

Introduction

This quick start guide helps you to get started with Zilog Real-Time Kernel (RZK) software for application development on Zilog's eZ80Acclaim![®] family of microcontrollers and microprocessors. This document guides you through the following tasks:

- [RZK Overview](#)
- [Supported Target Hardware](#)
- [Supported Host Environments](#)
- [Installing RZK](#)
- [RZK Directory Structure](#)
- [Creating and Executing an RZK Project](#)
- [Related Documentation](#)

RZK Overview

RZK is a real-time, preemptive, and multitasking kernel designed for time-critical, embedded applications. It is currently available for Zilog's eZ80[®] product line. RZK is supplied as a C library module. Figure 1 displays the RZK architecture RZK.

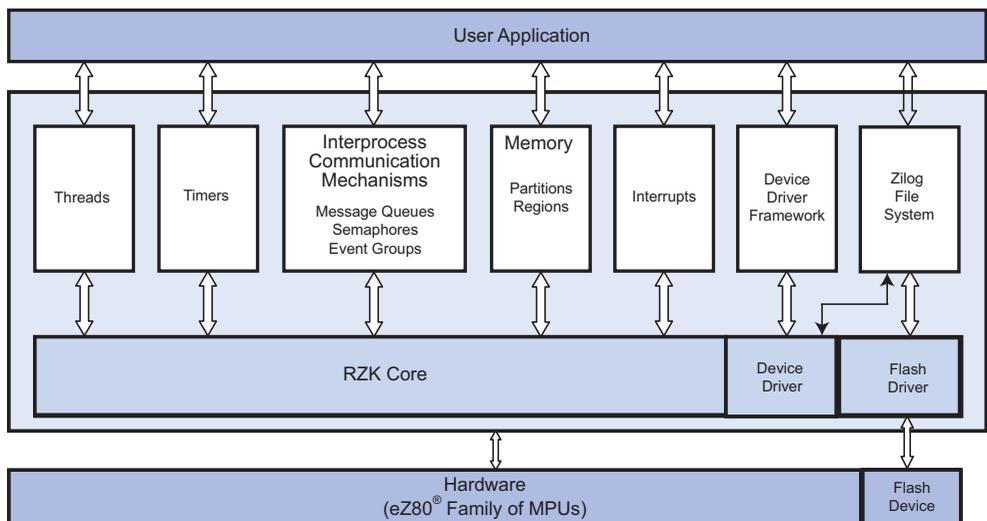


Figure 1. Zilog Real-Time Kernel Architecture

Real-time applications are linked with the RZK library during compilation. The executable files of the real-time application are downloaded to a target platform, or placed in ROM.

RZK contains kernel modules, which are referred to as RZK objects. RZK objects used for real-time application development are listed below:

- Threads
- Timers
- Semaphores
- Event groups
- Interrupts
- Message queues
- Regions and partitions
- Device driver framework
- Board Support Package (WLAN, USB, EMAC, UART, I²C, SPI, and RTC drivers)

For more information about these RZK objects, refer to the [Zilog Real-Time Kernel User Manual \(UM0075\)](#), which is available free for download from the Zilog website and can also be found in the following filepath:

```
<ZDSII installed directory>\Program Files\Zilog\  
ZDSII_eZ80Acclaim!_A.B.C\ZTP\ZTPX.Y.Z_Lib\RZK\Docs
```

► **Note:** Throughout this document, x.y.z represents the RZK version number in Major.Minor.Revision format, and A.B.C represents the ZDSII – eZ80 Acclaim! version number in Major.Minor.Revision format..

Supported Target Hardware

RZK supports the eZ80Acclaim![®] family of Flash MCUs, which includes the eZ80F91, eZ80F92, and eZ80F93 MCUs. It also supports the eZ80L92 MPU, an eZ80[®] microprocessor. Zilog provides development kits for each of these processors; refer to the documentation provided with each development kit for setup and configuration instructions.

Supported Host Environments

To use your eZ80Acclaim![®] development kit with RZK, your host system must meet the minimum hardware and software requirements specified in the `readme` file contained in your development kit's ZDSII installation.

