



# **Windows CE 6.0**

**For**

# **BCT RE1**

**User Guide**

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## Introduction

The content of this document provides all the necessary information required to get started with application development under Windows CE 6.0 for the RE1 platform. It covers:

- An overview of the Windows CE 6.0 Boot Process
- Peripheral support included in Windows CE 6.0
- How to install the tools necessary to develop applications that run under Windows CE 6.0
- How to start developing applications
- How to use the Hardware API functions supported under RE1

## Windows CE 6.0 initialisation and booting overview

The RE1 boot process begins with the execution of a Windows CE boot loader. The boot loader which is configurable using the RE1 USB device port in conjunction with accompanying desktop configuration utility performs the following initialisation steps:

- Setup initial processor registers
- Test for configuration mode or normal Windows CE boot
- Setup LCD display and show a custom splash screen
- Locate a Windows CE 6.0 image
- Boot Windows CE 6.0 Image

The boot loader can be used for updating Windows CE images, Splash screens and even the boot loader itself. The boot loader is also used to enable or disable peripherals, and configure the required LCD panel connected to a BCT RE1. The RISC engine supports booting from either onboard NOR flash or over Ethernet using Windows KITL. Again the boot source is selectable using the boot loader configuration utility. For full details on configuring the boot loader over USB using the desktop configuration utility please see the document, "RE1 Single Board Computer User Guide".

Windows CE 6.0 follows the standard boot process except drivers are configured to dynamically load dependent on their configuration in the boot loader. If the Windows CE image supports the hive based registry, the registry is restored from SD Card media during boot. This allows the OS to persist registry settings through a cold boot.

## Windows CE 6.0 Peripheral Support

The optional generic Windows CE 6.0 image included with an RE1 features support for the following on-board peripherals.

### USB Host

The BCT RE1 features support for an OHCI compatible USB host. Operating system support for HID, and Mass storage devices is included in the image.

### USB Device

In Windows CE the USB device port is implemented as a Microsoft ActiveSync device. Using ActiveSync 4.5 or greater, it is possible to debug and deploy applications using Visual Studio, as well as view the internal RISC engine files system in an explorer style interface.

### GPIO, IRDA, and I2S

The Windows CE GPIO driver supports up to a maximum of 12 separate pins, all configurable as either inputs or outputs. Two GPIO pins are mutually exclusive with the IRDA port, and three pins are mutually exclusive with the I2S peripheral. The pins available to the GPIO driver are dynamically configured based on if the IRDA driver and I2S driver are enabled. By default the IRDA and I2S peripherals are disabled in the boot loader so all 12 GPIO pins are available

The IRDA driver is configured to use COM6 when enabled and can be accessed in the same way as a serial port. Testing for COM6 being present in the system is a method of a custom application testing if the IRDA port is enabled.

At time of writing, there is no I2S support implemented in the Windows CE image. Contact Blue Chip Technology sales for details.

### Real Time Clock

The BCT RE1 includes a battery backed real time clock. This allows the system time to be remembered through a cold boot. Calls to either SetSystemTime() or SetLocalTime() automatically cause the new time to be saving into the battery backed clock.

### Serial Ports

Two RS232 ports and one RS422 / 485 port are exposed as standard COM ports in Windows CE. Please see the following table for details of how each physical port is mapped in Windows CE.

Header	Signal Type	Control Lines	Windows CE COM port
P11 RS422 / 485	RS422 / 485	No	COM1
P11 RS232	RS232	No	COM2 (When not in kernel debugging mode )
P10	RS232	Yes	COM3

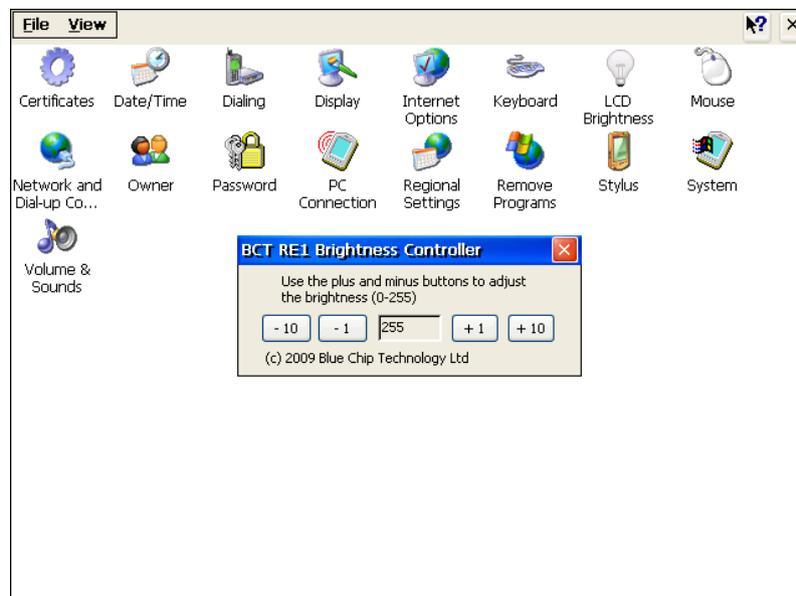
## Introduction

COM2 has a dual purpose in Windows CE. It can be configured as either a Windows CE standard COM port available to applications or as a kernel debug port useful during OS low level development. When configured for kernel debug, COM2 is unavailable for application development and is configured for 115200 baud, 8 data bits, 1 stop bit, and no parity. Please see, "RE1 Single Board Computer User Guide" for details on configuring this port using the configuration utility.

From Windows CE 6.0 BSP 1.02, the transmit line of the RS422/485 interface is software controllable to be enabled or disabled by using the DTR control line. When DTR is enabled the TX line is enabled. When DTR is disabled the TX line is disabled.

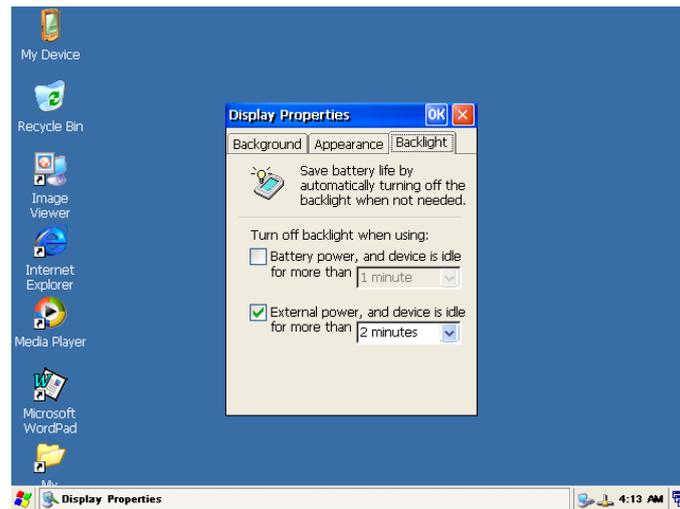
### Backlight control

A sample brightness control application is included in the Windows CE image to allow the brightness to be easily changed using the control panel in Windows Explorer. The sample application is included as source with the Windows CE SDK to demonstrate how to change the brightness using a custom application. To try the sample LCD Brightness application, navigate to the control panel and double click on 'LCD Brightness'.



The backlight is also configurable in the "Display Properties" dialogue to allow the screen to be automatically dimmed after a set amount of time. This feature is useful for power saving when the device is not in use. Only the external power idle mode is implemented. In the below screen shot the device is configured to automatically dim the backlight after 2 minutes of inactivity.

