

# Relio R9 ARM9 RISC Embedded Computer

## User Manual | Relio R91001



SEALEVEL®

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# ESD Warnings

## Electrostatic Discharges (ESD)

A sudden electrostatic discharge can destroy sensitive components. Proper packaging and earthing rules must therefore be observed. Always take the following precautions.

- Transport boards and cards in electrostatically secure containers or bags.
- Keep electrostatically sensitive components in their containers, until they arrive at an electrostatically protected workplace.
- Only touch electrostatically sensitive components when you are properly earthed.
- Store electrostatically sensitive components in protective packaging or on anti-static mats.

## Grounding Methods

The following measures help to avoid electrostatic damages to the device:

- Cover workstations with approved antistatic material. Always wear a wrist strap connected to workplace as well as properly grounded tools and equipment.
- Use antistatic mats, heel straps, or air ionizers for more protection.
- Always handle electrostatically sensitive components by their edge or by their casing.
- Avoid contact with pins, leads, or circuitry.
- Turn off power and input signals before inserting and removing connectors or connecting test equipment.
- Keep work area free of non-conductive materials such as ordinary plastic assembly aids and Styrofoam.
- Use field service tools such as cutters, screwdrivers, and vacuum cleaners which are conductive.
- Always place drives and boards PCB-assembly-side down on the foam.

# Introduction

The Relio R9 is an application-ready platform for your next product design. The system is based on the 200MHz Atmel AT91SAM9263 microcontroller boasting a 32-bit ARM® instruction set for maximum performance. With up to 256MB RAM and 256MB NAND Flash memory, the unmatched I/O features of the Relio R9 extend the possible uses beyond traditional ARM applications.

To provide the fastest time to market, the Windows CE 6.0 BSP binary and low-level drivers for system I/O are included. Additionally, the Relio R9 software package is equipped with the Sealevel Talos I/O Framework, which offers a high-level object-oriented .NET Compact Framework (CF) device interface. This interface provides an I/O point abstraction layer with built-in support for the specific needs of analog and digital I/O such as gain control and debouncing.

The Relio R9 is housed in a rugged, small enclosure suitable for mounting almost anywhere and is rated for a full -40° – +85°C operating temperature range. The Relio R9 is powered from your 7-30VDC source or select from a variety of Sealevel power supply options.

## Features

1. Atmel AT91SAM9263 ARM® Processor
2. Up to 256MB SDRAM and 256MB NAND Flash Memory
3. Dual SD/MMC Expansion Card Slots
4. LCD and Backlight Controller
5. Resistive Touchscreen Controller
6. 10/100 BaseT Ethernet
7. Two USB 2.0 Ports; USB Device Port
8. CAN Bus Interface
9. On-board Serial, Digital, and Analog I/O
10. Compatible with Windows Embedded CE 6.0 and Linux
11. Low Power Requirements
12. Power and Status LED Indicators



# Before You Get Started

## What's Included

The Relio R9 is shipped with the following items. If any of these items are missing or damaged, please contact Sealevel for replacement.

1. Relio R9 ARM9 Embedded RISC Single Board Computer
2. SD Card with CE runtime image, Talos .NET Framework, application samples, and documentation
3. Microsoft® Windows® CE 6.0 Core license

## Advisory Conventions



### Warning

The highest level of importance used to stress a condition where damage could result to the product, or the user could suffer serious injury.



### Important

The middle level of importance used to highlight information that might not seem obvious or a situation that could cause the product to fail.



### Note

The lowest level of importance used to provide background information, additional tips, or other non-critical facts that will not affect the use of the product.

## Quickstart Kit

The Relio R9-KT QuickStart kit is available, which includes the most common accessories. For applications with specialized hardware requirements, developers can use the Relio R9 as a platform for application development while Sealevel designs a customized target system specific to the user's application requirements.




The Relio R9-KT includes the following items:

- Relio R9 - ARM9 Embedded RISC Computer
- SD Card with CE runtime image, Talos .NET Framework, application samples, and documentation
- Microsoft Windows CE 6.0 Core License
- TR123 – 100-240VAC to 12VDC @ 2.5A, wall mount power supply
- CA356 - USB Type A to SeaLATCH USB Type B, Device Cable
- CA429 - R9 serial debug cable
- CA246 - CAT5 patch cable, 6' length


## Optional Items

Depending upon your application, you are likely to find one or more of the following items useful with the Relio R9. All items can be purchased from our website ([www.sealevel.com](http://www.sealevel.com)) by calling our sales team at (864) 843-4343.

## Cables

USB Type A to USB Type B, 72" in Length - Device Cable (Item# CA179)	
The CA179 is a 72" standard USB device cable that connects USB peripherals with a Type B connector to the Type A connector on a host computer. The CA179 is USB 2.0 compliant and is compatible with USB 1.1 and 1.0 devices.	
CAT5 Patch Cable, 7' in Length – Blue (Item# CA246)	
Standard 7' CAT5 UTP Patch Cable (RJ45).	
R9 Serial Debug Cable, 72" in Length (Item# CA429)	
The CA429 is a 72" serial debug cable with a 1x4 connector on one end and a standard DB9F connector on the other end. The DB9F connector is compatible with any standard RS-232 DB9M serial port.	

## Power Supply

100-240VAC to 12VDC @ 2.5A, Wall Mount Power Supply (Item# TR123)	
The TR123 is a wall mount (wall wart style) power supply rated for 100-240VAC input and 12VDC output at 2.5 amps. The 72" cable has tinned leads for use with products that have screw terminals for input power. The white line or printing on the insulation indicates positive polarity.	

# Product Overview

## Specifications

### PROCESSOR

Atmel (AT91SAM9263) – 200MIPS RISC Processor  
16KB Data Cache, 16KB Instruction Cache, Write Buffer  
Integrated Memory Management Unit (MMU)

### MEMORY

Up to 256MB SDRAM (64MB Standard)  
256MB NAND Flash  
Two SD Memory Card Sockets

### LCD CONTROLLER

Supports Passive or Active Displays  
16-bit Color in TFT/STN Modes  
Resolution Up to 2048 x 2048

### TOUCHSCREEN CONTROLLER

Supports 5-wire Resistive Touchscreens

### BUS INTERFACES

10/100 BaseT Ethernet  
USB Device Port  
Two USB 2.0 Ports  
CAN Bus  
Dedicated RS-485 Expansion

### INDUSTRIAL I/O

Four Software Configurable RS-232/422/485 Ports  
Eight Optically Isolated Inputs (5 – 24V)  
Eight Open-Collector Outputs (5 – 30V; 3 with PWM)  
Eight Analog Inputs (12-bit or 16-bit)  
Two 32-bit Quadrature Counters

### INDICATORS

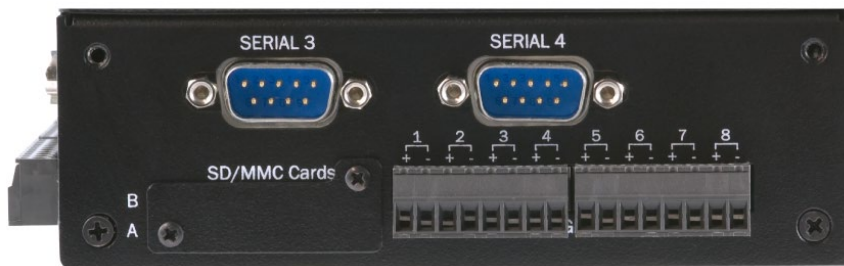
Dual LED Indicators for Power and Status

## Product Views

### RELIO R9 LEFT



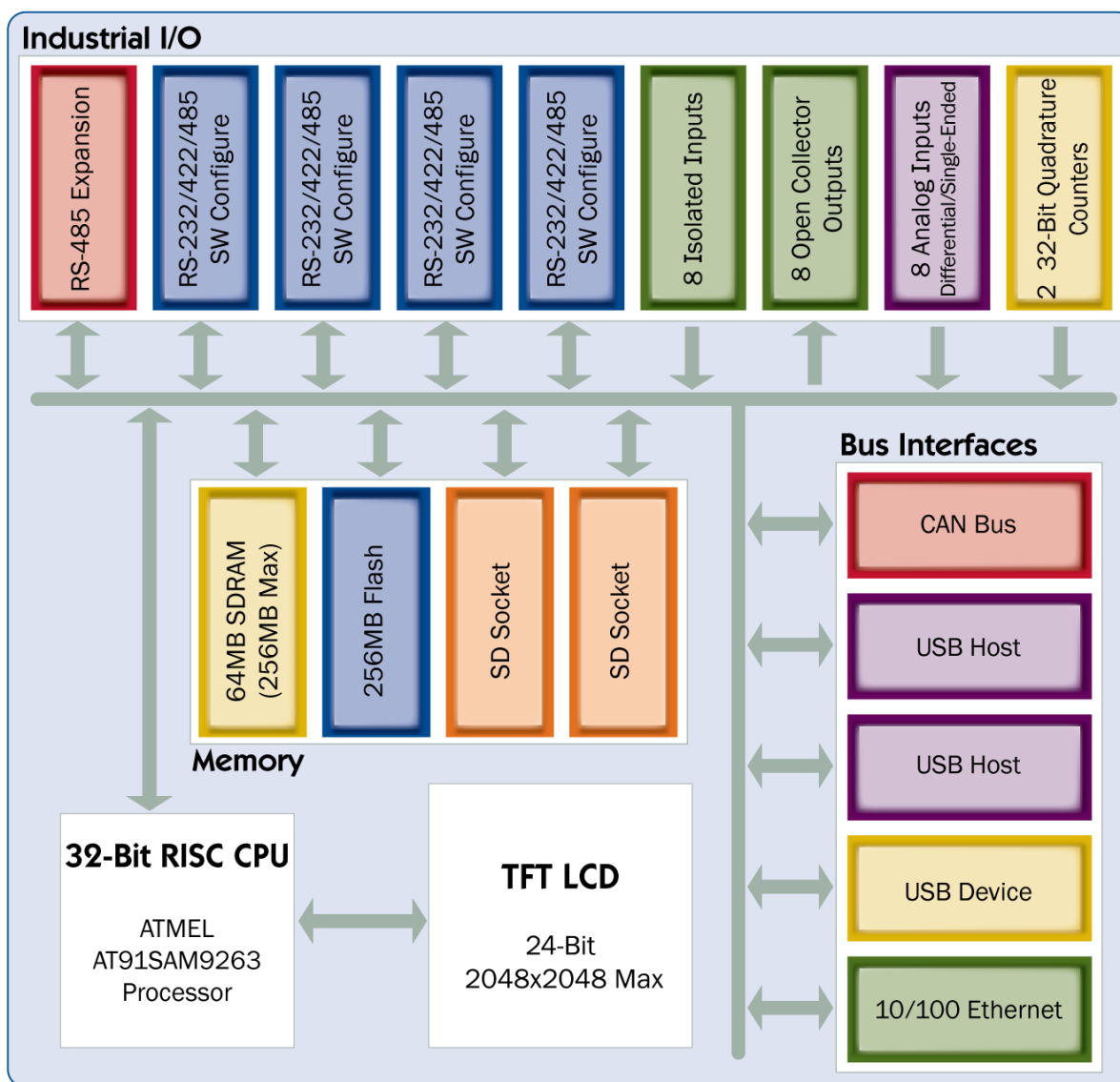
### RELIO R9 RIGHT



### RELIO R9 FRONT



## Block Diagram



See [Appendix B](#) for the Connector Reference Table, which details the connectors, jumpers, and test points located on the Relio R9.

# Technical Description

## Memory

The Relio R9 base configuration includes 64MB SDRAM and 256MB NAND Flash. For memory intensive applications, the board can be ordered preconfigured with up to 256MB SDRAM.

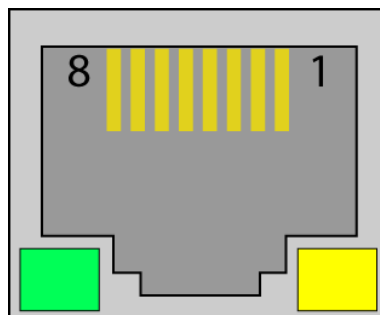
## Ethernet

The Relio R9 includes a 10/100 BaseT Ethernet interface accessed via the RJ45 connector located on the front of the enclosure.



The RJ45 port on the left side of the Relio R9 is a RS-485 Expansion Port (labeled “RS-485 OUT”) and is NOT an Ethernet port. Damage to Ethernet networking equipment can result if connected to the RS-485 RJ45 connector.

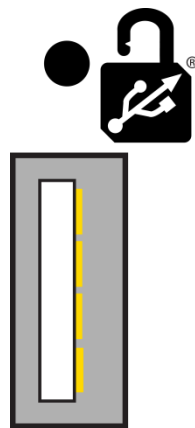
Pin	Signal
1	TX+
2	TX-
3	RX+
4	NC
5	NC
6	RX-
7	NC
8	NC



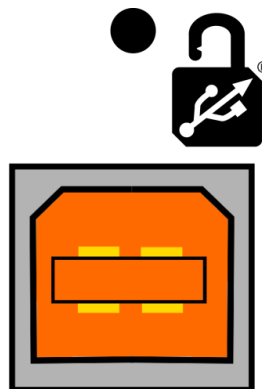
## USB

The Relio R9 provides two SeaLATCH USB 2.0 host ports, and one SeaLATCH USB device port. The USB host ports are located on the left side of the enclosure. The USB device port is located on the front of the enclosure.

<b>Connector:</b>	SeaLATCH USB 2.0 Host Port
<b>Manufacturer:</b>	Samtec
<b>Description:</b>	Standard USB Type A
<b>Mates with:</b>	SeaLATCH USB Type A, or Standard USB Type A



<b>Connector:</b>	SeaLATCH USB 2.0 Device Port
<b>Manufacturer:</b>	Samtec
<b>Description:</b>	Standard USB Type B
<b>Mates with:</b>	SeaLATCH USB Type B, or Standard USB Type B



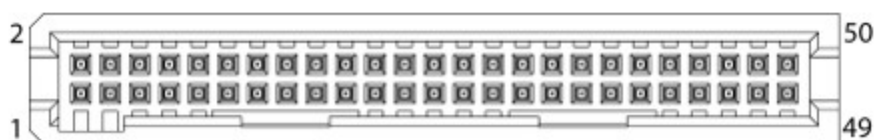
## LCD and Touchscreen Controllers

A variety of LCDs can be directly controlled by the Relio R9's on-board LCD controller. All LCD power and control signals are available on header connector P2. To access you will need to remove the cover of the Relio R9.

<b>Connector:</b>	P2
<b>Manufacturer:</b>	Samtec
<b>Part Number:</b>	TFML-125-02-S-D
<b>Description:</b>	Locking terminal strip, 50 pos, 0.050" pitch
<b>Mates with:</b>	Samtec SFML-125-T2-S-D or Samtec TFMDL-25-T-03.00

Position	Signal
1	GND
2	DCLK
3	HSYNC
4	VSYNC
5	GND
6	R0
7	R1
8	R2
9	R3
10	R4
11	R5
12	GND
13	G0
14	G1
15	G2
16	G3
17	G4
18	G5
19	GND
20	B0
21	B1
22	B2
23	B3
24	B4
25	B5

Position	Signal
26	GND
27	LCDEN
28	3.3V
29	3.3V
30	HDMODE
31	VDMODE
32	NC
33	NC
34	NC
35	NC
36	Touch UL
37	Touch LL
38	Touch UR
39	Touch LR
40	Touch Wiper
41	NC
42	NC
43	NC
44	NC
45	LCDLED3
46	GND
47	LCDLED2
48	GND
49	LCDLED1
50	GND

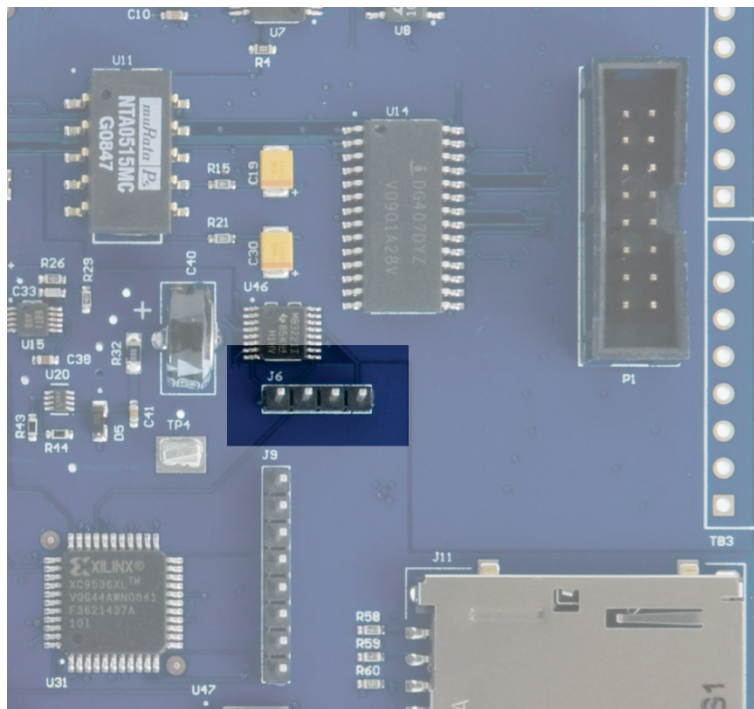


## Serial Debugging

Debug the R9 through the RS-232 debug port. To access you will need to remove the cover of the Relio R9.