Installing RZK

Zilog offers two options for installing the Zilog Real-Time Kernel: choose Option 1 if you will be installing the ZDSII – eZ80Acclaim! software from the CD included with your eZ80Acclaim! development kit, and choose Option 2 if you will be downloading and installing the most recent version of ZDSII – eZ80Acclaim! from the zillog.com website.

Option 1. RZK is automatically installed when you install the Zilog Developer Studio II – eZ80Acclaim! software from the kit CD. For information about installing ZDSII in this manner, please refer to the [Zilog Developer Studio II - eZ80Acclaim! User Manual \(UM0144\)](#).

Option 2. Zilog software, including RZK, is available from the [zillog.com website](http://zillog.com). Before downloading, however, you will need to create an account by clicking the **Register** link that appears underneath the Username/Password prompts in the upper left corner of most pages on the site. If you have already registered on zillog.com, simply log in with your username and password, then navigate via the **Tools and Software** menu to **Software Downloads**. In the left panel, listed under **Software Category**, click **ZDSII and Utility Tools**. Next, scroll to the *ZDS2_eZ80Acclaim* section and click the **Download** link for the latest version of the ZDSII – eZ80Acclaim! software, which includes the most recent version of RZK.

Uninstalling RZK

To uninstall RZK, launch the **InstallShield Wizard**. When the **InstallShield Wizard** finds an already-installed version of RZK, it allows you to modify, repair or remove the previous installation of RZK.

As an alternative, navigate via the Windows **Start** menu to **Settings** → **Control Panel** → **Add and Remove Programs** to select the installed version of RZK from the list.

► **Note:** The [Installing RZK](#) and [Uninstalling RZK](#) sections are applicable only for RZK version 2.2.0 and earlier versions.

RZK Directory Structure

Figure 2 displays the directory structure created in the host PC when you install RZK. By default, the installation directory is:

```
<ZDSII installed directory>\Program Files\Zilog\  
ZDSII_eZ80Acclaim!_A.B.C\ZTP\ZTPX.Y.Z_Lib.
```



Figure 2. RZK Directory Structure

Table 1 describes the contents of important folders in the RZK directory. Each folder contains subfolders for the RZK Core, Board Support Package (BSP) and Zilog File System.

Table 1. RZK Directory Contents

Folder in RZK	File Type	Description
\Conf	C and Assembly source files	This folder contains the required and optional RZK configuration files for inclusion in the application project workspace.
\Inc	Header files	RZK header files required for inclusion in the application project workspace.
\Lib	Library files	RZK library files required for inclusion in the application project workspace. Lib folder contains the following library files: RZKDebugPI.lib: debug, priority inheritance RZKDebugNPI.lib: debug, no priority inheritance RZKNDebugPI.lib: no debug, priority inheritance RZKNDebugNPI.lib: no debug, no priority inheritance RZKeZ80xxx.lib for ZDSII: target-related support file, where xxx refers to the platform; F91, F92, F93, or L92. Contains BSP libraries, BSPeZ80xxx.lib, where xxx refers to the platform; F91, F92, F93, or L92. Also contains stub files for EMAC driver, NOEmac.obj, and Zilog File System.
\Docs	This folder contains RZK-related documents, including this quick start guide.	
\SamplePrograms\ Core	Project workspace, application	Sample application project workspace.

Hardware Requirements

The hardware required to execute the sample application using RZK include:

- eZ80 Development Platform with eZ80Acclaim![®] Module installed
- Target Interface Module (TIM)
- ZPAKII/Serial Smart Cable/USB Smart Cable

- One RS-232 cable
- Two RJ-45 Ethernet cables
- Two COM ports on the PC
- USB/Serial Smart Cable

Software Requirements

The software required to execute the sample application using RZK include:

- Windows operating system
- ZDS II – eZ80Acclaim!®
- HyperTerminal application

Hardware Setup

Figures 3 and 4 display the hardware setup.