## Introduction



### SD Card

RE1 includes a Micro SD card interface which conforms to specification version 1.1 and supports cards up to 4GB in size. **Note: SDHC cards are not supported at this time.**

Windows CE optionally includes hive registry support on the SD Card which allows registry settings to be persisted through a cold boot. If an SD card is used to hold the hive registry, the SD card becomes non-removable and must be inserted from system start-up.

### Other Peripherals

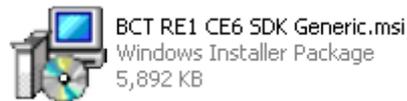
The Windows CE 6.0 has support for, 10/100 Ethernet, stylus touch screen, and AC97 Audio, all of which are implemented as standard OS components.

Watchdog and I2C support is also provided in the form of API's.

## Development tool installation

Application development targeting Windows CE 6 for RE1 requires Microsoft Visual Studio 2005 SP1, Microsoft Active sync 4.5 or greater, and the RE1 software development kit. **The version of Visual Studio 2005 chosen must support smart device development.** Ensure that Visual studio is fully installed along with active sync before following the steps below to install the BCT RE1 SDK.

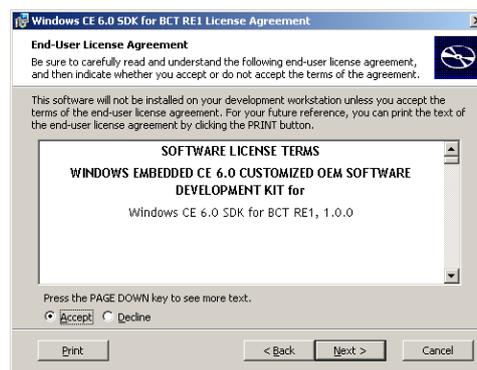
1. Launch the RE1 SDK installer file from the support CD



2. Click next

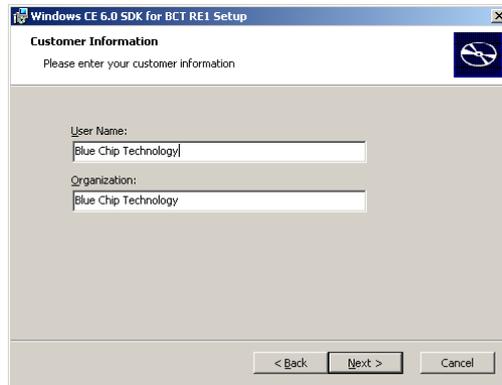


3. Accept the licence agreement and click next

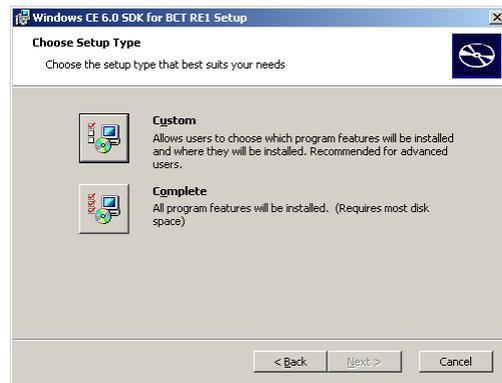


# Installation

4. Enter user and company name information and click next



5. Choose complete installation

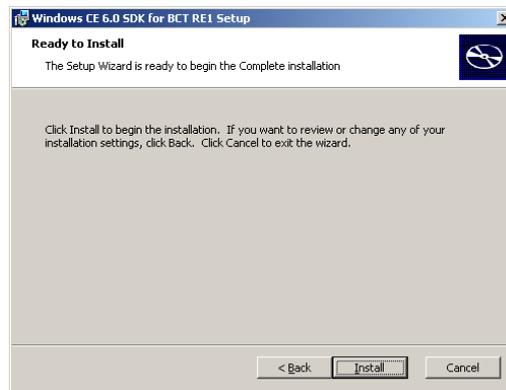


6. Click next

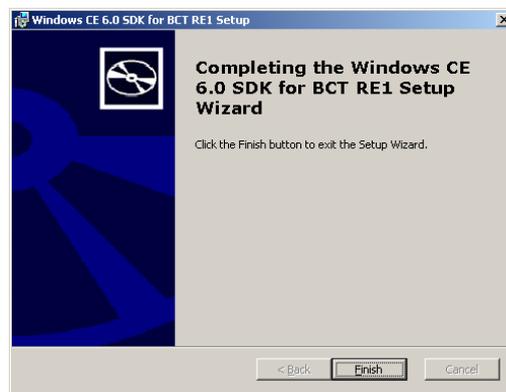


## Installation

### 7. Click install



### 8. After the installation completes click the "Finish" button



### 9. The installation of the BCT RE1 SDK is now complete.

By default the RE1 SDK installs to location: C:\Program Files\Windows CE Tools\wce600\BCTRE1CE6SDKGeneric. In this location the following folders will be copied.

Folder	Description
Include	This folder holds all the header files required to build an application for the RE1 platform
Lib	This folder holds all the library files required to build an application for the RE1 platform
Sample_applications	This folder holds some sample applications that can be used as references while creating applications for RE1. The examples demonstrate how to interface to the RE1 hardware libraries.

## Sample Applications

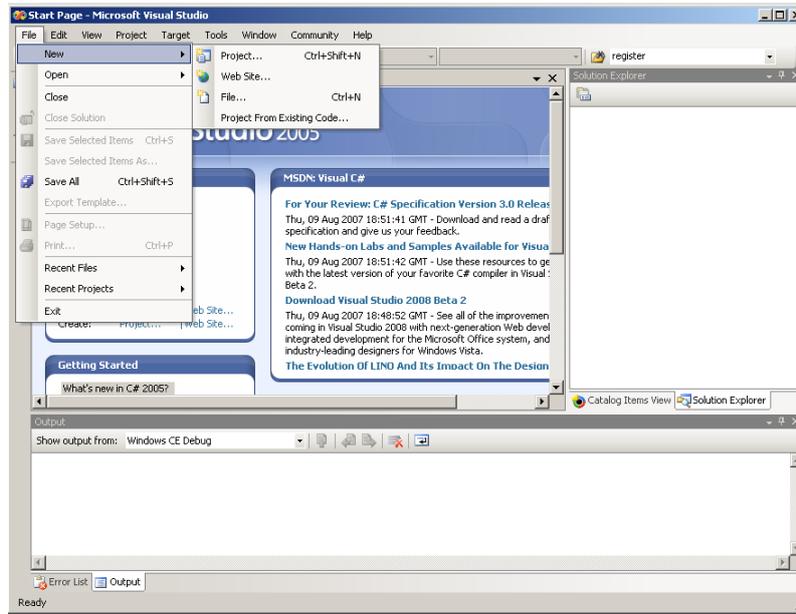
The Windows CE 6.0 SDK for RE1 includes four sample applications that demonstrate the use of RE1 specific API's. The sample applications are detailed below.

<b>Application</b>	<b>Description</b>
BrightnessController	This sample can be used for evaluating the brightness control capability of the RE1 platform. A binary of this sample is included in the Windows CE 6 image and can be accessed from the control panel.
GPIOSample	This sample can be used for evaluating the general purpose input/outputs of the RE1 platform. This application makes use of the GPIOAPI.dll API library.
WatchdogSample	This sample demonstrates how to operate the RE1 watchdog using the watchdog API.
ResetSystemSample	This sample demonstrates how to reset an RE1 system using system events.