**Connector:** J6  
**Manufacturer:** Amp/Tyco  
**Part Number:** 9-146278-0-04  
**Description:** Header, 0.100" Polarized 4 pos, pin 3 Removed

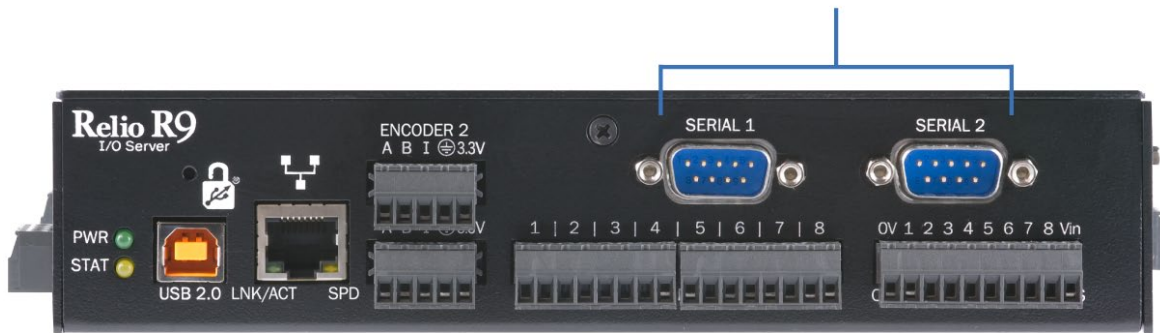
Pin	RS-232
1	RX
2	GND
3	Key
4	TX



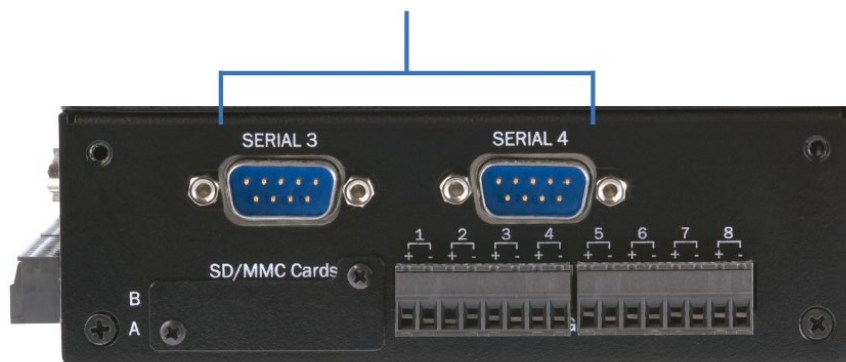
## Serial Communications

Connect to a variety of serial peripherals via the Relio R9's software configurable RS-232/422/485 ports. The serial port interfaces are available on DB-9 male connectors. Serial 1 and Serial 2 ports are located on the front of the enclosure, and Serial 3 and Serial 4 ports are located on the right side of the enclosure.

Two RS-232/422/485 Serial Ports



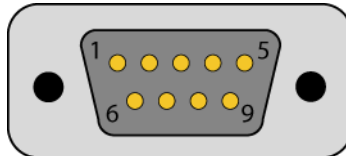
Two RS-232/422/485 Serial Ports



**Connectors:** Serial 1 – Serial 4

**Description:** DB-9 Male

PIN	RS-232	RS-422/485
1	DCD	RX+
6	DSR	NC
2	RX	RX-
7	RTS	NC
3	TX	TX-
8	CTS	NC
4	DTR	TX+
9	RI	NC
5	GND	GND

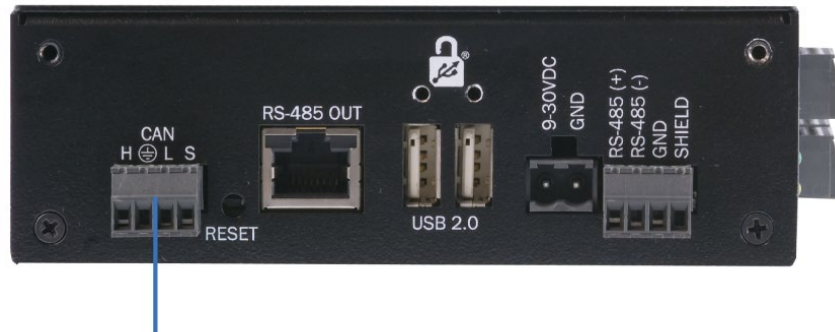


## COM Port Assignments

Serial Port	Assignment
RS485 Expansion Port	COM1
SERIAL1	COM2
SERIAL2	COM3
SERIAL3	COM4
SERIAL4	COM5


## CAN Bus

Connect directly to a Control Area Network (CAN) bus via the CAN connector on the left side of the enclosure.



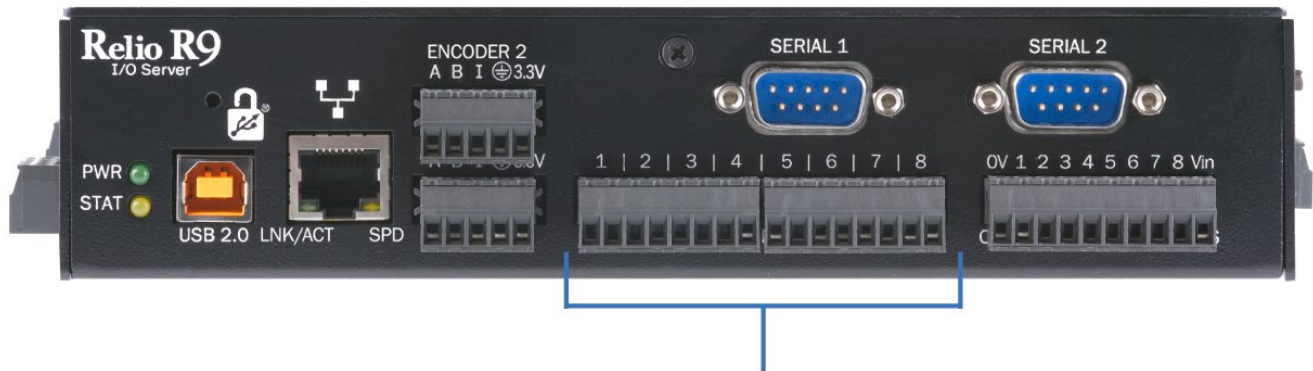
**CAN Bus Port**

<b>Connector:</b>	CAN
<b>Manufacturer:</b>	Weco
<b>Part Number:</b>	110-M-111/04
<b>Description:</b>	Terminal Block 4 position 3.5mm spacing
<b>Mates with:</b>	Weco 110-A-111/04 4 position screw-terminal plug (provided)

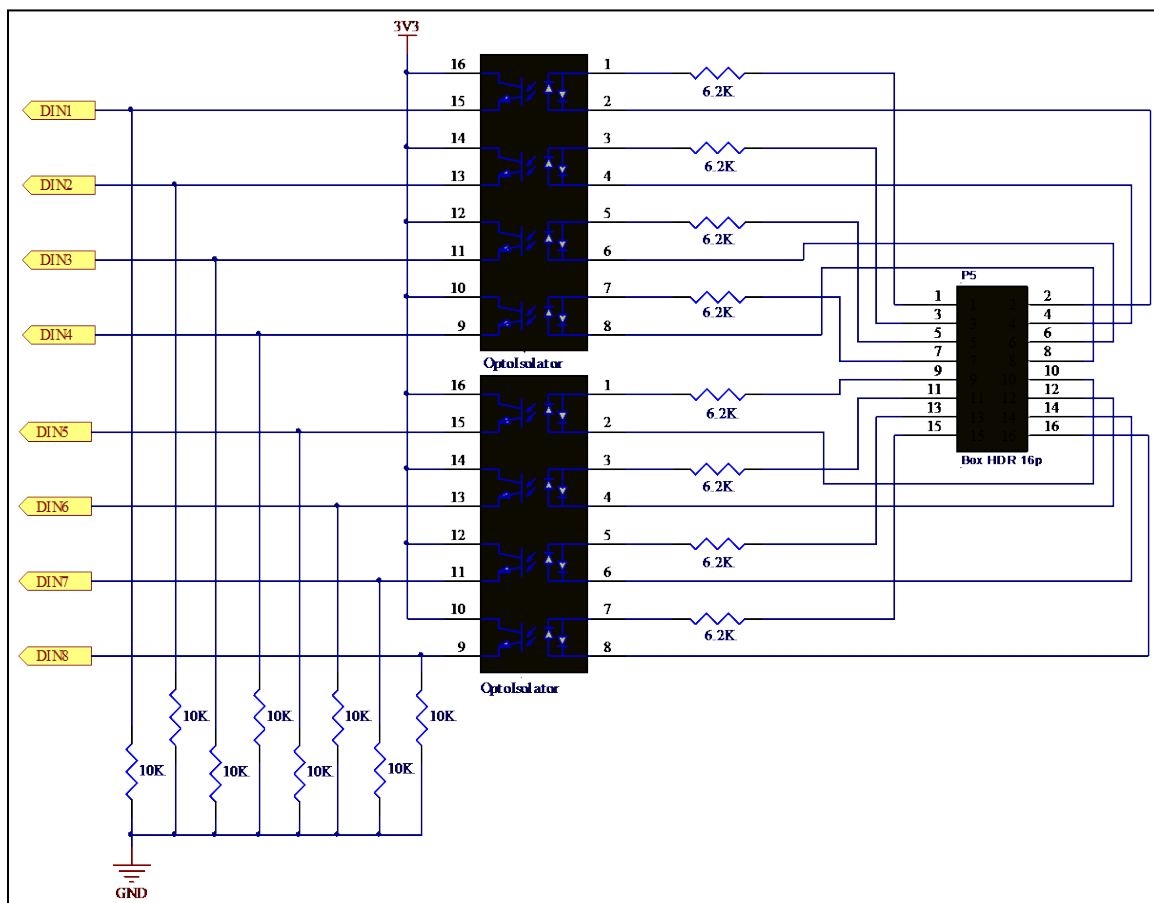
Pin	Signal
H	CAN High
	GND
L	CAN Low
S	Shield

## Optically Isolated Inputs

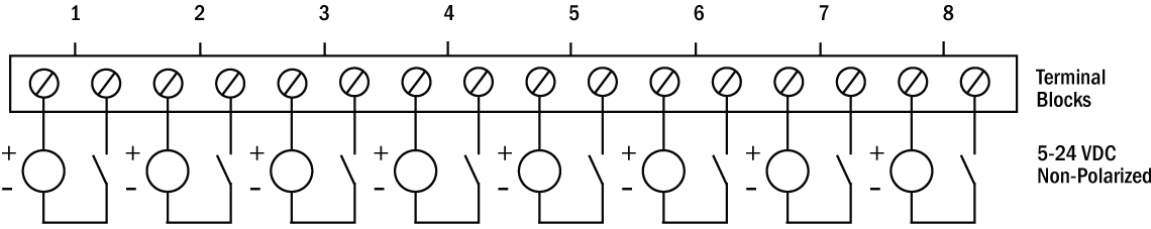
Interface 8 optically isolated inputs. The non-polarized inputs can range from 5-24VDC and provide 300V external isolation. Connection is made at on the front of the enclosure.



**Eight Optically Isolated Inputs**



8 Optically Isolated Inputs

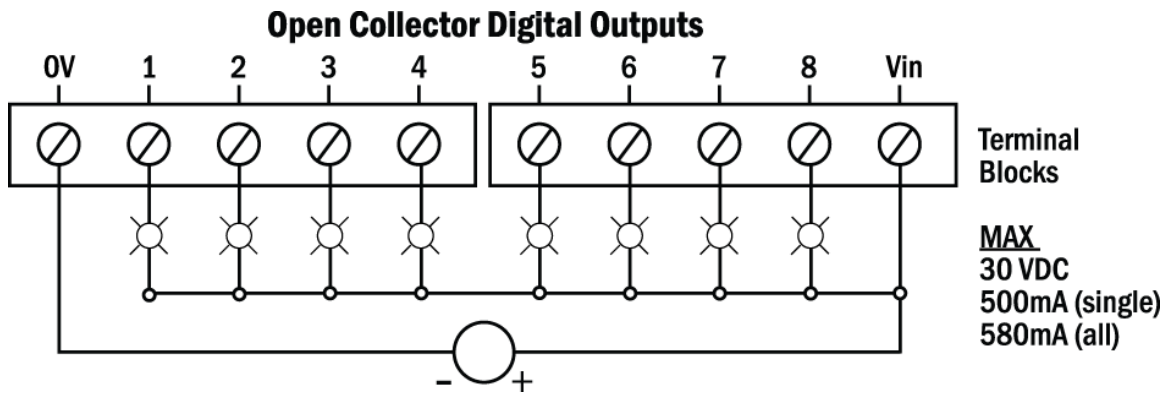


**Connector:** OPTO INPUTS  
**Manufacturer:** Weco  
**Part Number:** (2) 110-M-111/08  
**Description:** (2) Terminal Block 8 position 3.5mm spacing  
**Mates with:** (2) Weco 110-A-111/08 8 position screw-terminal plugs (provided)

Pin	Signal
1	Input 1A
	Input 1B
2	Input 2A
	Input 2B
3	Input 3A
	Input 3B
4	Input 4A
	Input 4B
5	Input 5A
	Input 5B
6	Input 6A
	Input 6B
7	Input 7A
	Input 7B
8	Input 8A
	Input 8B

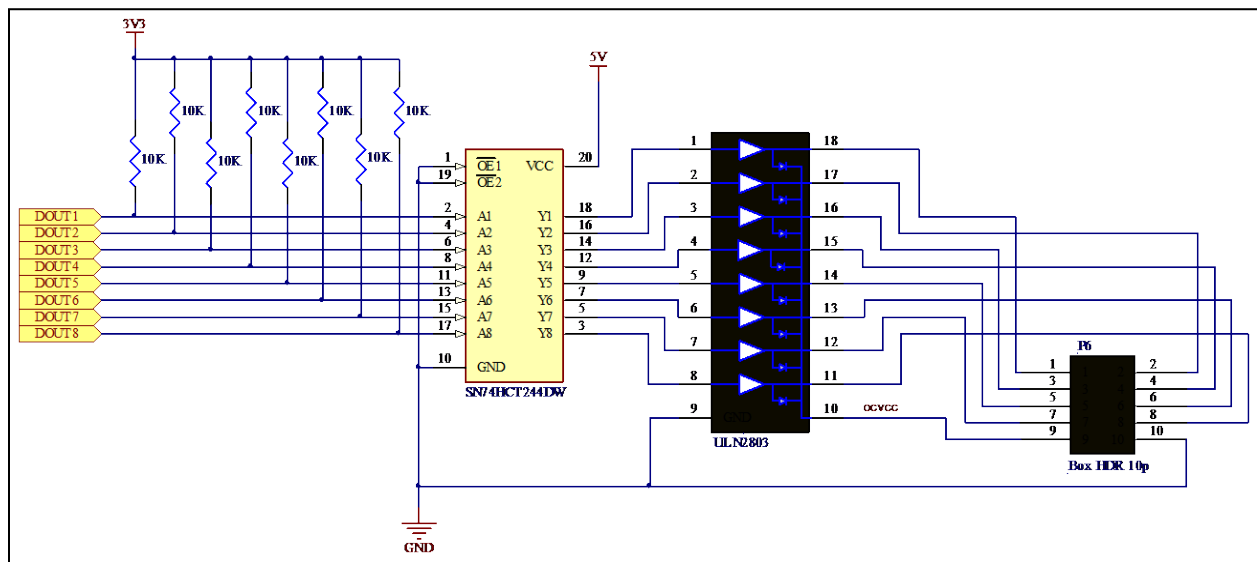
## Open Collector Outputs

Directly control eight outputs via the Relio R9's open-collector outputs found on the front of the enclosure. The open collector outputs have a range of 5 – 30V with a maximum sink current of 500mA on a single output with a combined maximum sink current of 580mA on all outputs.



