacturer code : 0x1
Device Id: S29GL064NTB Failed
Formatting Invalid Volume : EXTFDone
FTPD ready
TELNETD ready
Thu, 4 Sep 2012  9:38:21

ZGATE Firewall v1.00a

HTTPD ready
Login:
A Trap is generated

A Trap is generated
```

When prompted, log in using anonymous as both the username and the password.

At this point, the ZGATE Demo functions similarly to the standard ZTP Demo application, with the exception that the ZGATE image stored in eZ80F91 internal Flash memory is protecting the ZTP Demo application from suspicious network activity.

To understand how ZGATE protects ZTP applications, try the following procedure:

1. Start the ZGATE Demo program.
2. On a PC running a terminal emulation program (such as HyperTerminal), open a web browser such as Internet Explorer or Firefox.