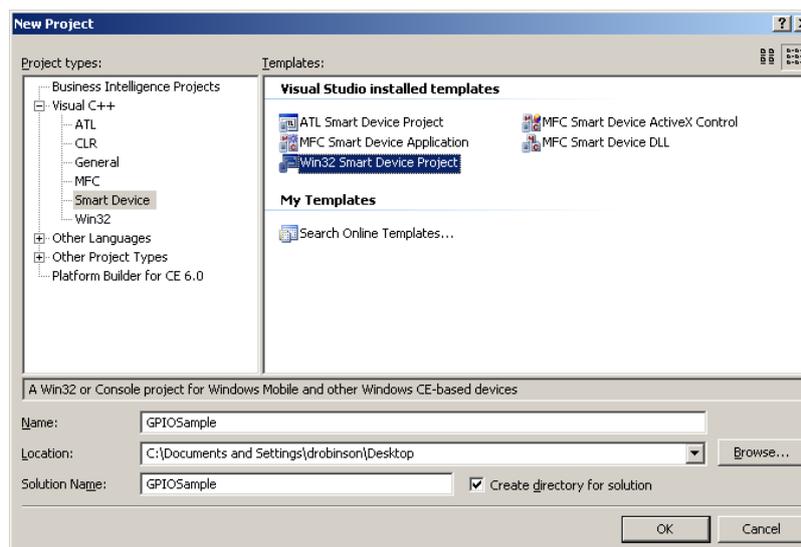
## Software development

This section describes how to create an RE1 Windows CE 6.0 application using the SDK and deploy the application to the RE1 device using Microsoft ActiveSync over USB. The sample application created will demonstrate how to use the RE1 GPIOapi to manipulate the GPIO bits.

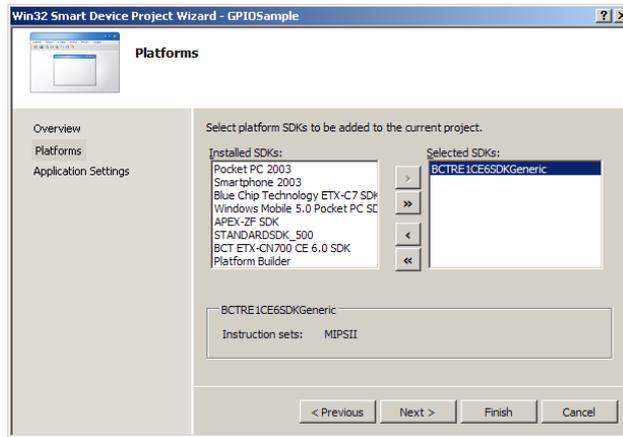
1. Open Visual Studio 2005. Click on File ->New ->Project to begin a new project.



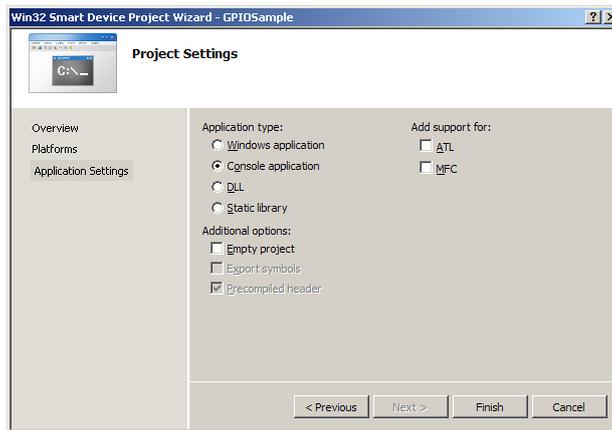
2. Under the “Visual C++” language click “smart device”. Select “Win32 Smart Device Project” and give the project the name “GPIOsample”. Click OK



3. The smart device project wizard should now start. Click next to begin. The RE1 SDK installed in the previous section should now be populated in the “Installed SDKs” list. Arrange the list boxes so that “BCTRE1CE6SDKGeneric” is the only SDK in the “Selected SDK’s” list. Click Next.



4. Select console application from the “Application type” selection box and click finish.



## 5. Modify the GPIOsample.cpp file to include the following code:

```

#include "stdafx.h"
#include <windows.h>
#include <commctrl.h>

#include <gpio.h>

int _tmain(int argc, TCHAR *argv[], TCHAR *envp[])
{
    DWORD dwReturnCode;
    DWORD dwOption = 0;
    DWORD dwValue;
    DWORD dwBitMap;
    WORD wValue;
    BOOL iValue;

    printf("BCT REL GPIO sample application V1.00\n");

    while(1)
    {
        fflush(stdin);
        printf("\n\t1) Read PORT\n");
        printf("\t2) Write a WORD to PORT\n");
        printf("\t3) Set Pin directions\n");
        printf("\t4) Get bit\n");
        printf("\t5) Set bit\n");
        printf("\t6) Exit\n");
        printf("\t\tPlease enter an Option(1-6)");
        scanf_s("%d", &dwOption);
        fflush(stdin);
        if(dwOption == 1)
        {
            printf("\n\nReading Port....\n\t");

            dwReturnCode = BCTReadGPIOPort(&wValue);
            if(dwReturnCode != GPIO_OK)
            {
                printf("Failed to read byte with error code: %d\n",
dwReturnCode);
            }
            else
            {
                printf("Read value %.4x\n", wValue);
            }
            printf("\n");
        }
        else if(dwOption == 2)
        {
            printf("\n\nPlease enter the byte to write (HEX): ");
            scanf_s("%x", &dwValue);
            printf("\n\nWriting Port: %.4x\n\t", (WORD) dwValue);
            dwReturnCode = BCTWriteGPIOPort((WORD) dwValue);
            if(dwReturnCode != GPIO_OK)
            {
                printf("Failed to write byte with error code: %d\n",
dwReturnCode);
            }
            else
            {
                printf("Byte written\n");
            }
            printf("\n");
        }
        else if(dwOption == 3)
        {
            printf("\n\nPlease enter a bitmap for pin Directions (HEX): ");
            scanf_s("%x", &dwBitMap);
            printf("\n\nWriting Port directions: %.2x\n\t", (WORD) dwBitMap);
            dwReturnCode = BCTSetGPIOPinDirection((WORD) dwBitMap);
            if(dwReturnCode != GPIO_OK)
            {
                printf("Failed to set pin directions with error code: %d\n",
dwReturnCode);
            }
        }
    }
}