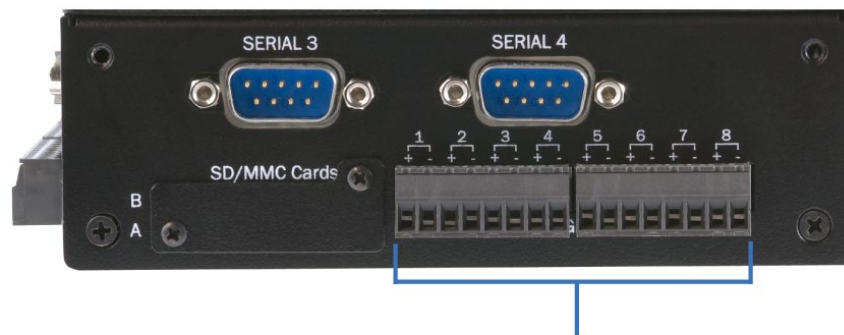
<b>Connector:</b>	OPEN-COLLECTOR OUTPUTS
<b>Manufacturer:</b>	Weco
<b>Part Number:</b>	110-M-111/10
<b>Description:</b>	Terminal Block 10 position 3.5mm spacing
<b>Mates with:</b>	Weco 110-A-111/10 10 position screw-terminal plug (provided)

Pin	Signal
0V	GND
1	Output 1 / PWM1
2	Output 2 / PWM2
3	Output 3 / PWM3
4	Output 4
5	Output 5
6	Output 6
7	Output 7
8	Output 8
Vin	OCVCC



## Analog Inputs

The Relio R9 base configuration includes a 12-bit ADC. Software programmable input ranges are 0V to 5V, 0V to 10V,  $\pm 5V$  or  $\pm 10V$ . Interface a variety of transducers and other analog signals via eight 12-bit analog inputs located on the right side of the enclosure. For applications requiring higher resolution, the board can be ordered preconfigured with a 16-bit A/D converter.



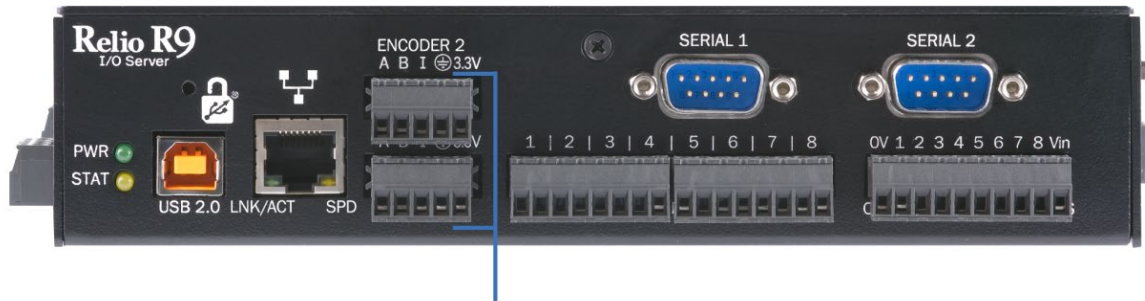
**Eight 12-bit Analog Inputs**

<b>Connector:</b>	ANALOG INPUTS
<b>Manufacturer:</b>	Weco
<b>Part Number:</b>	(2) 110-M-111/08
<b>Description:</b>	(2) Terminal Block 8 position 3.5mm spacing
<b>Mates with:</b>	(2) Weco 110-A-111/08 8 position screw-terminal plugs (provided)

Pin	Signal
1+	AIN1+
1-	AIN1-
2+	AIN2+
2-	AIN2-
3+	AIN3+
3-	AIN3-
4+	AIN4+
4-	AIN4-
5+	AIN5+
5-	AIN5-
6+	AIN6+
6-	AIN6-
7+	AIN7+
7-	AIN7-
8+	AIN8+
8-	AIN8-

## Quadrature Counters


High-speed input monitoring is accomplished with minimal software overhead using the two onboard 32-bit quadrature counters. Both counters are available on the front of the enclosure, as two connectors labeled “ENCODER”. The bottom connector is Quadrature Counter 1, and the top connector is Quadrature Counter 2. Input levels are LVTTTL (0 – 3.6VDC).




### Two 32-bit Quadrature Counters

<b>Connector:</b>	ENCODER
<b>Manufacturer:</b>	Weco
<b>Part Number:</b>	110-P-211/10
<b>Description:</b>	Terminal Block Dual Stacked 2 X 5 3.5mm
<b>Mates with:</b>	(2) Weco 110-A-111/10 5 position screw-terminal plugs (provided)

## Quadrature Counter 1 (Bottom connector)

Pin	Signal
A	A
B	B
I	#INDEX
	GND
3.3V	3.3VDC

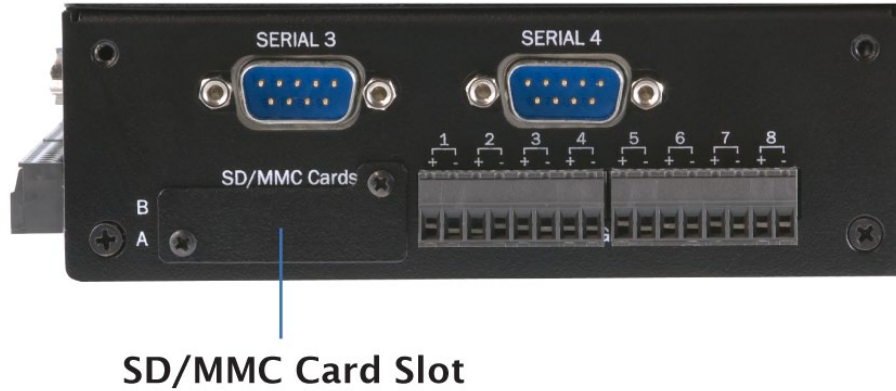
## Quadrature Counter 2 (Top connector)

Pin	Signal
A	A
B	B
I	#INDEX
	GND
3.3V	3.3VDC

## SD/MMC Cards

The Relio R9 provides two SD/MMC Card slots, Slot A and Slot B, located on the right side of the enclosure. Each slot will accept standard-capacity SD/MMC Cards up to 2GB. SD/MMC Card slot A may be used for booting.

To protect the SD/MMC Cards, a cover-plate is provided. To access the SD/MMC Cards, remove the two screws then the cover plate.



**SD/MMC Card Slot**

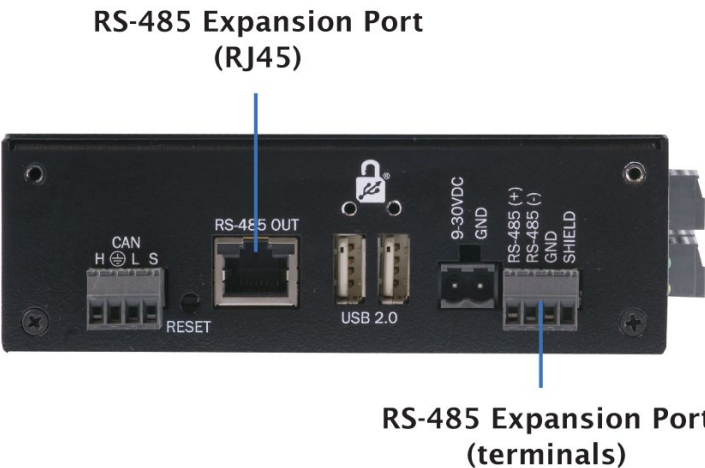
# RS-485 Expansion

The Relio R9 provides a RS-485 Expansion Port. The port is available on the left side of the enclosure via the RJ-45 connector labeled “RS-485 OUT”, as well as via a 4 pin terminal block.

The Relio R9 includes a RS-485 expansion connector on the left side of the unit that is internally connected to the same pins on the screw terminals, also on the left side of the unit. This offers two convenient options for adding additional expansion modules from the Seal/O product line.



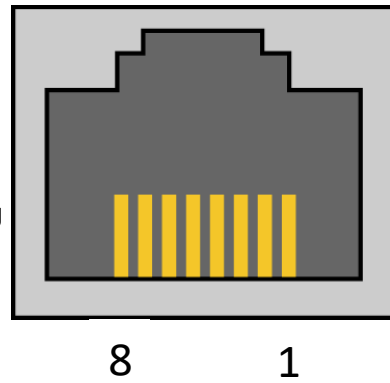
The RJ45 port on the left side of the Relio R9 is a RS-485 Expansion Port (labeled “RS-485 Out”) and is NOT an Ethernet port. Damage to Ethernet networking equipment can result if connected to the RS-485 RJ45 connector.



**Connector:** RS-485 Expansion (RJ45)  
**Manufacturer:** Xmultiple  
**Part Number:** XRJM-S-01-8-8-F2 or XRJM-S-01-8-8-0  
**Description:** RJ45 Socket, W/O LEDs, Shielded  
**Mates with:** Standard RJ45 Plug

Pin	Signal
1	9-30VDC Source
2	9-30VDC Source
3	Not connected
4	485+
5	485-
6	Not Connected
7	Common (GND)
8	Common (GND)

**Connector:** RS-485 Expansion  
**Manufacturer:** Weco  
**Part Number:** 110-M-111/04  
**Description:** Terminal Block 4 position 3.5mm spacing  
**Mates with:** Weco 110-A-111/04 4 position screw-terminal plug (provided)



Pin	Signal
RS-485 (+)	485+
RS-485 (-)	485-
GND	Common (GND)
SHIELD	Shield (GND)

## Power

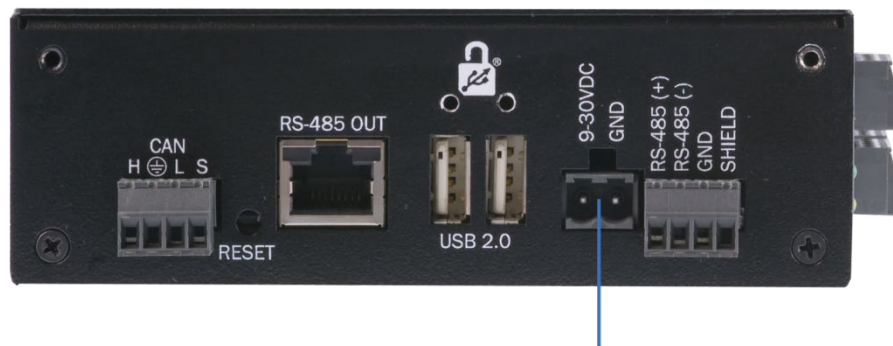
The Relio-R9 can be powered with the Sealevel TR134.

**Connector:** 9-30VDC Power Input  
**Manufacturer:** Weco  
**Part Number:** 121-M-111/02  
**Description:** 5.08mm Pitch Friction Lock Header  
**Mates with:** Weco 121-A-111/02



Be sure that you connect the power lead to the proper pin. Reversing the polarity of the power input will damage your SBC-R9

Pin	Signal
1	9-30VDC
2	GND



**9-30VDC Power Input**

## LED Indicators

The SBC-R9 features two LED indicators for power and status. The Green LED (Top) is illuminated when power is applied to the board. The Yellow LED (Bottom) is a GPIO controllable indicator accessible through the TALOS API.

**Designator:** D9  
**Description:** Dual Stacked LED Indicators

LED	Color	Signal
Top	Green	Power
Bottom	Yellow	Status



# Installation

## Software Installation

### Windows Installation

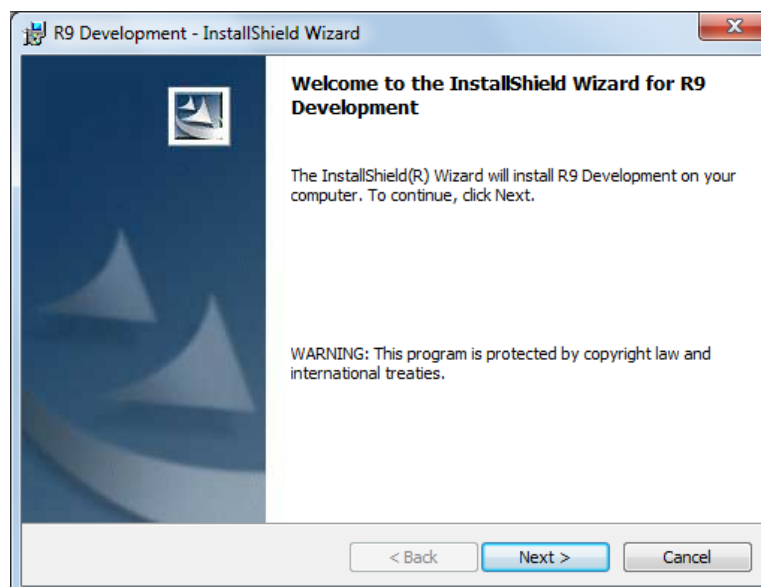


Do not install the hardware until the software has been fully installed.



Only users running Windows 7 or newer should utilize these instructions for accessing and installing the appropriate driver via Sealevel's website. If you are utilizing an operating system prior to Windows 7, please contact Sealevel by calling 864.843.4343 or emailing [support@sealevel.com](mailto:support@sealevel.com) to receive access to the proper driver download and installation instructions.

1. Begin by removing the contents from the box.
2. Download the correct software from the website - [Software: R9 Development SDK - Windows - Sealevel](#). This will install the R9 Development SDK, which includes the Talos.NET Framework, documentation, and examples, on to your PC (See Figure 1.)”



**Figure 1 - Installation Wizard**

3. The setup files will automatically detect the operating environment and install the proper components. Follow the information presented on the screens that follow.
4. After installation, the package can be found in Windows by clicking Start → All Programs → Sealevel Systems → R9 Development.
5. The contents of the factory provided NAND Flash build will allow the Relio R9 to run Windows CE 6.0 OS when power is applied to the board.



To avoid accidental damage, be sure to follow the proper ESD procedures by grounding yourself and the board.



To avoid accidental damage be sure to observe proper power connector polarity. See [Power Pin-out](#) section.

Apply power to the Relio R9 by connecting the TR123 tinned leads to the Relio R9 input power connector screw terminals, noting proper polarity. Attach the other end of the TR123 into a 120VAC wall outlet.

Use a standard USB device cable and connect the Type B connector to the Relio R9. Connect Type A connector into the host PC. (See *Figure 2*)



**Figure 2 - TR123 tinned leads and Type B USB connector.**

You are now ready to set up a USB communication interface between the host PC and the Relio R9 board. Depending on which operating system you are using – Windows 7, Vista, or XP – the setup experience will vary.

## Windows Device Center

If your host PC is running Windows Vista or later and you are connected to the Internet, then Windows Mobile Device Center software will install automatically. If you are not connected to the Internet but have obtained the Mobile Device Center software manually, then running their setup will achieve the same result. (See [Appendix A](#).)

After installation, a negotiation will begin between the PC and the Relio R9 board and the device center connection screen will appear. (See Figure 3.)



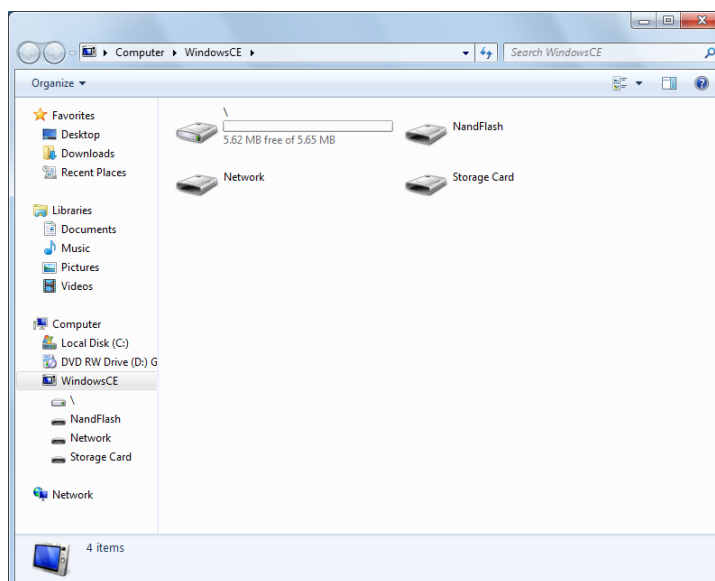
**Figure 3 - Device Center connected screen**

Using your mouse, click “Connect without setting up your device”. The idea is to explore the file system on the Relio R9 without setting up synchronization with contacts, calendar, or e-mail. Now choose “File Management → Browse the contents of your device” from the screen. (See Figure 4.)