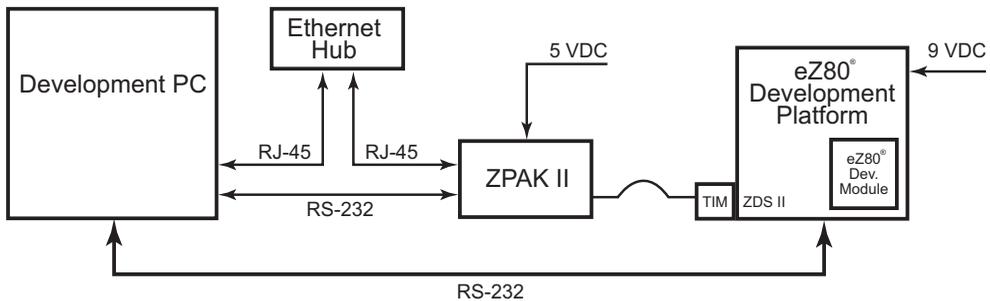


Figure 3. Hardware Setup Using an Ethernet Hub and ZPAK II

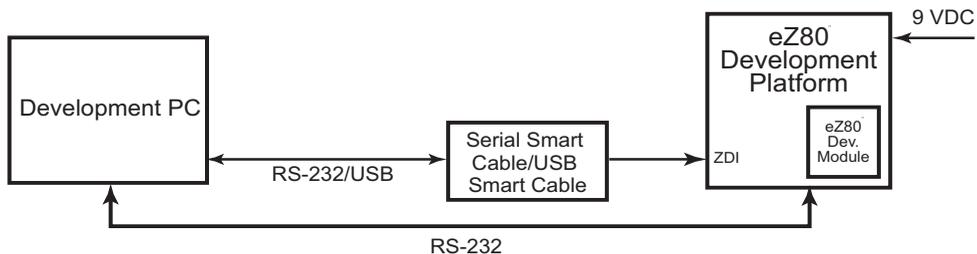


Figure 4. Hardware Setup Using a Serial Smart Cable/USB Smart Cable

Observe the following steps to set up the hardware:

1. Set the jumper pin connections on the eZ80 Development Platform to their default settings.
2. Connect the power supply (9V) cables to the eZ80 Development Platform.
3. If you're using ZPAKII, observe the following brief procedure; if you're using either of the Serial or USB smart cables, skip ahead to Step 4.
 - a. Connect the ZDI target interface module to the ZDI J4 port on the eZ80[®] Development Platform.
 - b. Connect one end of the RJ-45 cable to the Ethernet port on the ZPAKII unit and the other end to the LAN (required if debugging with ZDSII).
 - c. Connect the power supply (5 V) to the ZPAKII unit.
4. If you're using a Serial or USB Smart Cable, follow either of the following procedures:
 - **Serial Smart Cable:** Connect the ZDI target interface module of the Serial Smart Cable to the ZDI J4 port on the eZ80 Development Platform, and connect the other end to the serial port on the host PC.
 - **USB Smart Cable:** Connect the ZDI target interface module of the USB Smart Cable to the ZDI J4 port on the eZ80 Development Platform, and connect the other end to the USB port the on host PC.
5. Connect one end of the RJ-45 cable to the Ethernet port on the eZ80 Module and the other end to the LAN.
6. Connect the RS-232 cable to the eZ80 Development Platform and to the COM1 port of the development PC.

► **Note:** Before using RZK, ensure that the host and target system requirements are met and that the software is installed.

Configuring the HyperTerminal Application

Observe the following steps to configure the HyperTerminal application:

1. Launch the HyperTerminal application by navigating via the Windows **Start** menu to **Programs** → **Accessories** → **Communications** → **HyperTerminal**. The **Connection Description** dialog box is displayed.
2. Enter the name for a new connection in the **Connection Description** dialog, and click **OK** to open the **Connect To** dialog box.
3. In the **Connect Using** text field, select the port (COM1 or COM2) to which the serial cable is connected. Click **OK** to open the **Port Settings** dialog box for the selected port.
4. In the **Port Settings** dialog box, enter the values listed in Table 2 into their respective text fields:

Table 2. HyperTerminal Port Settings

Bits per second	57600 bps
Data bits	8
Parity	None
Stop Bits	2
Flow control	None

5. Click **OK** to establish connection to the eZ80 Development Platform using the serial port.
6. Press the **RESET** button on the eZ80 Development Platform.