```

## Software Development

```
        else
        {
            printf("Bit directions written\n");
        }
        printf("\n");
    }
    else if(dwOption == 4)
    {
        printf("\n\nPlease enter which bit value to read (0-11): ");
        scanf_s("%d", &dwBitMap);
        printf("\n\nReading bit: %d\n\t", (BYTE)dwBitMap);
        dwReturnCode = BCTGetGPIOBit((BYTE) dwBitMap, &iValue);
        if(dwReturnCode != GPIO_OK)
        {
            printf("Failed to read bit with error code: %d\n",
dwReturnCode);
        }
        else
        {
            printf("Read bit value: %d\n", iValue);
        }
        printf("\n");
    }
    else if(dwOption == 5)
    {
        printf("\n\nPlease enter which bit value to write (0-11): ");
        scanf_s("%d", &dwBitMap);
        printf("\n\nPlease enter 1 to set or 0 to clear: ");
        scanf_s("%d", &dwValue);

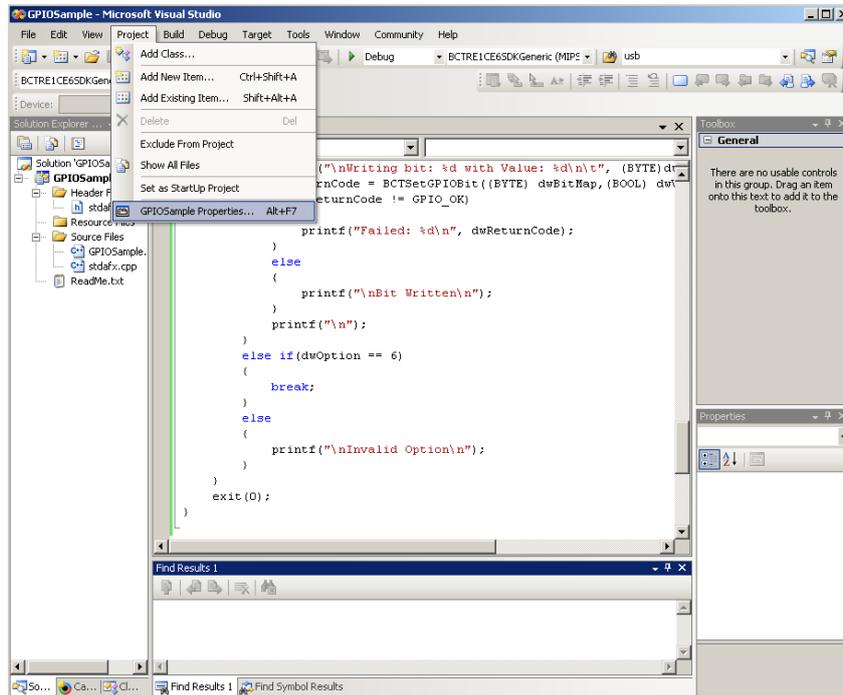
        if(dwValue > 1)
        {
            dwValue = 1;
        }
        if(dwValue < 0)
        {
            dwValue = 0;
        }

        printf("\n\nWriting bit: %d with Value: %d\n\t", (BYTE)dwBitMap, (BOOL)
dwValue);

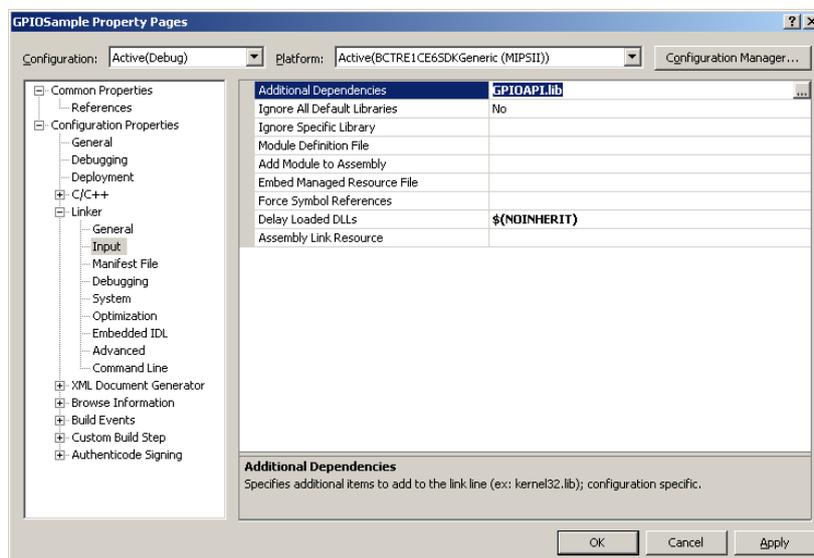
        dwReturnCode = BCTSetGPIOBit((BYTE) dwBitMap, (BOOL) dwValue);
        if(dwReturnCode != GPIO_OK)
        {
            printf("Failed: %d\n", dwReturnCode);
        }
        else
        {
            printf("\n\nBit Written\n");
        }
        printf("\n");
    }
    else if(dwOption == 6)
    {
        break;
    }
    else
    {
        printf("\n\nInvalid Option\n");
    }
}
exit(0);
}
```

## Software Development

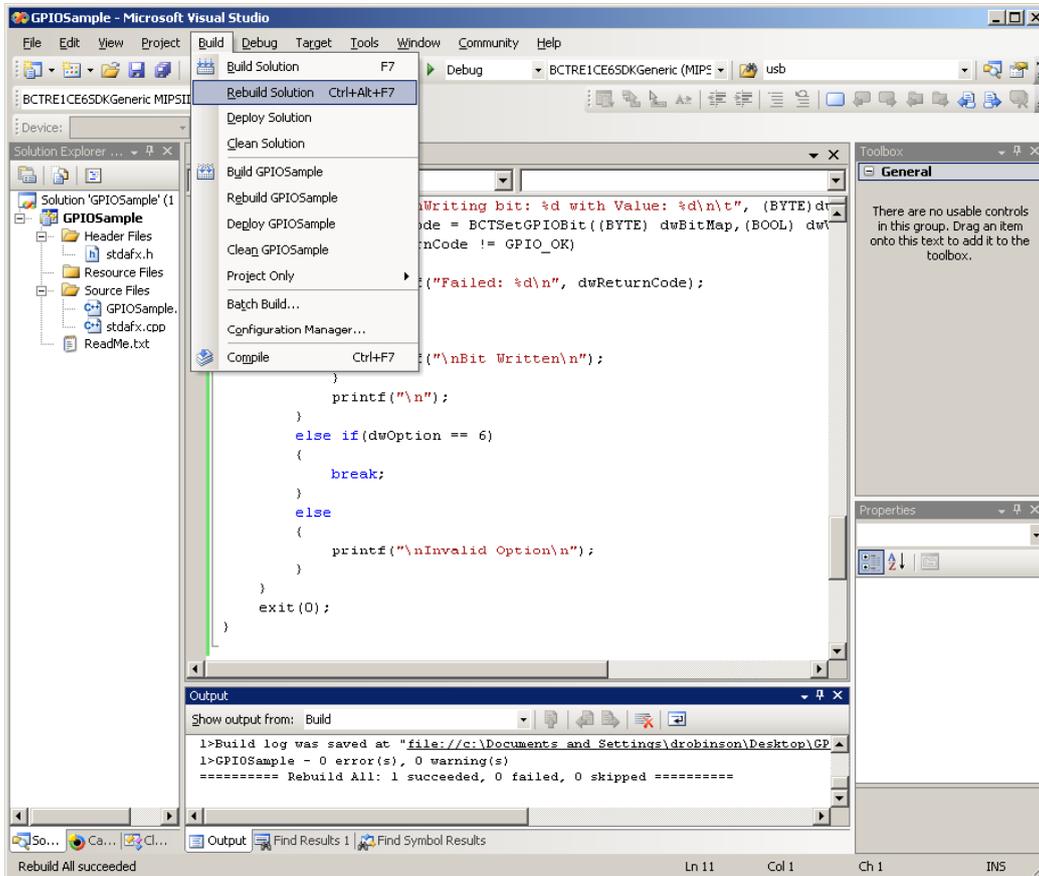
- As this application is using functions exported by the GPIOAPI library we need to link this project to the file "GPIOAPI.lib". From the "Project" menu click properties.