**Figure 4 - Device Center File Management**

This action opens a standard Windows Explorer where the default file contents of the Relio R9 can be read or written to. (See Figure 5.)



**Figure 5 – Contents of Relio R9**

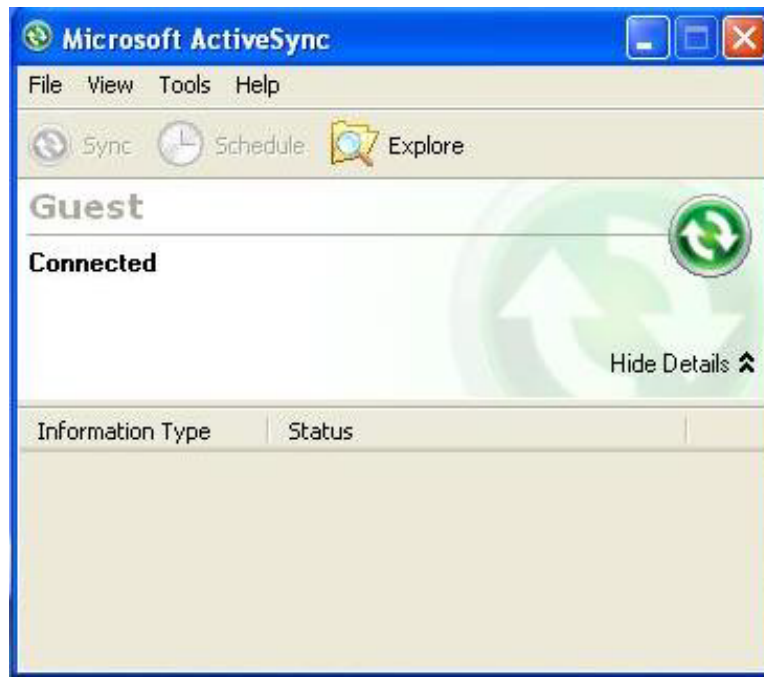
## Windows ActiveSync for XP

If your host PC is running Windows XP, ActiveSync is required to establish connection to the Relio R9. ActiveSync differs from Mobile Device Center in that having an internet connection will not establish an automatic download and installation. For installation procedures, refer to Microsoft's website. (See Appendix A). After installation, a negotiation will begin between the PC and the Relio R9 board, and the "New Partnership" dialog will appear. (See Figure 6.)



**Figure 6 - ActiveSync New Partnership screen**

Using your mouse, select “No” and then select “Next”. The ActiveSync main dialog will appear. Click the “Explore” icon. This action opens a standard Windows Explorer where the default file contents of the Relio R9 can be read or written. (See Figure7.)



**Figure 7** - ActiveSync Main Dialog screen

## Connection Complete

You are now ready to set up a complete development environment for building and debugging smart device applications and libraries. The next section guides you by example using Microsoft Visual Studio.

# Application Development

## Introduction

With .NET Compact Framework coupled with our Talos .NET Framework, C# and VB.NET programmers can develop powerful embedded applications on the Relio R9 such as mobile, robotics, home automation, industrial, and a broad range of other embedded applications. The low cost of licensing for Windows 6.0 CE has created an ideal environment to develop a new generation of embedded products around the Relio R9.

Our Talos Framework allows access to the more specific I/O sections of the Relio R9 development board such as analog and digital I/O points, CAN bus, quadrature counter inputs, and the multi-electrical interface serial ports. A complete list of the API documentation can be found either in Windows by clicking Start → All Programs → Sealevel Systems → R9 Development → Talos Documentation.html.

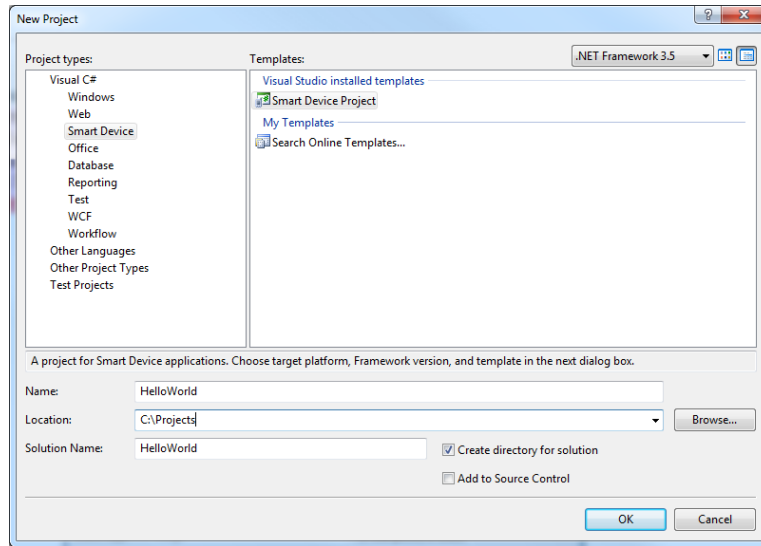
Writing .NET applications for the Relio R9 is very similar to writing desktop or console applications for Windows XP, Vista, and 7. The only difference is the amount of resources available. Because the memory footprint is smaller compared to a desktop computer, care should be taken where allocation of memory is concerned, such as large object creation.

## Requirements

- Visual Studio Professional 2005 or 2008
- .NET Compact Framework 3.5

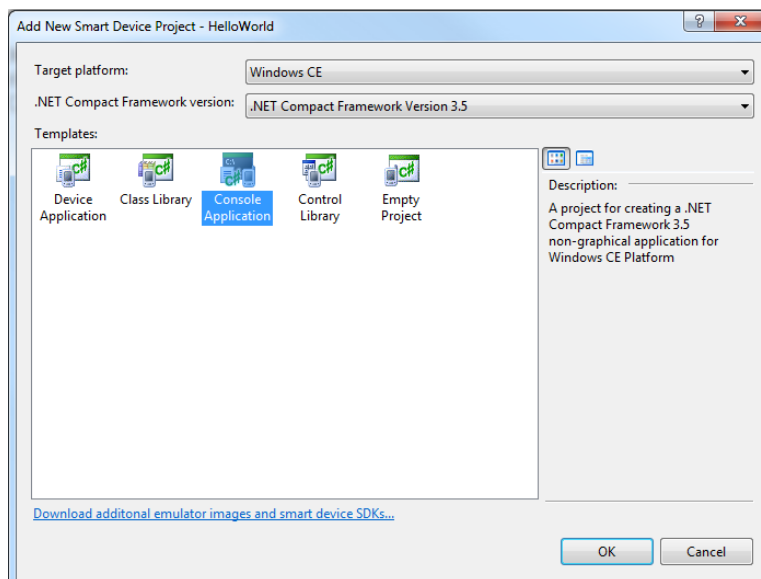
## Getting Started

For this demonstration, we will construct a smart device console application using Visual C#. Start Visual Studio and select File → New → Project. A 'New Project' dialog will appear. Select a project type of Visual C# → Smart Device. Select 'Smart Device Project' as the Template. Make sure the combo box has .NET Framework 3.5 selected. Type the name of the project. In this case, call it *HelloWorld*. (See Figure 8.)



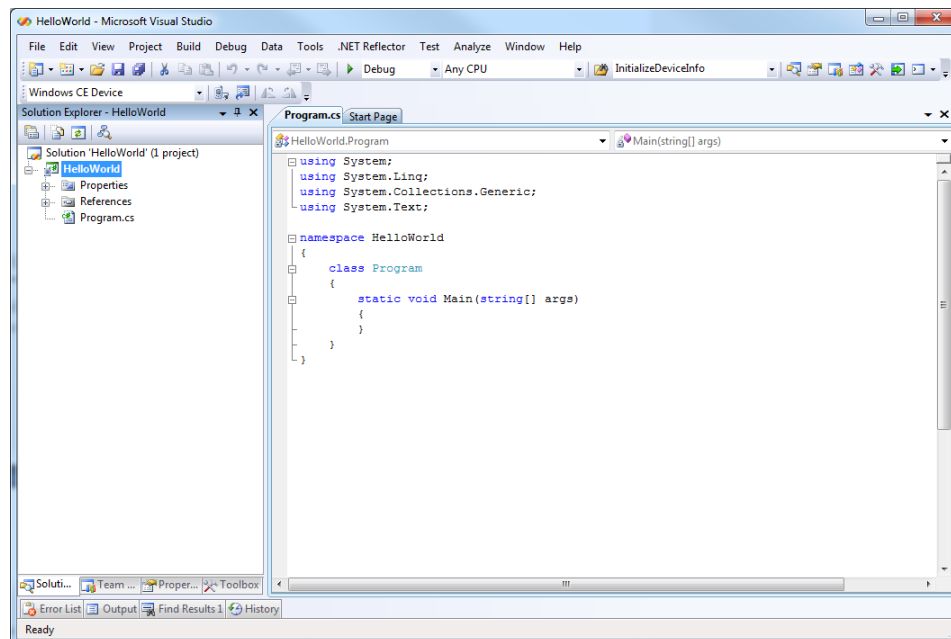
**Figure 8 - Visual Studio New Project dialog**

Click the "OK" button. The next configuration screen allows you to select the type of project you are creating. Select "Windows CE" for the target platform, .NET Compact Framework version 3.5 and select the "Console Application" icon for the template. (See Figure 9.)



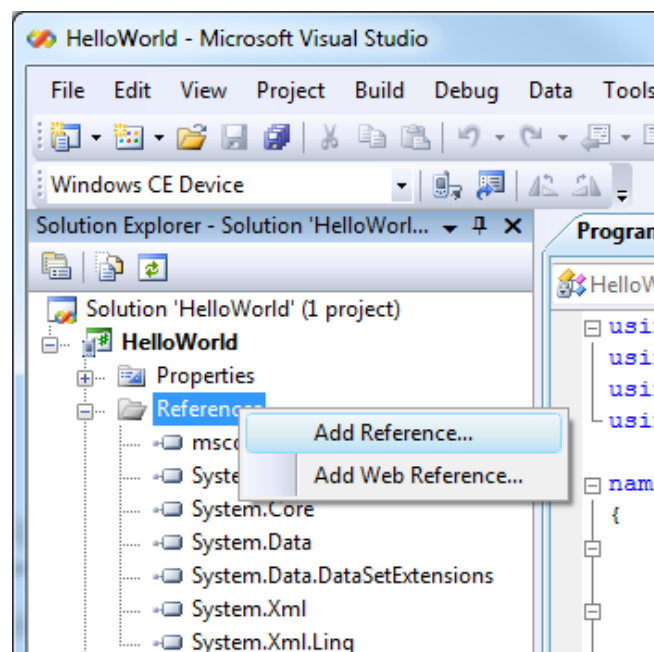
**Figure 9 - Visual Studio Add Smart Device dialog**

Once you have selected all of the configuration options, click the "OK" button. You will now see a console application template called *HelloWorld* in Visual Studio. (See Figure 10.)



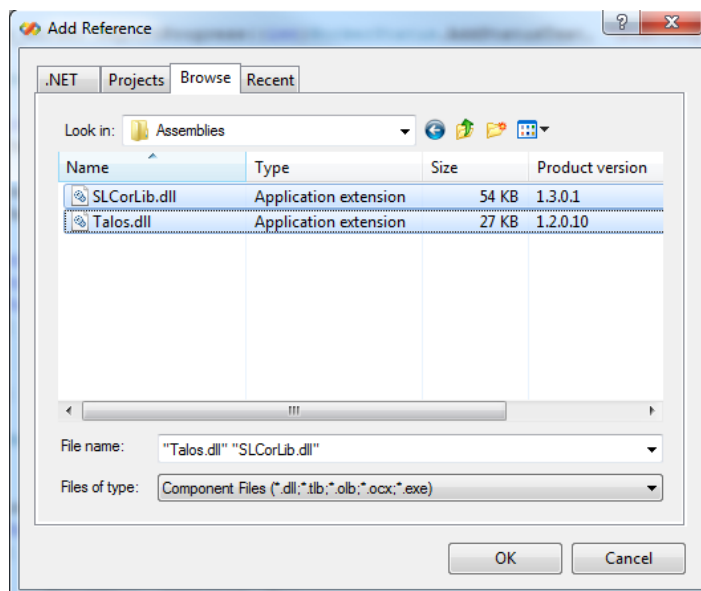
**Figure10** - Visual Studio Main Window

We can now add the references to the Talos Framework. Right click on the "References" and select the "Add Reference..." selection. (See Figure 11.)



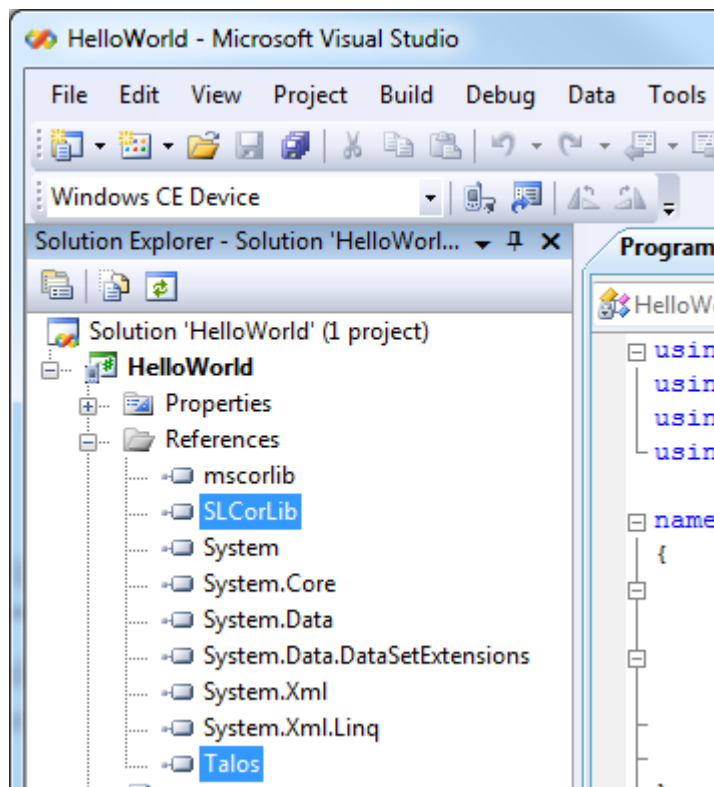
**Figure 11** - Adding References to Project

An 'Add Reference' dialog will appear. Click on the 'Browse' tab then search for the installed library path "C:\Program Files\Sealevel Systems\R9 Development\Assemblies". If you don't see a list of the R9 libraries as shown in Figure 12, then refer to the Relio R9 QuickStart section for software installation details. While holding down the CTRL key, click on both "SLCorLib.dll" and "Talos.dll". Click the "OK" button. (See Figure 12.)



**Figure 12 - Core library reference**

Both DLLs should appear in your "References" list. (See Figure 13.)



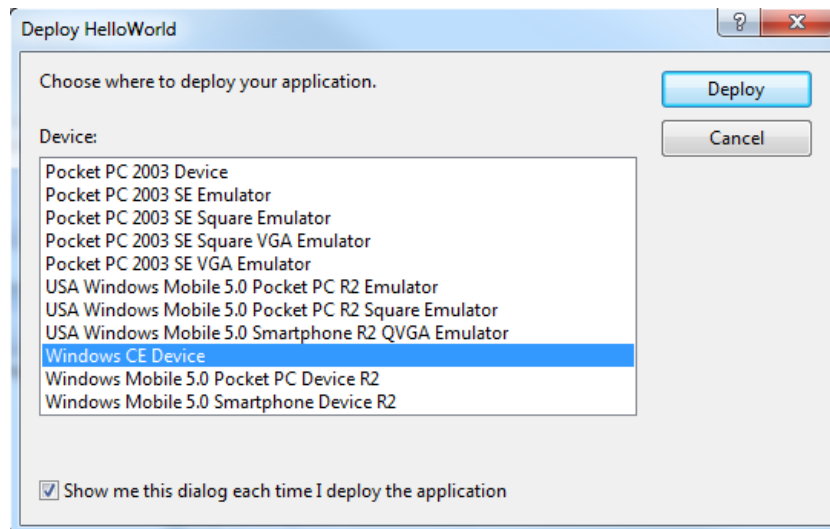
**Figure 13 - Verification of added library references**

Now that the Talos Framework has been referenced, you have access to all the I/O points exposed on the Relio R9 device.