Creating and Executing an RZK Project

After installing ZDSII_eZ80Acclaim!_A.B.C, open the sample software projects for RZK. These sample projects are available in the following filepath:

```
<ZDSII installed directory>\Program Files\Zilog\  

ZDSII_eZ80Acclaim!_A.B.C\ZTP\ZTPX.Y.Z_Lib\RZK\SampleProgram\Core
```

The RAM, FLASH and COPY_TO_RAM project configurations are provided with all of the sample applications, and can be readily used for new applications by removing the application files and adding your own application files.

A sample application written for RZK forms a part of the setup installation files. This section discusses the setup and the procedure to execute the sample application in the ZDSII Development Environment for the eZ80F91 MCU only. For other platforms, a similar pro-

cedure, also listed in this section, must be followed. The sample RZK application is located in the following path:

```
<ZDSII installed directory>\Program Files\Zilog\  
ZDSII_eZ80Acclaim!\_A.B.C\ZTP\ZTPX.Y.Z_Lib\RZK\SampleProgram\  
Core\routerApp
```

► **Note:** The following steps are intended for creating project workspaces only in the ZDSII environment. For programming guidance, refer to the [Zilog Real-Time Kernel Reference Manual \(RM0006\)](#). This section lists only those files and settings that must be modified to be compatible with RZK. For information about creating a project workspace, refer to the [Zilog Developer Studio II – eZ80Acclaim! User Manual \(UM0144\)](#).

Observe the following steps to create and execute an RZK project using ZDSII:

1. After creating the project workspace, add all of the files listed in the *RZK Configuration* section of the [Zilog Real-Time Kernel User Manual \(UM0075\)](#) to the project workspace by selecting **Add Files** from the **Project Menu**.
2. Add all of the user application files to the project workspace.
3. Navigate via the **Project** menu to **Settings** → **C**. The **Project Settings** dialog box is displayed.
4. In the **Code Generation** tab, select the **Size** or **Speed** option from the **Optimize For** drop-down list, as appropriate. Check the **Limit Optimizations for Easier Debugging** option.
5. In the **Preprocessor** tab of the **Project Settings** dialog box, add the macro definitions listed in the *RZK Configuration* section of the [Zilog Real-Time Kernel User Manual \(UM0075\)](#) to the **Preprocessor Definitions** field.

► **Note:** Do not enable ZSL. RZK does not support the ZSL provided by ZDSII. Selecting **PORTS** or **UART** from the **ZDSII Menu** → **Project** → **Settings** → **ZSL** navigation does not initialize the peripherals. You must initialize these peripherals using the RZK device driver APIs.

6. In the **Linker Settings** category (for the COPY_TO_RAM configuration), add the linker directives by checking the **Additional Directives** option, then click **Edit**. The

Additional Linker Directives dialog box is displayed. Add the following statement, then click **OK**:

```
CHANGE TEXT is CODE
```

7. In the Linker's **Address Spaces** field, provide the required memory ranges for RAM and ROM.
8. In the Linker's **Output** field, select the **Intel Hex32-Records** output option to generate a hex image for the FLASH and COPY_TO_RAM configurations.
9. In the **Debugger** tab, select the **eZ80DevPlatform_F91_Flash** target for the FLASH and COPY_TO_RAM configurations (ZPAKII must be connected to the eZ80 Development Platform). For the RAM configuration, select the **eZ80DevPlatform_F91_RAM** target. Select the appropriate debug tool from the **Debug Tool** → **Current** drop-down list and click **OK**. For information about performing this step, refer to the [Zilog Developer Studio II – eZ80Acclaim! User Manual \(UM0144\)](#).
10. Rebuild the application by selecting **Build** → **Rebuild All**.
11. Download the application to the target by selecting **Debug** → **Download Code**. Select **Debug** → **Go** to execute the application.
12. After burning the application hex image, press the **RESET** button on the eZ80 Development Platform to execute the application.