- Under "Configuration Properties -> Linker -> Input", add "GPIOAPI.lib" to the "Additional dependencies", and click OK.



- We are now ready to compile and build the sample application. From the “Build” menu click on “Rebuild Solution”. If the compile and build was successful the output window should state “1 succeeded, 0 failed”.



## Software Development

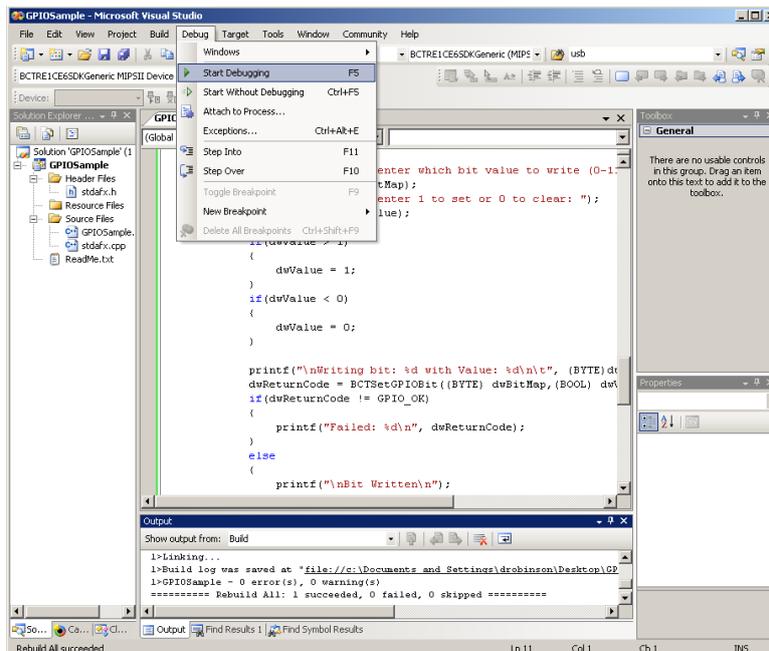
- Visual Studio 2005 SP1 supports deploying applications automatically to the target device and debugging applications remotely. This requires an ActiveSync connection. Using a USB A/B cable, attach the development machine to the RE1 device port and ensure that the RE1 is turned on.



- Ensure Microsoft ActiveSync is connected.



- We can now deploy our application remotely from Visual Studio. From the “Debug” menu click on “Start Debugging”. Visual studio should now download the application to the target and run it.

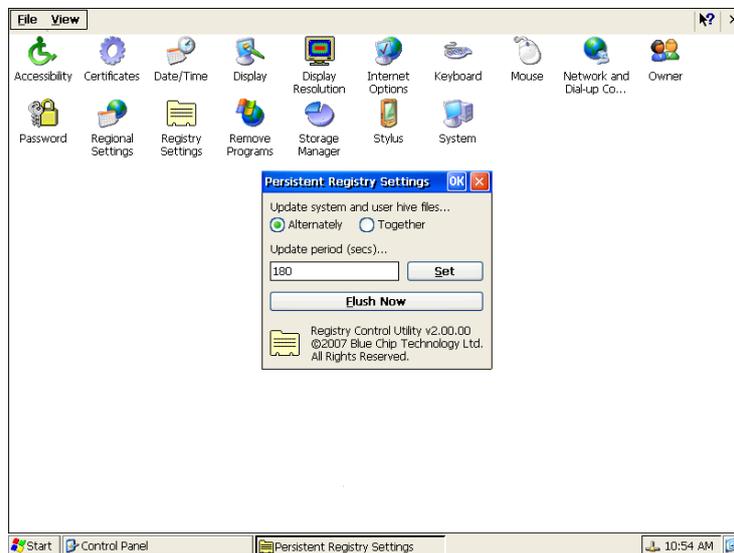


If deployment fails ensure that the USB A/B cable is attached and ActiveSync is connected.

## System and Development tools

### Registry Settings

Windows CE 6.0 for RE1 optionally comes with hive based registry support. This allows registry settings to be persisted through a cold boot. The Registry Settings utility, accessible from the system control panel can be used to set how often the volatile registry is backed up to solid state media, and also perform manual commits. It is possible for a custom application to manage the persisting the hive registry using the Windows API function “RegFlushKey()”. **In the event that a registry change makes the system unusable, a factory reset will force the registry to be restored to its default state on next boot.** Refer to the RE1 user manual for details on how to achieve this.

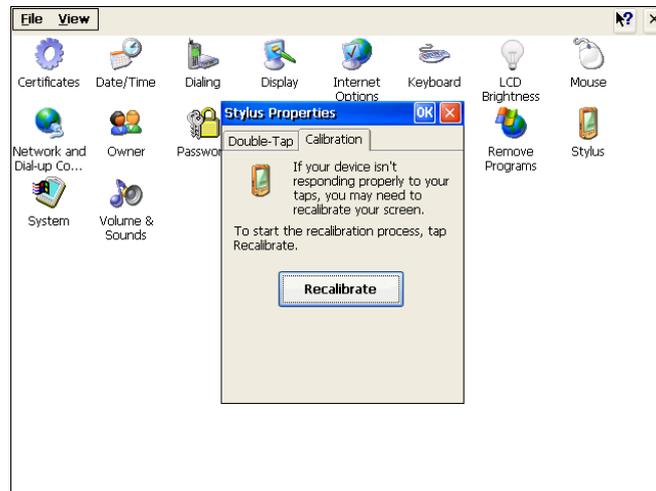


### Regedit

Windows CE 6.0 for RE1 comes with a built in registry editor in the style of the standard Windows registry editor. To access it load “regedit” from either the command prompt or Run menu.

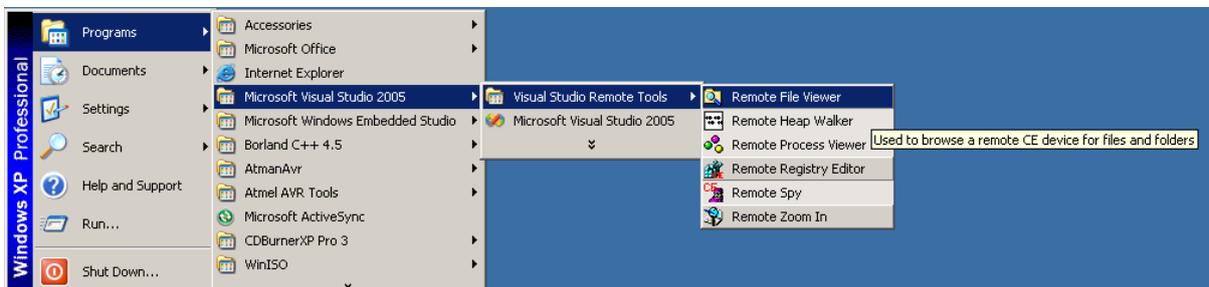
## Touch Screen Calibration

The touch screen can be calibrated using the built in calibration utility. To access it open the “Stylus Properties” window from the system control panel.



## Visual Studio 2005 Remote Tools

Visual 2005 includes remote tools that can be used for managing Windows CE images and debugging Windows CE applications. All the remote tools require an ActiveSync connection. The remote tools must be run from the start menu rather than within Visual Studio at location: Start->Programs->Microsoft Visual Studio 2005->Visual Studio Remote Tools.