For this simple HelloWorld application, we will just echo the string “Hello World” in the console window. This can be accomplished by adding the following code to the automatically created Program::Main() method. This code will echo “Hello World” and then pause for 5 seconds.

```
static void Main(string[] args)
{
    Console.WriteLine("Hello World");
    System.Threading.Thread.Sleep(5000);
}
```

From Visual Studio’s menu bar, select “Build → Build HelloWorld”. After the build process has completed select from the same menu bar, “Build → Deploy HelloWorld”. A “Deploy HelloWorld” dialog will appear for you to choose the appropriate target. Choose “Windows CE Device” then press the ‘Deploy’ button. (See Figure 14.)



**Figure 14** - Choose Windows CE Device and Deploy

After the deployment phase the “Hello World” message will appear on the Debug Serial console output.

Examples can be found from the installation directory under ‘..\R9 Development\Samples\C#’ and ‘..\R9 Development\Samples\VB.NET’.

# Application Debugging

## Introduction

This guide details the process of debugging an application developed for the Relio R9 embedded IO system. The Relio R9 development platform easily integrates into standard Microsoft development tools to make the debugging process extremely easy. The following sections detail the requirements to begin debugging an application on Microsoft Windows 7, Vista, or XP.

## Requirements

- Microsoft Mobile Device Center using Vista or ActiveSync using XP
- Microsoft Visual Studio Professional 2005 or 2008
- USB Cable or Ethernet connection

Debugging your Relio R9 applications is a simple process that requires a USB cable or Ethernet connection, Microsoft device synchronization software, and Visual Studio. Depending on your version of Windows, you will need to follow a different process to install the device synchronization software as outlined in the Relio R9 Quick Start section.

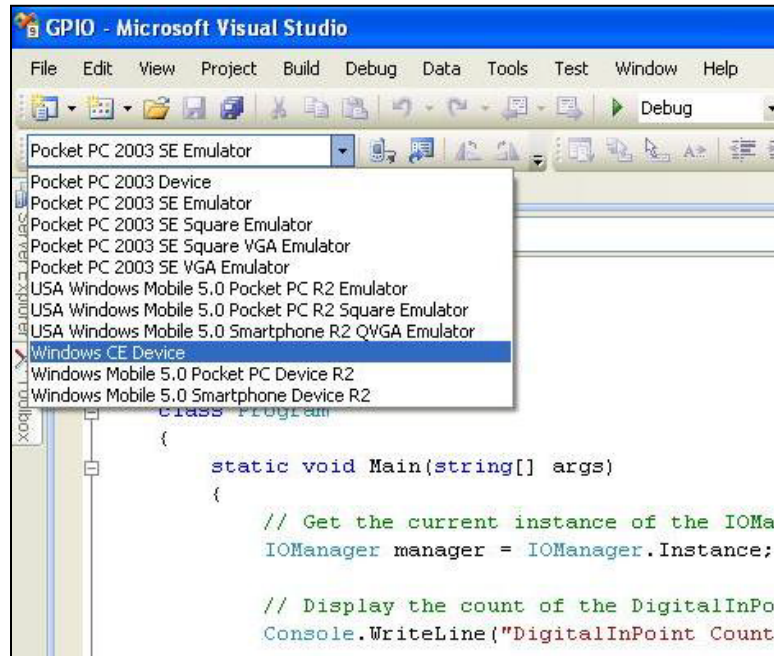
## Debugging an Application

Once the Relio R9 has been successfully attached to your PC, it is easy to begin debugging an application on the Relio R9. This section will demonstrate how to attach the Microsoft Visual Studio debugger to the Relio R9, show the use of breakpoints in the debugger, and show how to access useful information while debugging an application.

We will be using the GPIO example application found in the "samples" directory of the Talos Framework installation. The same methods will apply to any application you wish to debug on the Relio R9.

## Attach the Debugger

Once your solution is opened, it is necessary to specify the device target that you would like to use in conjunction with the debugger. The default option is an emulator. Select "Windows CE Device" from the target device drop down. (See Figure 15.)

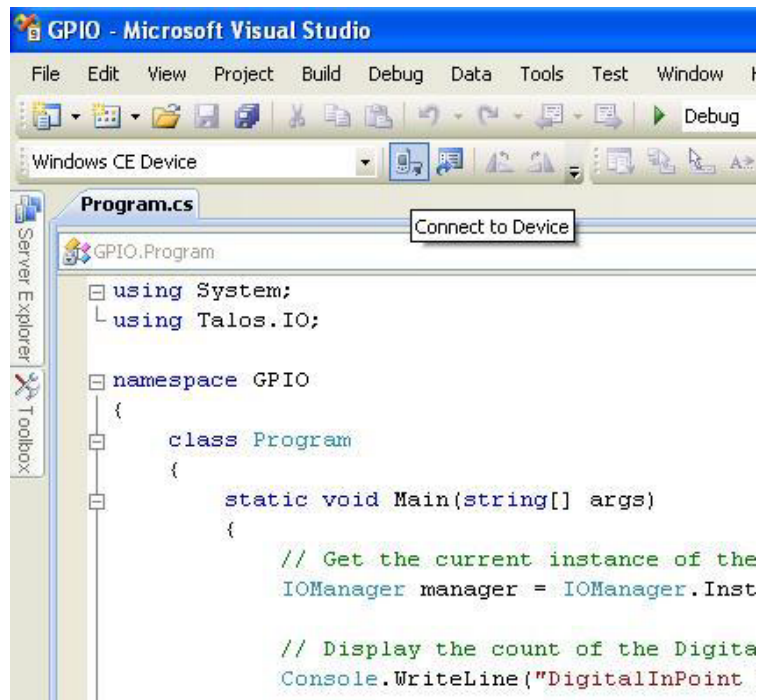


**Figure 15 - Device Target Selection**



If you would like to Use the faster Ethernet connection for debugging instead of the USB connection, refer to [Appendix C](#) – Application Debugging over Ethernet.

Now select the “Connect to Device” icon to initiate synchronization between Visual Studio and the Relio R9 device. (See Figure 16.)



**Figure 16** - Connect to Device icon

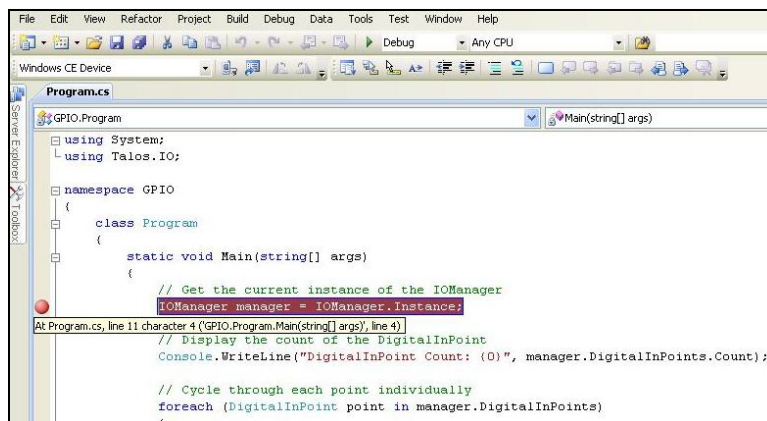
You should now see a connection dialog appear. (See Figure 17.)



**Figure 17 - Connection Status Dialog**

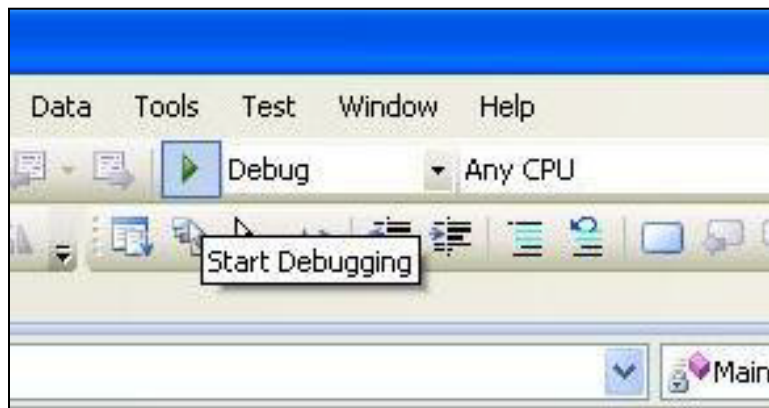
## Breakpoints

Setting breakpoints allows you to stop execution of your application at any point and examine the state of the application. A breakpoint may be set by selecting a line and pressing the "F9" hotkey. (See Figure 18.)



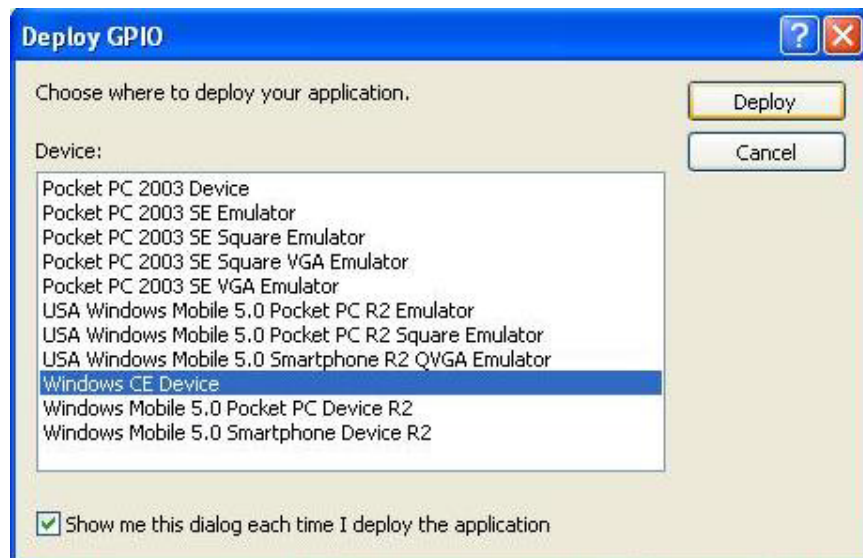
**Figure 18 - Breakpoint selection**

To begin debugging the application, click the "Start Debugging" button. (See Figure 19.)



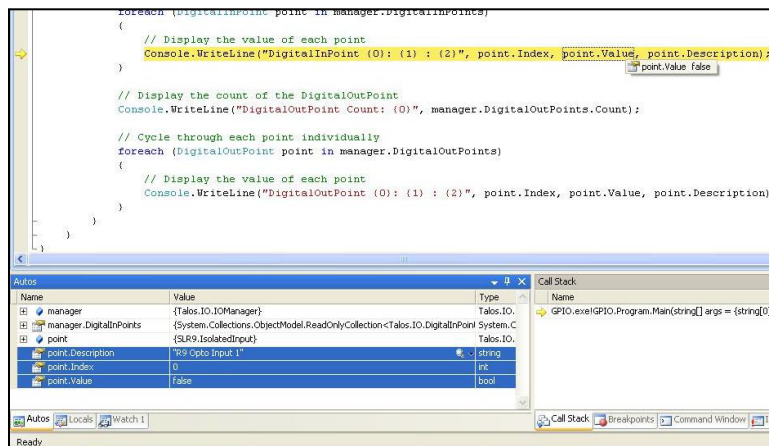
**Figure 19 - Run Debugger icon**

Although you previously set up the target device, upon starting the first debug session, you will be prompted to select the device to deploy the application to. Select the "Windows CE Device" as was done earlier when selecting the target. (See Figure 20.)



**Figure 20.** Target Deployment dialog

Once the application is deployed to the Relio R9, it will begin execution. As soon as the first breakpoint is reached, execution will cease, and you will gain full control over the running application. You may use the debugging options to continue execution, execute a single line, or execute multiple lines. You may view the status of each variable by either hovering over it with the cursor or by examining the windows at the bottom of Visual Studio just as you would with a desktop application. (See Figure 21.)



**Figure 21 - Examining program variables**

## Watching Variables

When program execution is halted due to a break point condition being met, the debugger will display the state of all local variables. In addition to those variables, class specific variables can be grouped together as a view to aid in debugging your application. This is accomplished by right clicking on a variable and selecting "Add Watch". Each addition appends a tab to the "Watch n" window where n is incremented for each variable added. (See Figure 22.) Each watch window provides a convenient tree type structure for viewing hierarchical class variables.

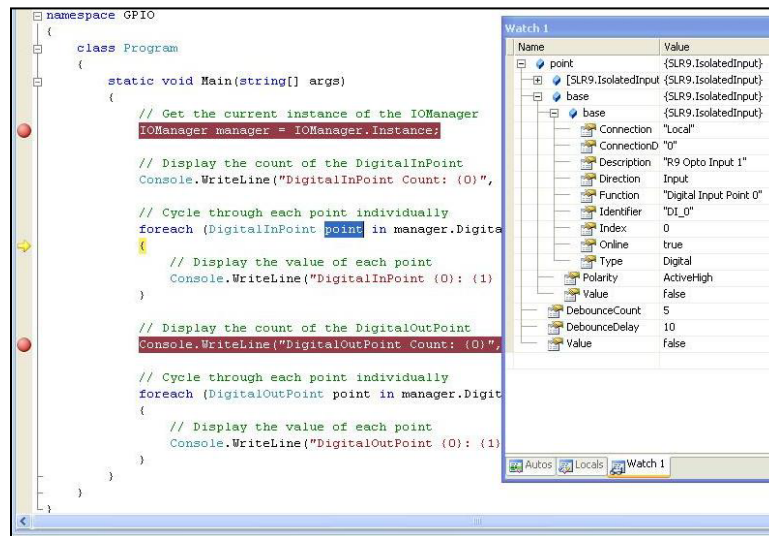
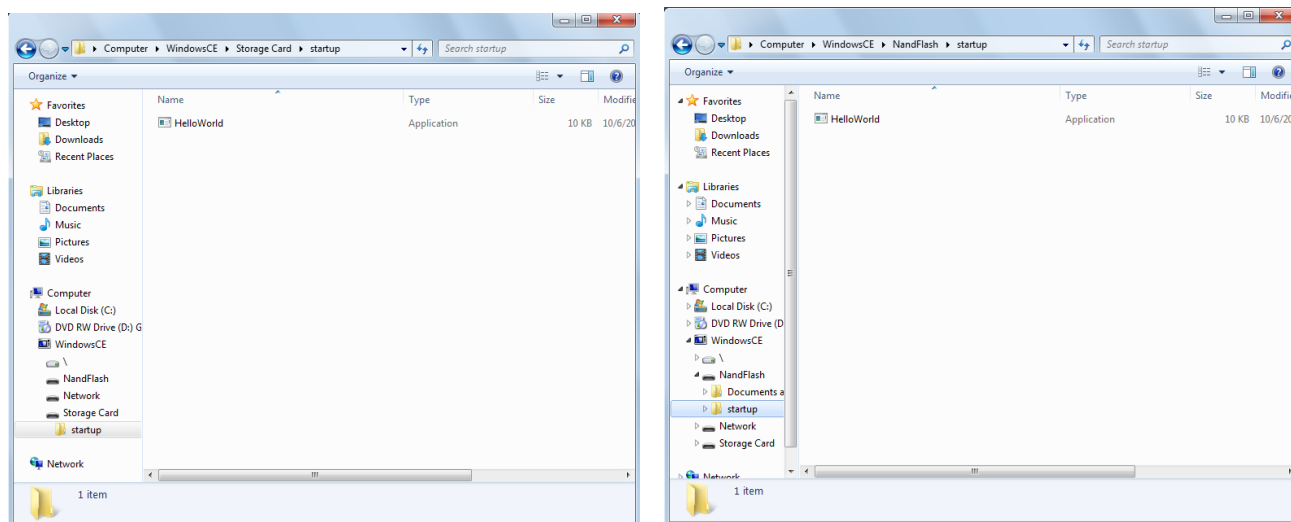


Figure 22 - Watch view

## Target Deployment and Execution

After your application is built using Visual Studio, either a debug or release executable, it may be desirable to copy it onto the SDCARD or NAND Flash. This would provide a means to store and execute your application without the need for connectivity to a host computer. The first step is transferring your application to a suitable directory on the SDCARD or on-board NAND Flash. To accomplish this you will need to establish connectivity via Mobile Device Center or ActiveSync as outlined in the Relio R9 Quick Start section above.



**Figure 23- Application Placement**

The Relio R9 Runtime image comes pre-loaded with a utility program called “SpringBoard”. This utility provides a solution for automatically running your applications at startup. Rather than copying your application files to ‘/Windows/Startup/’ - which is in volatile memory - the executables should be copied to ‘/Storage Card/startup/’ or ‘/nandflash/startup/’. After Windows CE runs, SpringBoard automatically starts applications located in the NAND Flash followed by applications in the Storage Card.

SpringBoard also provides a way to specify program arguments by supplying an XML configuration file. You will need to create a simple XML file called “startup.xml”. This XML file should consist of an element list each with an application name and the desired arguments for that application. (See Figure 24.) This file must reside in the following location: ‘/storage card/startup/startup.xml’ and/or ‘/nandflash/startup/startup.xml’.