Building and Running the Sample RZK Project

The sample project provided with the kit is a router application, located in the following filepath:

```
<ZDSII installed directory>\Program Files\Zilog\  
ZDSII_eZ80Acclaim!_A.B.C\ZTP\ZTPX.Y.Z_Lib\RZK\SamplePrograms\  
Core\routerApp
```

Observe the following steps to execute this router application:

1. Establish the hardware connections displayed in [Figure 3](#) on page 6.
2. Launch ZDSII by navigating via the Windows **Start** menu to **Programs** → **Zilog ZDSII – eZ80Acclaim!_<Version>** → **ZDSII – eZ80Acclaim!_<Version>**.
3. From the **File** menu in ZDSII, select **Open Project**, and navigate to the following filepath:

```
<ZDSII installed directory>\Program Files\Zilog\  
ZDSII_eZ80Acclaim!_A.B.C\ZTP\ZTPX.Y.Z_Lib\RZK\SamplePrograms\  
Core\routerApp
```

Select the `routerApp_xxx.zdsproj` project (in which `xxx` refers to the F91, F92, F93 or L92 platform) located in the above filepath. Click **Open**. A list of source files appears in the **Workspace** panel.

4. Select the RAM, FLASH or COPY_TO_RAM configuration from the **Build** → **Set Active Configuration** menu.
5. Select **Settings** from the **Project** menu in ZDSII. The **Project Settings** dialog box is displayed.
6. In the **Debugger** tab, select the appropriate debug tool from the **Debug Tool** → **Current** drop-down list and click **OK**.
7. Select **Rebuild All** from the **Build** menu to rebuild your project.
8. After the build is complete, press the **RESET** button on the eZ80 Development Platform.
9. For the RAM configuration, download the application code by selecting **Debug** → **Download Code**.
10. To execute the application, select **Debug** → **Go**.
11. For FLASH or COPY_TO_RAM configurations, burn either of the `routerApp_xxx_Flash.hex` or `routerApp_xxx_Copy_To_Ram.hex` image files into Flash memory using the integrated Flash Loader feature of ZDSII by performing the following steps:
 - a. Select **Tools** → **Flash Loader** to open the **Flash Loader** dialog box.
 - b. Select `routerApp_xxx_Flash.hex` or `routerApp_xxx_Copy_To_Ram.hex`, both of which are located in the following path:

```
<ZDSII installed directory>\Program Files\Zilog\  
ZDSII_eZ80Acclaim!_A.B.C\ZTP\ZTPX.Y.Z_Lib\RZK\  
SamplePrograms\Core\routerApp
```
 - c. Click **Erase**, then click **Fast Burn** to write the application image into Flash memory.
 - d. Click **Close** to close the **Flash Loader** dialog box.
 - e. Press the **RESET** button on the eZ80 Development Platform. The output, which will be similar to the example shown below, is displayed in the HyperTerminal application.

```
processing.....  
SOURCE BUFFER:  
0RZK REAL TIME1RZK REAL TIME2RZK REAL TIME3RZK REAL TIME4RZK  
REAL TIME  
5RZK REAL TIME6RZK REAL TIME7RZK REAL TIME8RZK REAL TIME9RZK  
REAL TIME  
:RZK REAL TIME;RZK REAL TIME<RZK REAL TIME=RZK REAL TIME>RZK  
REAL TIME  
?RZK REAL TIME
```

DESTINATION BUFFER:

```
0RZK REAL TIME1RZK REAL TIME2RZK REAL TIME3RZK REAL TIME4RZK  
REAL TIME  
5RZK REAL TIME6RZK REAL TIME7RZK REAL TIME8RZK REAL TIME9RZK  
REAL TIME  
:RZK REAL TIME;RZK REAL TIME<RZK REAL TIME=RZK REAL TIME>RZK  
REAL TIME  
?RZK REAL TIME
```

```
Entry count = 1  
Application successful  
processing.....
```

```
SOURCE BUFFER:  
0RZK REAL TIME1RZK REAL TIME2RZK REAL TIME3RZK REAL TIME4RZK  
REAL TIME  
5RZK REAL TIME6RZK REAL TIME7RZK REAL TIME8RZK REAL TIME9RZK  
REAL TIME  
:RZK REAL TIME;RZK REAL TIME<RZK REAL TIME=RZK REAL TIME>RZK  
REAL TIME  
?RZK REAL TIME
```

DESTINATION BUFFER:

```
0RZK REAL TIME1RZK REAL TIME2RZK REAL TIME3RZK REAL TIME4RZK  
REAL TIME  
5RZK REAL TIME6RZK REAL TIME7RZK REAL TIME8RZK REAL TIME9RZK  
REAL TIME  
:RZK REAL TIME;RZK REAL TIME<RZK REAL TIME=RZK REAL TIME>RZK  
REAL TIME  
?RZK REAL TIME
```

```
Entry count = 2  
Application successful  
:  
:
```