The table below details the remote tools available and their purpose:

Remote Tool	Purpose
Remote File Viewer	Used to browse a remote CE device for files and folders. The same can be achieved using the Explore option in ActiveSync.
Remote Registry Editor	Used to remotely view and edit a Windows CE registry
Remote Heap Walker	Used to remotely view the memory allocation (heap) on a CE device
Remote Spy	Used to remotely view Windows/Messages on a CE device
Remote Process Viewer	Used to remotely view processes running on a Windows CE device
Remote Zoom In	Used to retrieve a current snap shot of a CE device desktop

## RE1 Hardware API Libraries

### SMBUS API

The SMBUSAPI is provided to give developers a simple mechanism for accessing devices attached the RE1 SMBUS compatible bus. The four SMBUSAPI functions provided are detailed over the next pages.

#### BCTSmbusWriteByte

Sends a command, and writes a byte of data to a device on the SMBUS.

```
DWORD WINAPI BCTSmbusWriteByte (BYTE bDeviceAddress, BYTE bCommand, BYTE bData);
```

#### Parameters

##### *bDeviceAddress*

[in] The slave address on the SMBUS to send the command to

##### *bCommand*

[in] The SMBUS command identifier

##### *bData*

[in] A byte of data to pass in with the command. For commands that do not require any data be passed in, set this value to 0x00

#### Return Value

If the function succeeds, the return value is `SMBUS_OK`.

If the function fails, the return value is a nonzero error code defined in `SMBUS.h`.

#### Remarks

As the SMBUS architecture is a two wire interface it operates on a "first come first served" bases. For this reason the driver also operates in the same way and limits access to its functions to one process at a time. If the SMBUS is accessed while already in use the error code `SMBUS_DRIVER_LOCKED_BY_OTHER_PROCESS` will be returned and is normal. The application should wait for an undefined period before retrying.

#### Requirements

Header	Declared in <code>SMBUS.h</code>
Library	Use <code>SMBUSAPI.lib</code> .
DLL	Requires <code>SMBUSAPI.dll</code> .

**BCTSmbusReadByte**

Sends a command, and reads a byte of data from a device on the SMBUS.

```
DWORD WINAPI BCTSmbusReadByte (BYTE bDeviceAddress, BYTE bCommand, PBYTE pbData);
```

**Parameters**

*bDeviceAddress*

[in] The slave address on the SMBUS to send the command to

*bCommand*

[in] The SMBUS command identifier

*pbData*

[out] A pointer to an 8 bit value to hold the data returned

**Return Value**

If the function succeeds, the return value is `SMBUS_OK`.

If the function fails, the return value is a nonzero error code defined in `SMBUS.h`.

**Remarks**

As the SMBUS architecture is a two wire interface it operates on a "first come first served" bases. For this reason the driver also operates in the same way and limits access to its functions to one process at a time. If the SMBUS is accessed while already in use the error code `SMBUS_DRIVER_LOCKED_BY_OTHER_PROCESS` will be returned and is normal. The application should wait for an undefined period before retrying.

**Requirements**

Header	Declared in <code>SMBUS.h</code>
Library	Use <code>SMBUSAPI.lib</code> .
DLL	Requires <code>SMBUSAPI.dll</code> .

**BCTSmbusBufferedWrite**

Sends a command, and writes up to 16 bytes of data.

```
DWORD WINAPI BCTSmbusBufferedWrite(BYTE bDeviceAddress, BYTE bCommand, BYTE
bdata[], BYTE bBytesToWrite);
```

**Parameters***bDeviceAddress*

[in] The slave address on the SMBUS to send the command to

*bCommand*

[in] The SMBUS command identifier

*bdata*

[in] An pointer to an array of bytes to write

bBytesToWrite [in] The number of bytes to write

**Return Value**

If the function succeeds, the return value is `SMBUS_OK`.

If the function fails, the return value is a nonzero error code defined in `SMBUS.h`.

**Remarks**

As the SMBUS architecture is a two wire interface it operates on a "first come first served" bases. For this reason the driver also operates in the same way and limits access to its functions to one process at a time. If the SMBUS is accessed while already in use the error code `SMBUS_DRIVER_LOCKED_BY_OTHER_PROCESS` will be returned and is normal. The application should wait for an undefined period before retrying. This function supports sending a maximum of 16 bytes at a time. This function can also be used for SMBUS quick writes, by setting the `bBytesToWrite` to 0. This will cause the function to send the command without a data phase.

**Requirements**

Header	Declared in <code>SMBUS.h</code>
Library	Use <code>SMBUSAPI.lib</code> .
DLL	Requires <code>SMBUSAPI.dll</code> .

**BCTSmbusBufferedRead**

Sends a command, and reads up to 16 bytes of data.

```
DWORD WINAPI BCTSmbusBufferedRead(BYTE bDeviceAddress, BYTE bCommand, BYTE bdata[],
BYTE bBytesToRead);
```

**Parameters***bDeviceAddress*

[in] The slave address on the SMBUS to send the command to

*bCommand*

[in] The SMBUS command identifier

*bData*

[out] A pointer to an array of bytes to read into

*bBytesToRead*

[in] The number of bytes to read.

**Return Value**

If the function succeeds, the return value is `SMBUS_OK`.

If the function fails, the return value is a nonzero error code defined in `SMBUS.h`.

**Remarks**

As the SMBUS architecture is a two wire interface it operates on a "first come first served" bases. For this reason the driver also operates in the same way and limits access to its functions to one process at a time. If the SMBUS is accessed while already in use the error code `SMBUS_DRIVER_LOCKED_BY_OTHER_PROCESS` will be returned and is normal. The application should wait for an undefined period before retrying. This function supports reading a maximum of 16 bytes at a time.

**Requirements**

Header	Declared in <code>SMBUS.h</code>
Library	Use <code>SMBUSAPI.lib</code> .
DLL	Requires <code>SMBUSAPI.dll</code> .

## LCD Brightness API

The LCD brightness API library allows the brightness of compatible LCD's to be changed. The library exports two functions which are detailed below.

### **BCTSetLCDBrightness**

Sets the LCD brightness to the value specified

```
DWORD WINAPI BCTSetLCDBrightness(BYTE bBrightness);
```

#### **Parameters**

*bBrightness*  
[in] The brightness value to write

#### **Return Value**

If the function succeeds, the return value is RE1\_LCD\_OK.

If the function fails, the return value is a nonzero error code defined in BCTLCDBrightnessAPI.h.

#### **Remarks**

When bBrightness is set to 0 the LCD will be at its dimmest.

#### **Requirements**

Header	Declared in BCTLCDBrightnessAPI.h
Library	BCTLCDBrightnessAPI.lib
DLL	BCTLCDBrightnessAPI.dll

**BCTGetLCDBrightness**

Retrieves the current LCD brightness.

```
DWORD WINAPI BCTGetLCDBrightness(PBYTE bBrightness);
```

**Parameters**

*bBrightness*

[out] A pointer to a byte that will hold the current LCD brightness

**Return Value**

If the function succeeds, the return value is `RE1_LCD_OK`.

If the function fails, the return value is a nonzero error code defined in `BCTLCDBrightnessAPI.h`.

**Remarks**

When `bBrightness` is set to 0 the LCD will be at its dimmest.