If the startup.xml file is not found or is not desired, SpringBoard will still automatically run all the applications placed in the aforementioned directory structure, only no arguments will be included for those applications.

```
<?xml version="1.0" encoding="utf-8" ?>

<programs>

  <program name="sample1.exe" arguments="/i 1010 /w
```

**Figure 24 - startup.xml**

## SDCARD Boot Sequence

Upon power up, the Relio R9 follows a specific boot sequence. The initial sequence is “firstboot”. The firstboot process initializes the low level hardware and is responsible for loading the next sequence called “eboot”. Eboot provides a configuration menu for setting connection types and start up memory locations. Connection types include Ethernet and USB. Memory locations include SDCARD and NAND Flash. Ultimately, eboot attempts to load and execute the OS runtime image based on those configuration settings.

The Relio R9 development board checks the root directory of the bottom SDCARD for a valid Eboot boot loader (boot.bin). The file must be named boot.bin and the SDCARD must be formatted as FAT 12/16/32. If no boot image is found, the device will next check the raw data in the NAND Flash.



Only the bottom SDCARD slot (Slot A) or NAND Flash can be used for booting to an OS runtime image.

The Relio R9 ships with an SDCARD loaded with the OS files listed below:

- Boot.bin
- Eboot.bin
- NK.bin

## OS File Restoration

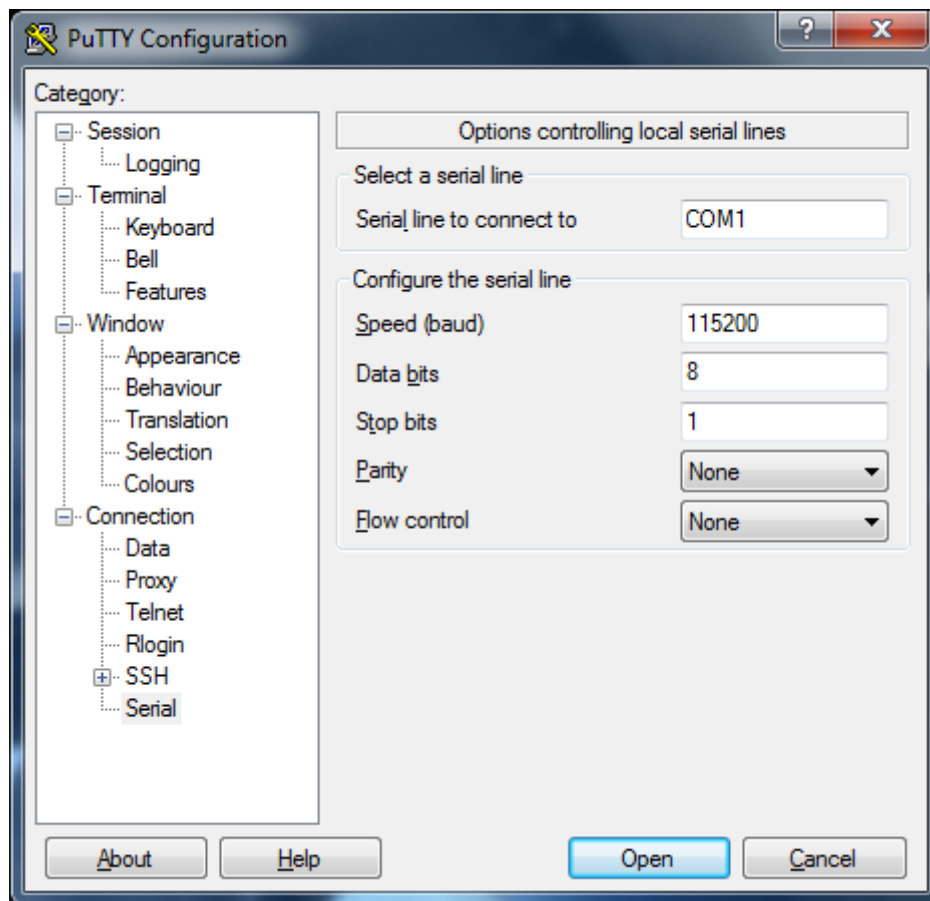
In the event that Sealevel produces updated OS file versions, or a backup is desired, the OS files will need to be copied to the root directory of an SDCARD or programmed to the NAND Flash. There are a variety of ways to copy files to the SDCARD; please see the section labeled “Upgrading the OS runtime image on SDCARD” below for more detail. Please see the section labeled “Upgrading the OS runtime image on NAND Flash” for further detail into that process. The NAND Flash cannot be programmed until any existing OS runtime image has been removed and the SDCARD is removed or the OS image on it is removed.

## Using the Debug Port

This procedure requires an available RS-232 COM port or USB to RS-232 serial port adapter attached to a host PC, a Relio R9 Serial Debug cable (Item# CA429), and any telnet terminal client application such as PuTTY (See Appendix A). For this procedure, we will demonstrate the use of PuTTY.

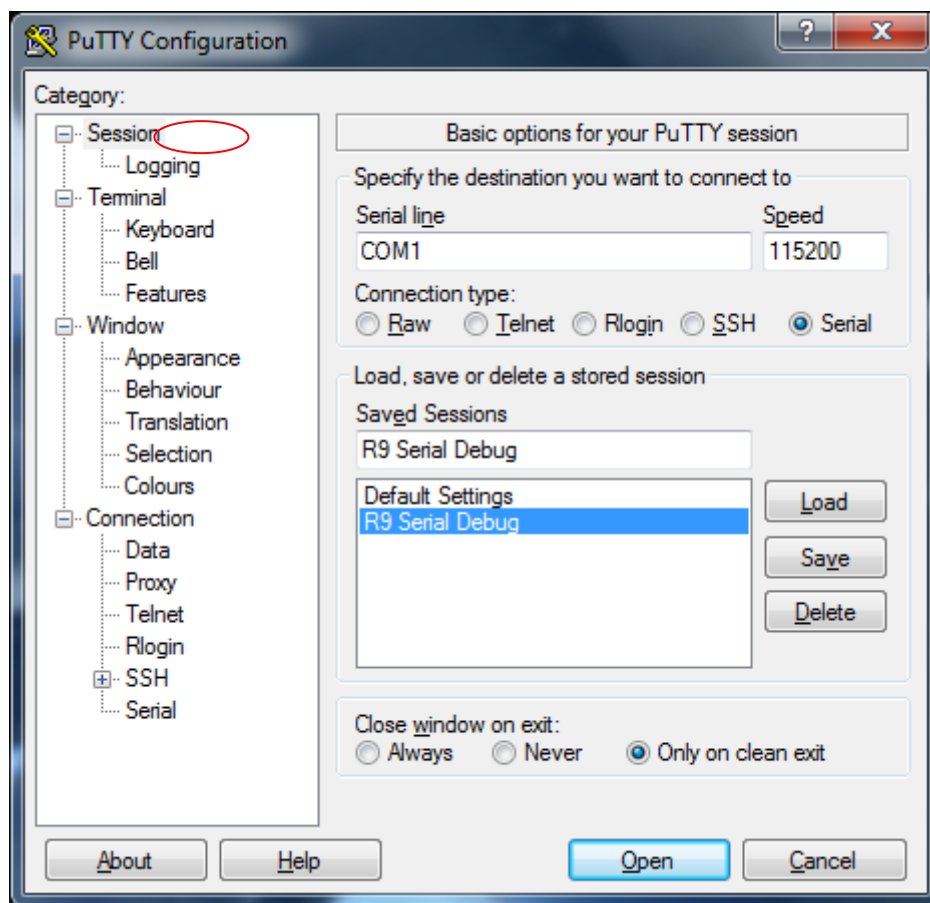
Connect the 4-pin keyed female end of the Relio R9 RS-232 cable into the Relio R9 connector (J6). To access this connector you will need to remove the cover of the Relio R9 and locate the connector on the exposed motherboard. Connect the DB9 end of the Relio R9 RS-232 cable into an available serial port on the host PC.

Run PuTTY and select “Serial” from the Category section of the dialog. Identify the proper COM port number and always assign the speed (baud) equal to 115200. Set Data bits to 8, Stop bits to 1, Parity to None, and Flow control to None. (See Figure 25.)



**Figure 25-** PuTTY Serial configuration

Select "Session" from the Category section of the dialog. A saved session of this configuration can be performed to avoid reconfiguration in the future. Next select Serial for the connection type. Type a name for this session under "Saved Sessions", then press the "Save" button. (See Figure 26.)

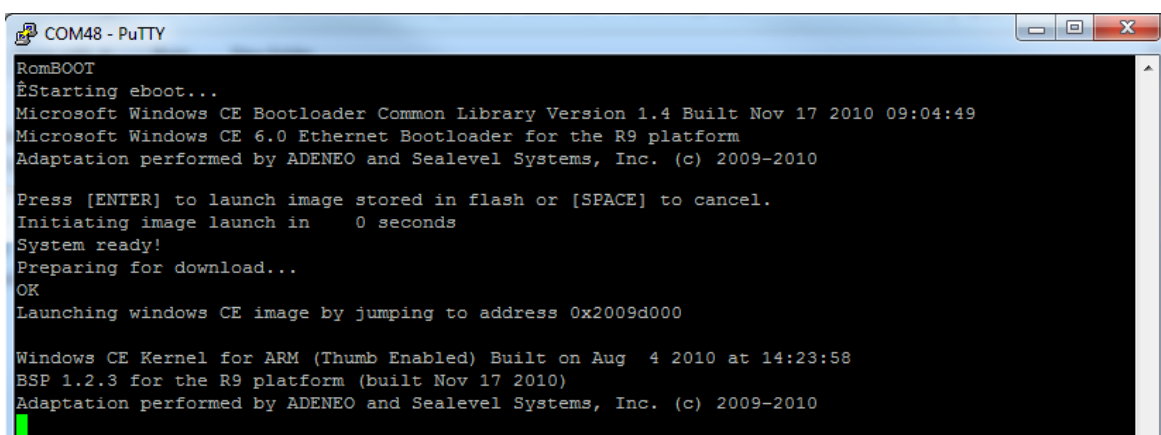


**Figure 26-** PuTTY Session configuration

Press “Open” to start a new terminal session. A blank terminal window will appear. Debug messages may not appear until power is applied to the Relio R9 board. Press the reset button on the Relio R9 to display the Ethernet boot loader configuration screen. (See Figure 27.) When the unit boots, the following menu on the debug port terminal will appear (no user input is required for booting):

```
“Press [ENTER] to download now or [SPACE] to
cancel.
Initiating image download in 2 seconds”
```

Once the prompt period expires, the OS runtime will be loaded from SDCARD or NAND Flash (depending on boot sequence and boot files available) into RAM and executed. At this point, the OS is running, and all console output is redirected to the debug serial port. (See Figure 27.)



```
COM48 - PuTTY
RomBOOT
EStarting eboot...
Microsoft Windows CE Bootloader Common Library Version 1.4 Built Nov 17 2010 09:04:49
Microsoft Windows CE 6.0 Ethernet Bootloader for the R9 platform
Adaptation performed by ADENEO and Sealevel Systems, Inc. (c) 2009-2010

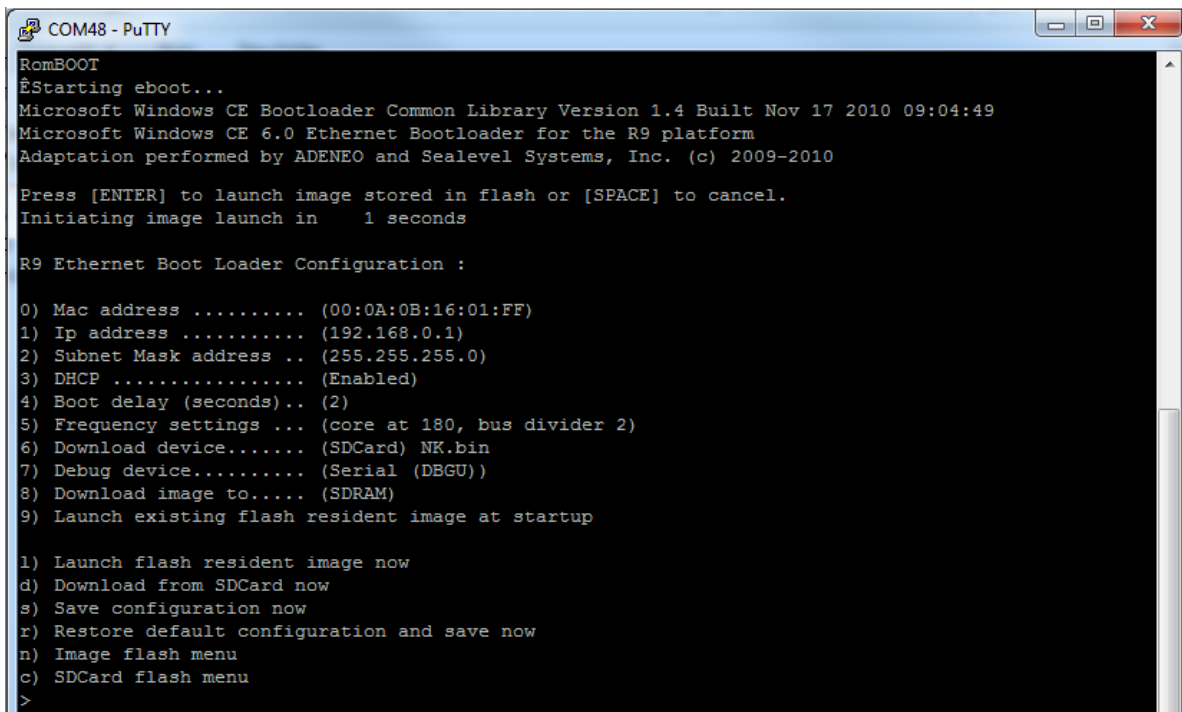
Press [ENTER] to launch image stored in flash or [SPACE] to cancel.
Initiating image launch in 0 seconds
System ready!
Preparing for download...
OK
Launching windows CE image by jumping to address 0x2009d000

Windows CE Kernel for ARM (Thumb Enabled) Built on Aug 4 2010 at 14:23:58
BSP 1.2.3 for the R9 platform (built Nov 17 2010)
Adaptation performed by ADENEO and Sealevel Systems, Inc. (c) 2009-2010
```

**Figure 27-** Application Debug Text Output



Eboot configuration settings can be modified by hitting the ‘space’ key during the 2 second boot prompt period. When modifying the configuration, a menu such as the one below is displayed. (See Figure 28.)



```
COM48 - PuTTY
RomBOOT
Starting eboot...
Microsoft Windows CE Bootloader Common Library Version 1.4 Built Nov 17 2010 09:04:49
Microsoft Windows CE 6.0 Ethernet Bootloader for the R9 platform
Adaptation performed by ADENEO and Sealevel Systems, Inc. (c) 2009-2010

Press [ENTER] to launch image stored in flash or [SPACE] to cancel.
Initiating image launch in 1 seconds

R9 Ethernet Boot Loader Configuration :

0) Mac address ..... (00:0A:0B:16:01:FF)
1) Ip address ..... (192.168.0.1)
2) Subnet Mask address .. (255.255.255.0)
3) DHCP ..... (Enabled)
4) Boot delay (seconds).. (2)
5) Frequency settings ... (core at 180, bus divider 2)
6) Download device..... (SDCard) NK.bin
7) Debug device..... (Serial (DBGU))
8) Download image to..... (SDRAM)
9) Launch existing flash resident image at startup

1) Launch flash resident image now
d) Download from SDCard now
s) Save configuration now
r) Restore default configuration and save now
n) Image flash menu
c) SDCard flash menu
>
```

**Figure 28.** Eboot configuration output



Modifying any of these settings may render your Relio R9 unbootable.