Creating a New RZK Project

To create a new RZK project, copy an existing sample project into a new directory and modify it to suit your requirements. For information about how to add and remove files from a project and for a description of the advanced features of ZDSII, refer to the [Zilog Developer Studio II – eZ80Acclaim! User Manual \(UM0144\)](#). For a information about creating new projects and the settings required for RAM projects, refer to the [Zilog Real-Time Kernel User Manual \(UM0075\)](#).

Observe the following steps to create a new RZK project called `MyRZKApp` from an existing RZK application called `RouterApp`:

1. Navigate to the following filepath:

```
<ZDS Install DIR>\<RZK Install Dir>\RZK\SamplePrograms\Core\  
RouterApp
```

In this path, `<ZDS Install Dir>` is platform-dependent, as follows:

- For 32-bit Windows platforms, `<ZDS Install Dir> = C:\Program Files\Zilog\ZDSII_eZ80Acclaim!_A.B.C`
 - For 64-bit Windows platforms, `<ZDS Install Dir> = C:\Program Files(x86)\Zilog\ZDSII_eZ80Acclaim!_A.B.C`
 - Additionally, `<RZK Install Dir> = ZTP\ZTPX.Y.Z_Lib`
2. Copy the `routerApp_xxx.zdsproj` file by right-clicking on the file and selecting **Copy** from the pop-up menu.
 3. Navigate to `<ZDS Install DIR>\<RZK Install Dir>\RZK\SamplePrograms\Core` and create a new folder named *MyProject* by right-clicking any empty space within the folder window and selecting **New** → **Folder** from the pop-up menu.
 4. Double-click the *MyProject* folder to enter the new folder that you created in the previous step.
 5. Right-click on any empty space in the folder window and select **Paste** from the pop-up menu. Optionally, right-click the `routeApp_xxx.zdsproj` file that you copied to the *MyProject* folder and select **Rename** from the pop-up menu. Enter a new name for the project; for example, `MyRZKApp.zdsproj`.
 6. Launch ZDS II by navigating from the **Start** menu to **Programs** → **Zilog** → **ZDSII – eZ80Acclaim!_<Version>** → **ZDSII–eZ80Acclaim!_<Version>**.

7. In ZDSII, click **File** → **Open Project**, and navigate to the location of the project file shown in Step 6.
8. Remove the source files that appear in the *Workspace* window by right-clicking each file and selecting **Remove Selected File(s)** from the pop-up menu.
9. Create new source files that implement your application.
10. Build the project by executing the steps listed in the [Building and Running the Sample RZK Project](#) section on page 10. Be sure to substitute the appropriate path and application project name.

Related Documentation

By default, the RZK documentation directory is installed in the following path:

```
<ZDSII installed directory>\Program Files\Zilog\  
ZDSII_eZ80Acclaim!_A.B.C\ZTP\ZTPX.Y.Z_Lib\RZK\Docs
```

The `Docs` folder contains the following documents related to RZK. Each of these documents is also available free for download from the Zilog website.

- [Zilog Real-Time Kernel User Manual \(UM0075\)](#)
- [Zilog Real-Time Kernel Reference Manual \(RM0006\)](#)
- [Zilog Real-Time Kernel Product Brief \(PB0155\)](#)
- [Zilog File System Reference Manual \(RM0039\)](#)
- [Zilog File System User Manual \(UM0179\)](#)
- [Zilog File System Quick Start Guide \(QS0050\)](#)
- RZK – ZDSII Release Notes

The following documents apply to all eZ80Acclaim! devices, and are available free for download from the Zilog website.

- [eZ80 CPU User Manual \(UM0077\)](#)
- [Zilog Developer Studio II – eZ80Acclaim! User Manual \(UM0144\)](#)
- [ZPAKII Debug Interface Tool Product User Guide \(PUG0015\)](#)
- [eZ80 C Compiler User Manual \(UM0055\)](#)
- [eZ80Acclaim! External Flash Loader Product User Guide \(PUG0016\)](#)

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