**Requirements**

Header	Declared in <code>BCTLCDBrightnessAPI.h</code>
Library	<code>BCTLCDBrightnessAPI.lib</code>
DLL	<code>BCTLCDBrightnessAPI.dll</code>

## GPIO API

The GPIO API library provides access to the 12 available GPIO pins on the RE1 platform. The library exports five functions which are detailed below.

### BCTSetGPIOPinDirection

Sets the directions of GPIO bits to either input or output.

```
DWORD WINAPI BCTSetGPIOPinDirection(WORD wVal);
```

#### Parameters

*wVal*

[in] A bitmap of the required pin directions. Bit set = input. Bit cleared = output.

E.g. Passing a value of 0x05 into the function would set bits 0 and 2 to inputs and other bits to outputs

#### Return Value

If the function succeeds, the return value is `GPIO_OK` or `GPIO_OK_SOME_BITS_BELONG_TO_PERIPHERAL`.

If the function fails, the return value is a nonzero error code defined in `gpio.h`.

#### Remarks

Bits 12 – 15 of *wVal* are ignored.

If some GPIO bits are shared with either the IRDA or I2S peripherals `GPIO_OK_SOME_BITS_BELONG_TO_PERIPHERAL` is returned. This should be considered a warning and not an error. If the GPIO pins are sharing with either the IRDA or I2S peripherals the bits relating to the peripheral(s) will be ignored.

#### Requirements

Header	Declared in <code>GPIO.h</code>
Library	Use <code>GPIOapi.lib</code>
DLL	Requires <code>GPIOapi.dll</code>

**BCTReadGPIOPort**

Reads the current state of the GPIO port

```
DWORD WINAPI BCTReadGPIOPort (PWORD pwVal);
```

**Parameters**

*pwVal*

[out] A pointer to an 16 bit value that will hold the value of the GPIO port.

**Return Value**

If the function succeeds, the return value is `GPIO_OK` or `GPIO_OK_SOME_BITS_BELONG_TO_PERIPHERAL`.

If the function fails, the return value is a nonzero error code defined in `gpio.h`.

**Remarks**

Bits 12 – 15 of *pwVal* should be ignored.

If some GPIO bits are shared with either the IRDA or I2S peripherals `GPIO_OK_SOME_BITS_BELONG_TO_PERIPHERAL` is returned. This should be considered a warning and not an error. If the GPIO pins are sharing with either the IRDA or I2S peripherals the bits relating to the peripheral will be undefined.

**Requirements**

Header	Declared in GPIO.h
Library	Use GPIOapi.lib.
DLL	Requires GPIOapi.dll.

**BCTWriteGPIOPort**

Writes to the GPIO port

```
DWORD WINAPI BCTWriteGPIOPort (WORD wVal);
```

**Parameters**

*wVal*  
[in] The word that gets written to the GPIO port.

**Return Value**

If the function succeeds, the return value is `GPIO_OK`.

If the function fails, the return value is a nonzero error code defined in `gpio.h`.

**Remarks**

Bits 12 – 15 of *wVal* are ignored.

If some GPIO bits are shared with either the IRDA or I2S peripherals `GPIO_OK_SOME_BITS_BELONG_TO_PERIPHERAL` is returned. This should be considered a warning and not an error. If the GPIO pins are sharing with either the IRDA or I2S peripherals the bits relating to the peripheral will be ignored.

GPIO 11 belongs to a separate physical peripheral at the silicon level compared to the rest of the GPIO pins. This incurs a latency between bit 11 being set in relation to the rest of the port.

**Requirements**

Header	Declared in <code>GPIO.h</code>
Library	Use <code>GPIOapi.lib</code> .
DLL	Requires <code>GPIOapi.dll</code> .

**BCTSetGPIOBit**

Sets an individual bit to a value specified

```
DWORD WINAPI BCTSetGPIOBit (WORD wBitNumber, BOOL iVal);
```

**Parameters**

*wBitNumber*

[in] The bit that should be written. Acceptable values 0-11

*iVal*

[in] The value to be written to the bit. TRUE = Set, FALSE = Clear

**Return Value**

If the function succeeds, the return value is `GPIO_OK`.

If the function fails, the return value is a nonzero error code defined in `gpio.h`.

**Remarks****Requirements**

Header	Declared in <code>GPIO.h</code>
Library	Use <code>GPIOapi.lib</code> .
DLL	Requires <code>GPIOapi.dll</code> .

**BCTGetGPIOBit**

Gets the value of an individual bit

```
DWORD WINAPI BCTGetGPIOBit (WORD wBitNumber, PBOOL piVal);
```

**Parameters**

*wBitNumber*

[in] The bit that should be read. Acceptable values 0-11

*iVal*

[in] A pointer to a BOOL that will hold the state of the pin. TRUE = Set, FALSE = Clear

**Return Value**

If the function succeeds, the return value is GPIO\_OK.

If the function fails, the return value is a nonzero error code defined in gpio.h.

**Remarks****Requirements**

Header	Declared in GPIO.h
Library	Use GPIOapi.lib.
DLL	Requires GPIOapi.dll.

## Watchdog API

The Watchdog API allows the system watchdog to be used to cause a system reset in the event of an unresponsive application. The library exports four functions which are detailed below.

### BCTEnableWatchdog

Enables the RE1 watchdog to timeout in the time specified

```
DWORD WINAPI BCTEnableWatchDog (BYTE bTimeout);
```

#### Parameters

*bTimeout*

[in] The duration in 10's of ms before a timeout is triggered. Must be greater than 0 and less than 128.

#### Return Value

If the function succeeds, the return value is WATCHDOG\_OK.

If the function fails, the return value is a nonzero error code defined in watchdog.h.

#### Remarks

#### Requirements

Header	Declared in Watchdog.h
Library	Use watchdog.lib
DLL	Requires watchdog.dll

**BCTDisableWatchdog**

Disables the RE1 watchdog.

```
DWORD WINAPI BCTDisableWatchDog (VOID);
```

**Parameters****Return Value**

If the function succeeds, the return value is WATCHDOG\_OK.

If the function fails, the return value is a nonzero error code defined in watchdog.h.

**Remarks****Requirements**

Header	Declared in Watchdog.h
Library	Use watchdog.lib.
DLL	Requires watchdog.dll.

**BCTRefreshWatchdog**

Resets the watchdog counter to the timeout value.

```
DWORD WINAPI BCTRefreshWatchDog (VOID);
```

**Parameters****Return Value**

If the function succeeds, the return value is WATCHDOG\_OK.

If the function fails, the return value is a nonzero error code defined in watchdog.h.

**Remarks****Requirements**

Header	Declared in Watchdog.h & azfavr.h
Library	Use watchdog.lib.
DLL	Requires watchdog.dll.

## System Reset

The RE1 Windows CE 6 platform allows the system to be reset using system events.

The two available system events are:

<b>Event Name</b>	<b>Event Description</b>
RE1_EVENT_COLD_BOOT_RESET	When set causes a system warm boot
RE1_EVENT_WARM_BOOT_RESET	When set causes a system cold boot

Please see the ResetSystemSample application included in the Windows CE 6.0 SDK for details on how to use these events.