When upgrading an existing OS runtime stored in the NAND Flash, it is necessary to first erase the NAND Flash of a pre-programmed unit. This is accomplished through the “Image flash menu” (‘n’ key) in Eboot. The flash menu has an option to “Erase all sectors” of the NAND Flash (‘1’ key). (See Figure 29.)

```
COM48 - PuTTY
RomBOOT
EStarting eboot...
Microsoft Windows CE Bootloader Common Library Version 1.4 Built Nov 17 2010 09:04:49
Microsoft Windows CE 6.0 Ethernet Bootloader for the R9 platform
Adaptation performed by ADENEO and Sealevel Systems, Inc. (c) 2009-2010

Press [ENTER] to launch image stored in flash or [SPACE] to cancel.
Initiating image launch in 1 seconds

R9 Ethernet Boot Loader Configuration :

0) Mac address ..... (00:0A:0B:16:01:FF)
1) Ip address ..... (192.168.0.1)
2) Subnet Mask address .. (255.255.255.0)
3) DHCP ..... (Enabled)
4) Boot delay (seconds).. (2)
5) Frequency settings ... (core at 180, bus divider 2)
6) Download device..... (SDCard) NK.bin
7) Debug device..... (Serial (DBGU))
8) Download image to..... (SDRAM)
9) Launch existing flash resident image at startup

1) Launch flash resident image now
d) Download from SDCard now
s) Save configuration now
r) Restore default configuration and save now
n) Image flash menu
c) SDCard flash menu
>

Image Flash Menu :
1) Erase all sectors
2) Enter manually the image parameters
3) Quit...
>
```

**Figure 29-Eboot Image Flash Menu**



The “Erase all sectors” option in Eboot will erase the entire NAND Flash, so be sure to back up any data you wish to save before attempting to erase the device.

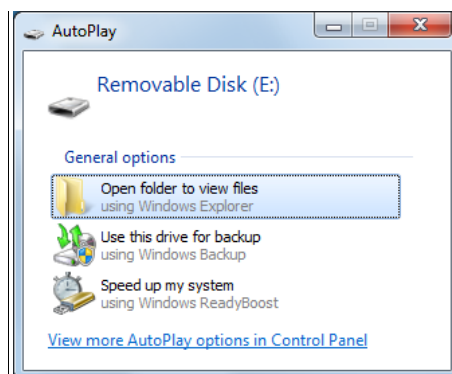
## Upgrading the OS Runtime Image on SDCARD

Factory OS runtime images are stored in the “Boot Files” directory of the R9 Development installation (see Quick start guide). There is a few ways to upgrade the OS runtime image (\*.bin) located on your bootable SDCARD:

- a memory card reader (preferred method)
- USB connection with Windows Mobile Device Center or ActiveSync
- FTP connection.

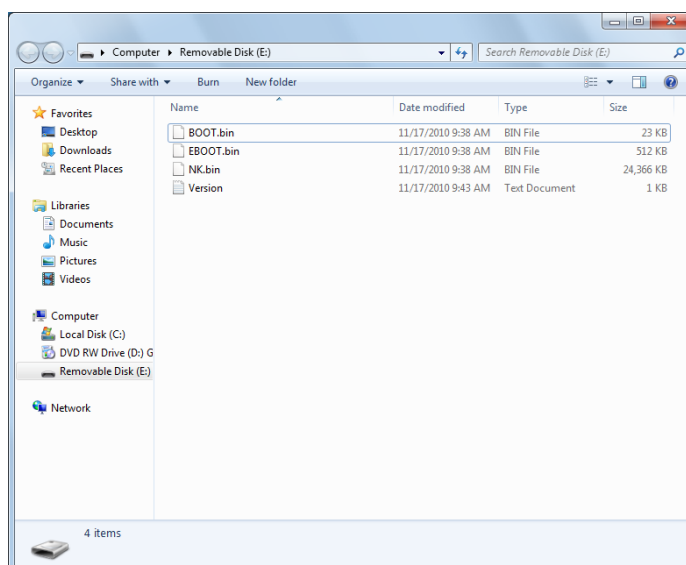
## Memory Card Reader

When inserting the SDCARD into your memory card reader, you may be prompted with an “AutoPlay” option. Choose “Open folder to view files”. If the “AutoPlay” feature has been disabled, navigate to the memory card reader manually. (See Figure 30).



**Figure 30**-AutoPlay screen

The OS runtime image consists of three binary (.bin) files as demonstrated below. (See Figure 31).

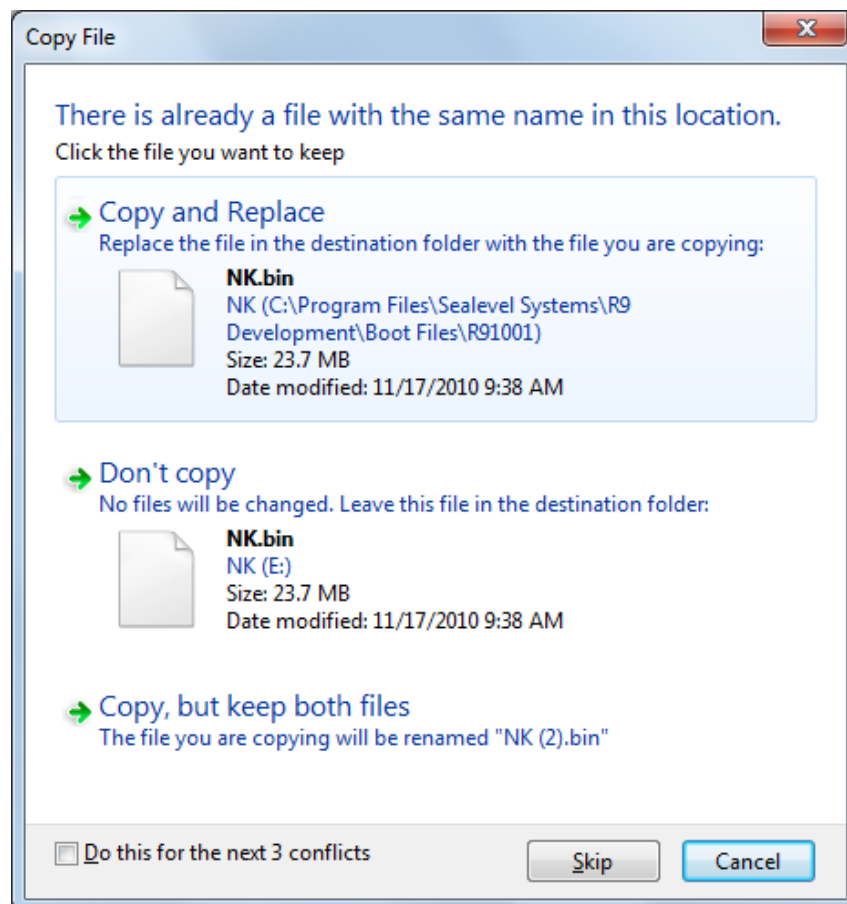


**Figure 31**-SDCARD File Contents



To save the existing OS runtime Image, backup the files previously stored on the SDCARD. .

Copy the new OS runtime image to the SDCARD. A popup will appear asking you to override your current files. Select the "Copy and Replace" option to over-write the existing OS runtime image. The new OS runtime image will be loaded the next time the device is booted with the SDCARD. (See Figure 32.)

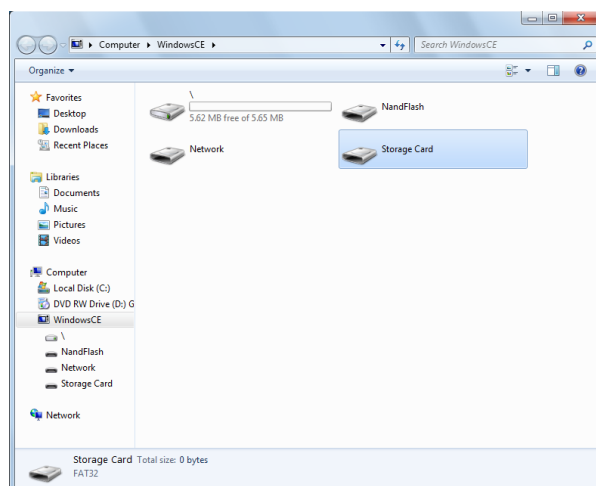


**Figure 32-Copy and Replace**

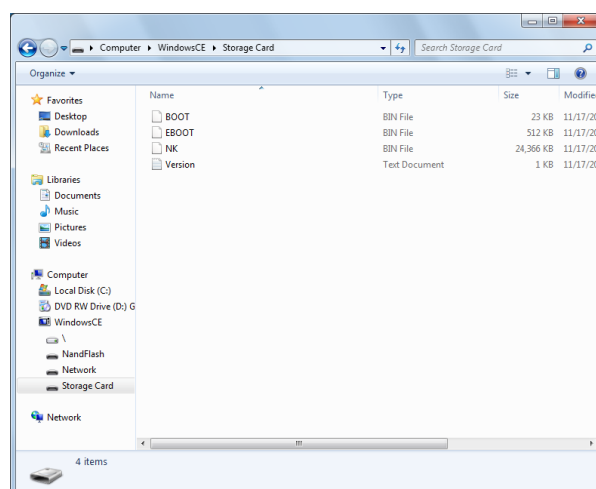
## USB Connection: Using Windows Mobile Device Center or ActiveSync

Another way to upgrade the OS runtime image is to connect via Windows Mobile Device Center or ActiveSync; for instructions on installing Windows Mobile Device Center or ActiveSync refer to the Relio R9 Quick Start section above.

Using the device file explorer, navigate to the “Storage Card” folder to view the SDCARD contents. (See Figures 33/34.)



**Figure 33-** WindowsCE Device Explore

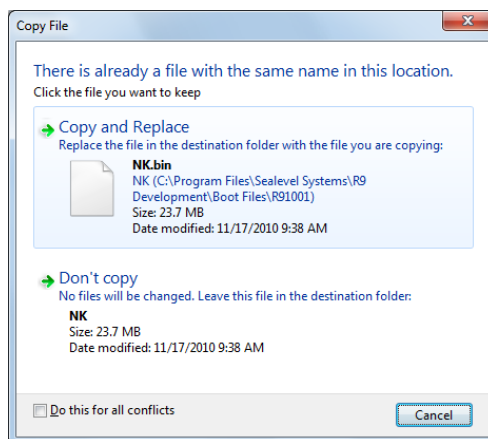


**Figure 34-** Storage Card contents



To save the existing OS runtime image, backup the SD Card contents.

Copy the new OS runtime image to the SDCARD. A popup will appear asking you to over-write your current files. (See Figure 35.)

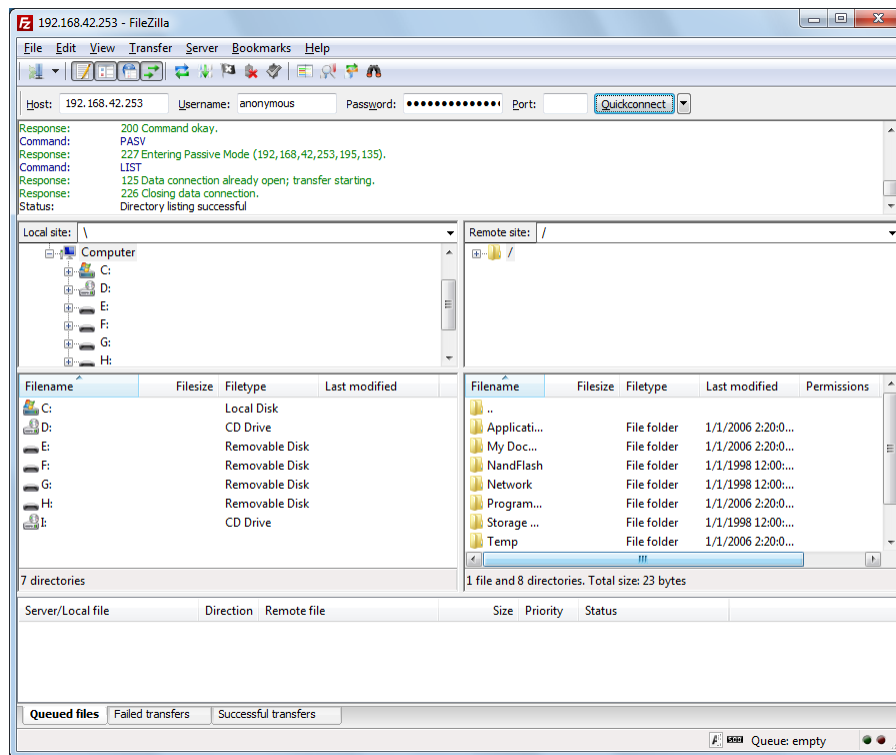


**Figure 35-***Copy and Replace*

Select the "Copy and Replace" option to over-write the existing OS runtime image. Reboot the Relio R9 once the file has been copied. The new OS runtime image will be loaded on bootup.

## FTP Connection

Use an FTP program to connect to the Relio R9 and upload the new OS runtime image to the SDCARD. FileZilla (See Appendix A), an open-source FTP client, is used in the example below. By default, FTP is open to anonymous access with no password needed. (See Figure 36.)



**Figure 36**-Connect to device through FTP

Select the "Storage Card" folder for the remote site. (See Figure 37.)

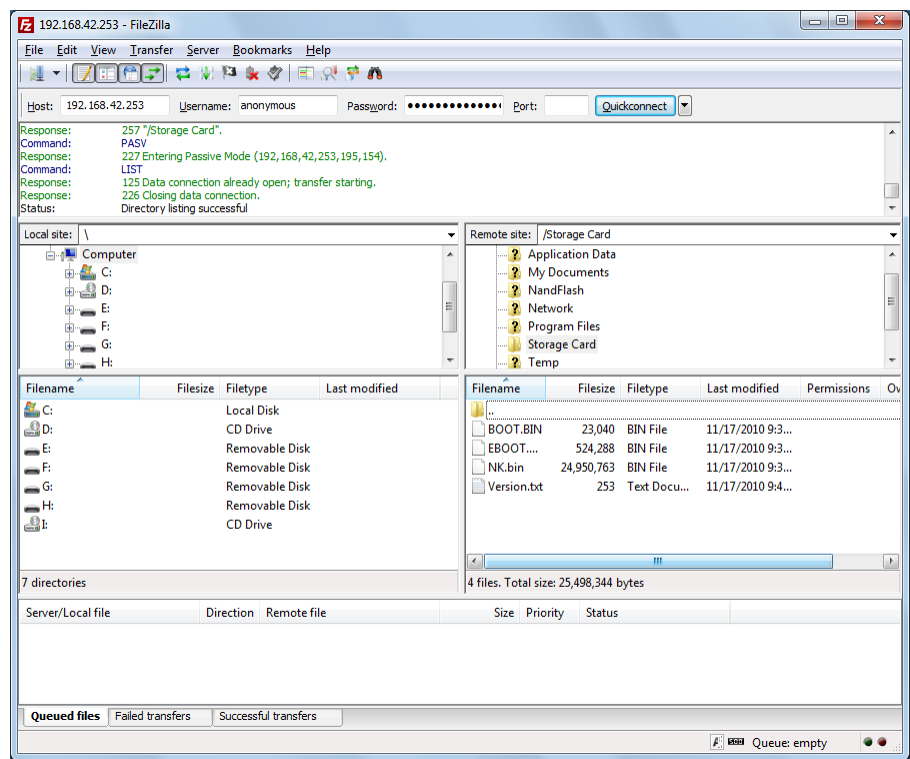
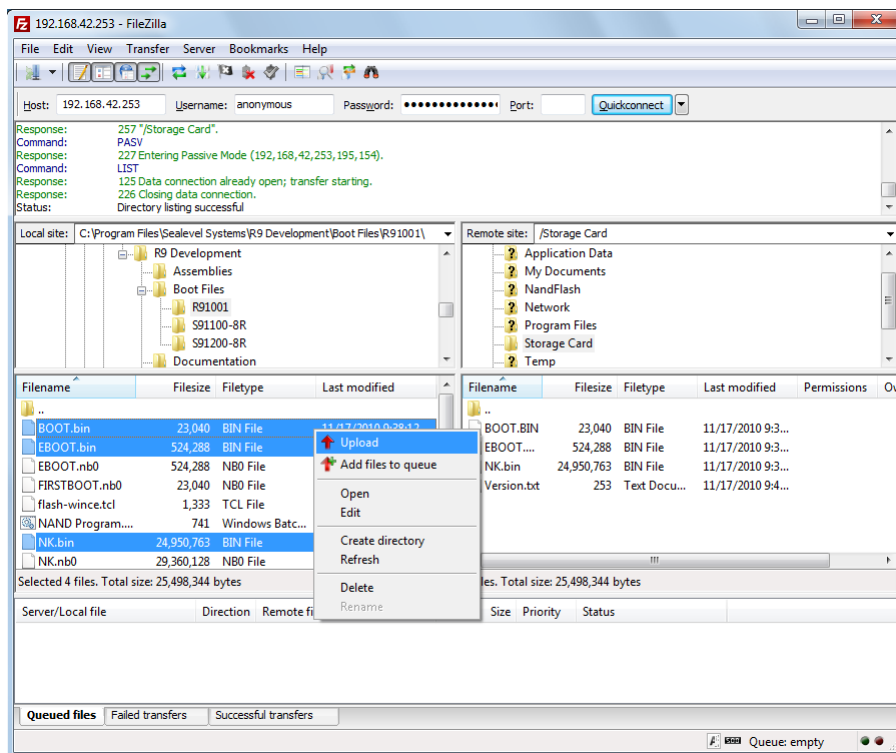


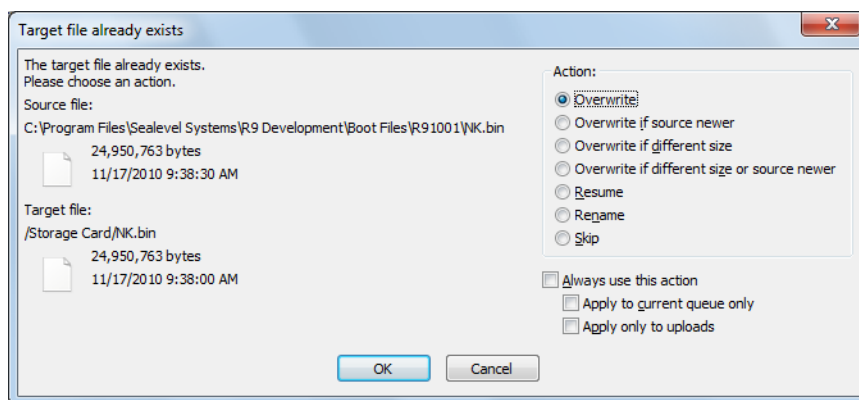
Figure 37-Select Storage Card

Navigate to the “Boot Files” directory of the R9 Development installation. Select the OS Runtime files to copy (\*.bin). Right-click and select “Upload” to begin the file transfer. (See Figure 38.)