## Appendix A – Windows CE components included in the generic Windows CE image for RE1

SYSGEN\_ACM\_MSFILTER, SYSGEN\_ASYNCMAC, SYSGEN\_AS\_BASE, SYSGEN\_ATL,  
 SYSGEN\_AUDIO, SYSGEN\_AUDIO\_ACM, SYSGEN\_AUDIO\_STDWAVEFILES, SYSGEN\_AUTH,  
 SYSGEN\_AUTH\_SCHANNEL, SYSGEN\_AUTORAS, SYSGEN\_AYGSHELL, SYSGEN\_CEDDK,  
 SYSGEN\_CEPLAYER, SYSGEN\_CERTS, SYSGEN\_CMD, SYSGEN\_COMMCTRL, SYSGEN\_COMMDLG,  
 SYSGEN\_CONNMC, SYSGEN\_CONSOLE, SYSGEN\_CORELOC, SYSGEN\_CORESTRA,  
 SYSGEN\_CPP\_EH\_AND\_RTTI, SYSGEN\_CREDMAN, SYSGEN\_CRYPT, SYSGEN\_CTLPNL,  
 SYSGEN\_CURSOR, SYSGEN\_DCOM, SYSGEN\_DEVICE, SYSGEN\_DEVLOAD, SYSGEN\_DHCPSRV,  
 SYSGEN\_DISPLAY, SYSGEN\_DOTNETV2, SYSGEN\_DOTNETV2\_SUPPORT, SYSGEN\_DSHOW,  
 SYSGEN\_DSHOW\_ACMWRAP, SYSGEN\_DSHOW\_DISPLAY, SYSGEN\_DSHOW\_DMO,  
 SYSGEN\_DSHOW\_IMAADPCM, SYSGEN\_DSHOW\_MP3, SYSGEN\_DSHOW\_MPEGA,  
 SYSGEN\_DSHOW\_MPEGSPLITTER, SYSGEN\_DSHOW\_MSADPCM, SYSGEN\_DSHOW\_MSG711,  
 SYSGEN\_DSHOW\_MSGSM610, SYSGEN\_DSHOW\_WAV, SYSGEN\_DSHOW\_WAVEOUT,  
 SYSGEN\_DSHOW\_WMA, SYSGEN\_DSHOW\_WMA\_VOICE, SYSGEN\_DSHOW\_WMP,  
 SYSGEN\_DSHOW\_WMT, SYSGEN\_DSHOW\_WMT\_ASXV1, SYSGEN\_DSHOW\_WMT\_ASXV2,  
 SYSGEN\_DSHOW\_WMT\_ASXV3, SYSGEN\_DSHOW\_WMT\_HTTP, SYSGEN\_DSHOW\_WMT\_LOCAL,  
 SYSGEN\_DSHOW\_WMT\_MMS, SYSGEN\_DSHOW\_WMT\_MULTI, SYSGEN\_DSHOW\_WMT\_NSC,  
 SYSGEN\_ETHERNET, SYSGEN\_EXFAT, SYSGEN\_FATFS, SYSGEN\_FIBER, SYSGEN\_FMTMSG,  
 SYSGEN\_FMTRES, SYSGEN\_FONTS\_ARIAL\_1\_30, SYSGEN\_FONTS\_COUR\_1\_30,  
 SYSGEN\_FONTS\_SYMBOL, SYSGEN\_FONTS\_TAHOMA\_1\_07, SYSGEN\_FONTS\_TIMES\_1\_30,  
 SYSGEN\_FONTS\_WEBDINGS, SYSGEN\_FONTS\_WINGDING, SYSGEN\_FSDBASE,  
 SYSGEN\_FSPASSWORD, SYSGEN\_FSRAMROM, SYSGEN\_FSREGHIVE, SYSGEN\_FSREPLBIT,  
 SYSGEN\_FULL\_CRT, SYSGEN\_GDI\_ALPHABLEND, SYSGEN\_GRADFILL, SYSGEN\_HTTPD,  
 SYSGEN\_IESAMPLE, SYSGEN\_IE\_JSCRIPT, SYSGEN\_IE\_VBSCRIPT, SYSGEN\_IMAGING,  
 SYSGEN\_IMAGING\_BMP\_DECODE, SYSGEN\_IMAGING\_BMP\_ENCODE,  
 SYSGEN\_IMAGING\_GIF\_DECODE, SYSGEN\_IMAGING\_GIF\_ENCODE,  
 SYSGEN\_IMAGING\_JPG\_DECODE, SYSGEN\_IMAGING\_JPG\_ENCODE,  
 SYSGEN\_IMAGING\_PNG\_DECODE, SYSGEN\_IMAGING\_PNG\_ENCODE, SYSGEN\_IMM,  
 SYSGEN\_INETCPL, SYSGEN\_IPHLPAPI, SYSGEN\_IRDA, SYSGEN\_JSCRIPT\_AUTHOR,  
 SYSGEN\_JSCRIPT\_ENCODE, SYSGEN\_LOCALAUDIO, SYSGEN\_MENU\_OVERLAP,  
 SYSGEN\_MINGDI, SYSGEN\_MINGWES, SYSGEN\_MININPUT, SYSGEN\_MINWMGR,  
 SYSGEN\_MLANG, SYSGEN\_MODEM, SYSGEN\_MSGQUEUE, SYSGEN\_MSHTML, SYSGEN\_MSMQ,  
 SYSGEN\_MSPART, SYSGEN\_MSXML\_DOM, SYSGEN\_MSXML\_XQL, SYSGEN\_NDIS,  
 SYSGEN\_NDISUIO, SYSGEN\_NETUTILS, SYSGEN\_NKCOMPR, SYSGEN\_NKMAPFILE,  
 SYSGEN\_NOTIFY, SYSGEN\_PM, SYSGEN\_PPP, SYSGEN\_PRINTING, SYSGEN\_PWORD,  
 SYSGEN\_QVGAP, SYSGEN\_REDIR, SYSGEN\_RELFS, SYSGEN\_SDBUS, SYSGEN\_SD\_MEMORY,  
 SYSGEN\_SERDEV, SYSGEN\_SERVICES, SYSGEN\_SHDOCVW, SYSGEN\_SHELL,  
 SYSGEN\_STANDARDSHHELL, SYSGEN\_STDIO, SYSGEN\_STDIOA, SYSGEN\_STOREMGR,  
 SYSGEN\_STREAMAUDIO, SYSGEN\_STRSAFE, SYSGEN\_TAPI, SYSGEN\_TCPIP,  
 SYSGEN\_TCPIP6, SYSGEN\_TIMESVC\_DST, SYSGEN\_TOOLHELP, SYSGEN\_TOUCH,  
 SYSGEN\_UIPROXY, SYSGEN\_UNIMODEM, SYSGEN\_URLMON, SYSGEN\_USB, SYSGEN\_USBFN,  
 SYSGEN\_USBFN\_SERIAL, SYSGEN\_USBFN\_STORAGE, SYSGEN\_USB\_HID,  
 SYSGEN\_USB\_HID\_CLIENTS, SYSGEN\_USB\_HID\_KEYBOARD, SYSGEN\_USB\_HID\_MOUSE,  
 SYSGEN\_USB\_PRINTER, SYSGEN\_USB\_STORAGE, SYSGEN\_VBSCRIPT\_AUTHOR,  
 SYSGEN\_VBSCRIPT\_ENCODE, SYSGEN\_VBSCRIPT\_MSGBOX, SYSGEN\_VEM, SYSGEN\_WCELOAD,  
 SYSGEN\_WININET, SYSGEN\_WINSOCK