**Figure 38**-Select boot files to update

You may be asked how to proceed when replacing existing files. Select the “Overwrite” radio button and click “OK”. (See Figure 39.)



**Figure 39**-Over-write files

Once the files have been uploaded, (See Figure 40.) reboot the device. The new OS runtime image will be loaded on bootup.

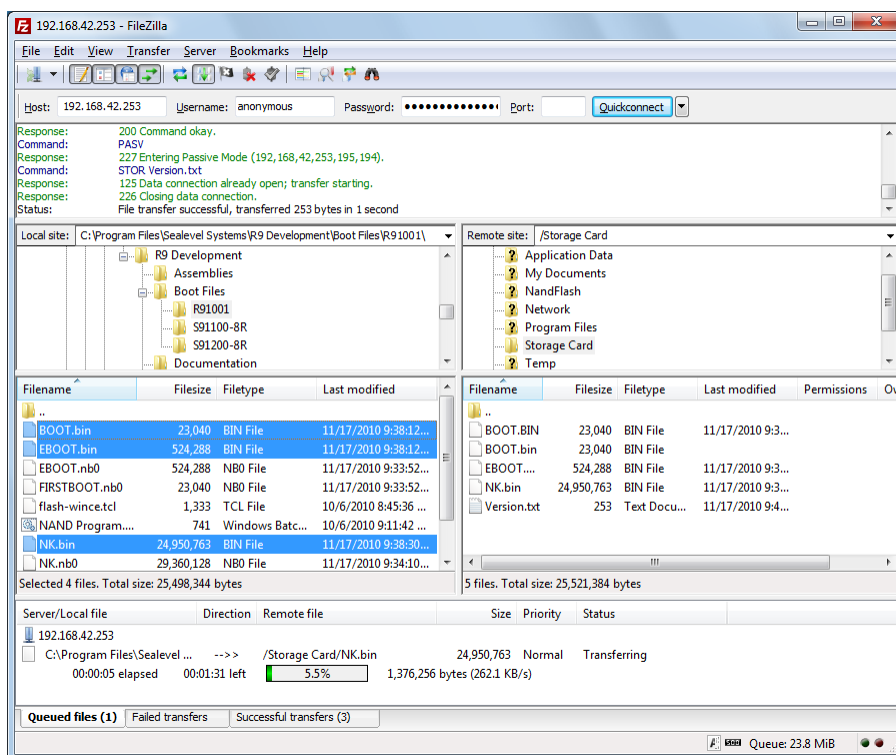


Figure 40-Uploading boot files

## Upgrading the OS Runtime Image on NAND Flash

Factory OS runtime images are stored in the “Boot Files” directory of the R9 Development installation (see Quick start guide). The OS runtime image present in the NAND Flash is programmed through the USB device port connection. Prior to programming an OS runtime, the existing image must be erased. The procedure to erase the NAND Flash is documented in the Debug Port section.

Once the NAND Flash has been erased, use a standard USB device cable, and connect the Type B connector to the Relio R9. Connect Type A connector into the host PC. (See Figure 41.)



**Figure 41-**TR123 tinned leads and Type B USB connector

In Microsoft Windows 7, the device is recognized as a GPS camera and will typically enumerate as a COM port. Check the device manager to determine the COM# associated with the device. If prompted with the New Hardware wizard or the device is not recognized, then install the driver using the following steps (XP menus shown, but Vista is similar). In the Found New Hardware Wizard, specify "Install from a list or specific location" and click Next. (See Figure 42.)



**Figure 42-**Found New Hardware Wizard

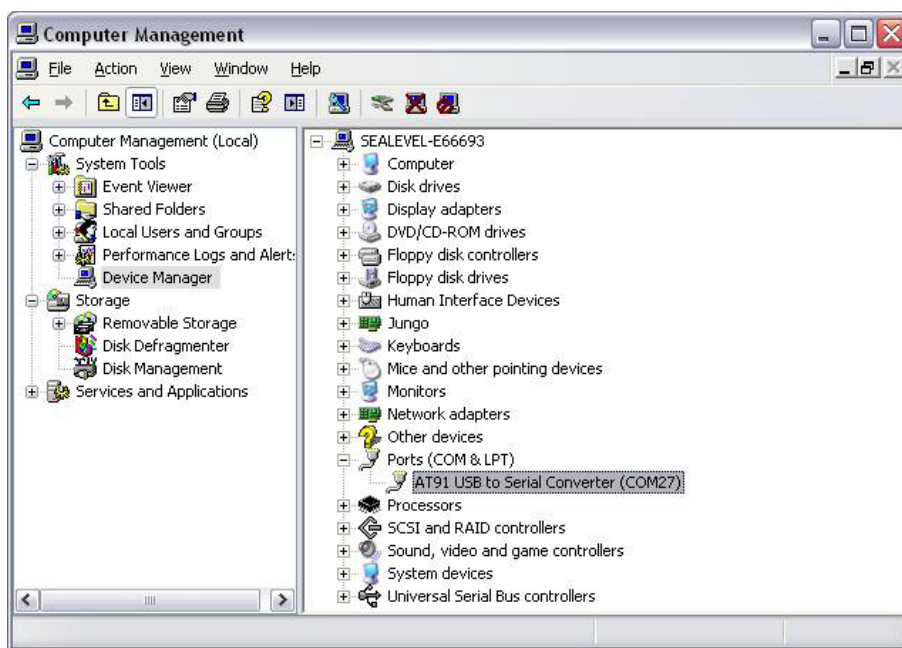
Select "Search for the best driver in these locations" and check "Include this location in the search". Use the Browse button to browse to the "Utilities\SAM-BA\XP driver" directory of the R9 Development installation and click "Next".

The driver should be installed and will come in as "AT91 USB to Serial Converter." Click Finish to complete. (See Figure 43.)



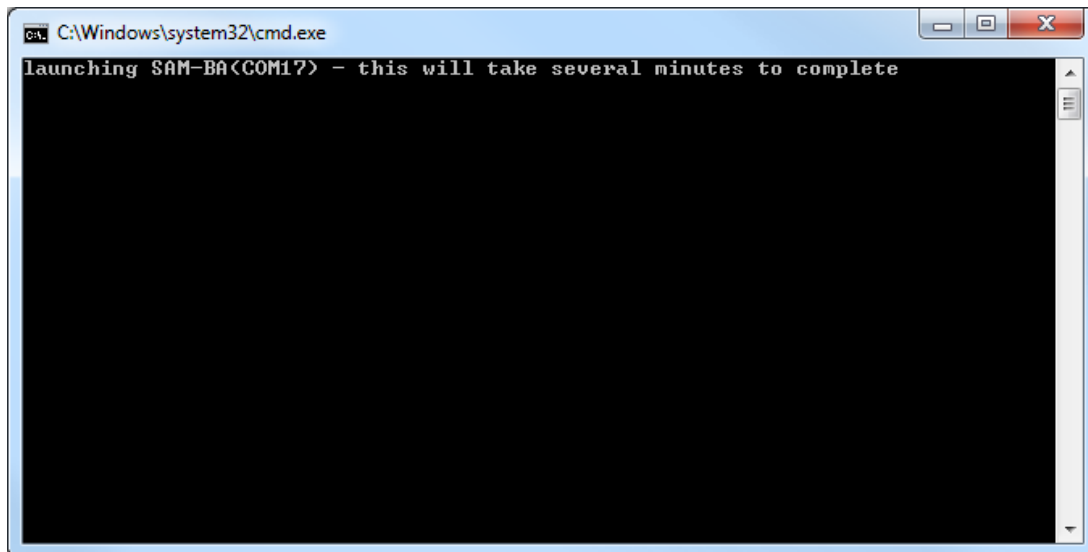
**Figure 43- Driver Installed**

Determine COM port assignment using Device Manager > Ports. The USB function port should be listed. For Windows 7, it may be listed as a GPS camera, otherwise it should be "AT91 USB to Serial Converter." Take note of the COM port assignment, to modify the programming batch file used to program the new OS Runtime image. (See Figure 44.)



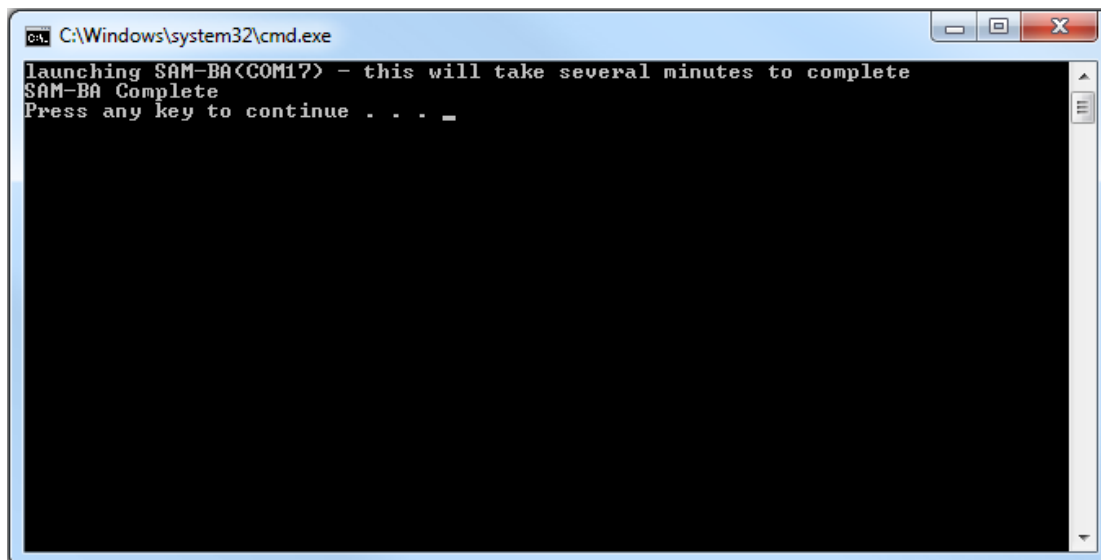
**Figure 44- AT91 COM Port**

Sample scripts have been provided in the R9 Development installation to automate the process of writing a complete OS runtime to the device. The script is configured to target a device attached to COM49 by default. This can be modified simply by editing the comport variable in the “NAND Program.bat” batch file. Once the batch file has been updated to reflect your system configuration, simply double-click the batch file to begin the programming process. The process will take a few minutes. (See Figure 45).



**Figure 45.** Programming NAND (COM17)

Once programming has completed, cycle device power and the OS runtime should boot. (See Figure 46.)



**Figure 46-Programming complete**



As previously mentioned, the process of programming the NAND Flash first erases all content from the NAND Flash. This includes the unique MAC address assigned to your device at the factory. The “finalize.exe” tool is provided in the “Boot Files” directory of the R9 Development installation. Finalize is a command line utility that accepts a MAC address in dashed notation (00-0A-0B-16-12-34). The application should be executed on the device after reprogramming the NAND Flash to reassign the MAC address. Once the application has been executed, the setting is applied upon device restart and persists.

## Network Configuration

The Windows CE that runs on the Relio R9 is initially configured obtain its IP address via DHCP. Settings may be required for DNS or WINS server IP addresses or if you want to set up a static IP address. We have included an application in the OS that enables device configuration through a simple XML file format. The configuration is stored in a file that is kept up to date on the NAND Flash of the device. Likewise, edits to this file can be read as requests to modify the device's configuration. The configuration file can be accessed through ActiveSync using the USB device port connection or through an FTP client if you already know the IP address of the device. This section defines the XML configuration structure and corresponding values applicable for each element of the structure. Throughout this section the following definitions apply:

Term	Definition	Example
[int]	A number	123
[String]	Series of printable characters	This is a test string!234567609
[Multi-line String]	strings separated by \r\n	A\r\nNew\r\nMulti-liner
[Version]	A version number	1.2.3.4
[Boolean]	A binary state	True / False
[MACAddress]	A hardware identifier	00-0A-0B-16-11-1A
[IPAddress]	An IPv4 network address	192.168.0.100



The act of writing a new configuration file to the device will trigger a scan of that file (approximately every 10 seconds). If the file is invalid, it will be replaced with the current configuration. If a single element is invalid, that element and corresponding elements will be replaced with default values. To apply a new configuration, use the <Action> element with a value of "apply" as documented below.

```
<?xml version='1.0'?>
<Configuration>
  <System>
    <OS>WinCE</OS>
    <Version>6.0.0</Version>
    <Runtime>Proconex</Runtime>
    <RuntimeVersion>1.0.0.6</RuntimeVersion>
    <Processor>ATMEL, ARM926EJ-S-AT91SAM9263</Processor>
    <Name>WindowsCE</Name>
    <Description>WindowsCE Device</Description>
    <Owner></Owner>
    <Company></Company>
    <Address></Address>
    <Phone></Phone>
    <Extension></Extension>
  </System>
  <Ethernet>
    <Interface name="EMACB1">
      <DHCP>True</DHCP>
      <MAC>00-0A-0B-16-11-1A</MAC>
      <IPAddress>192.168.99.101</IPAddress>
      <Subnet>255.255.255.0</Subnet>
      <Gateway>192.168.99.1</Gateway>
      <Wifi enabled="True">
        <SSID>TESTNETWORK</SSID>
        <Mode>Infrastructure</Mode>
        <Channel>11</Channel>
        <Security>Wpa2Aes</Security>
        <Key encoding="Pass">*****</Key>
      </Wifi>
    </Interface>
  </Ethernet>
</Configuration>
```

Sample configuration.xml read from device.

## <Configuration> -Structure

The configuration element is the root XML element. This element must be present, or the configuration file will not be considered valid. Invalid configurations will be replaced with a default configuration.

### <SYSTEM> -STRUCTURE

The system element contains all of the system information elements. This element must be a child of the Configuration element. This element must be present, or the configuration file will not be considered valid.

#### <OS> - READONLY [STRING]

The OS element contains a string representation of the Operating System name. This element must be a child of the System element. In the case of R9 products, this will be equivalent to "WinCE".

#### **<VERSION> - READONLY [VERSION]**

The version element contains a dot-notation version string. This element must be a child of the System element. This version is associated with the Operating System element.

#### **<RUNTIME> - READONLY [STRING]**

This element contains a string representation of the specific OS Runtime Image. This element must be a child of the System element.

#### **<RUNTIMEVERSION> - READONLY [VERSION]**

This element contains a dot-notation version string. This element must be a child of the System element. This version is associated with the OS Runtime Image.

#### **<PROCESSOR> - READONLY [STRING]**

This element contains a Processor Identification string. This element must be a child of the System element.

#### **<NAME> - READ/WRITE [STRING]**

This element may contain the device name string. This element must be a child of the System element. This identifier is used as the WinCE host name.

#### **<DESCRIPTION> - READ/WRITE [STRING]**

This element may contain the device description string. This element must be a child of the System element. This element can be used to further identify a device.

#### **<OWNER> - READ/WRITE [STRING]**

This element may contain a string that can be used to identify a person or department responsible for maintaining a device. This element must be a child of the System element.

#### **<COMPANY> - READ/WRITE [STRING]**

This element may contain a string that can be used to identify the Company to which the device Owner is associated. This element must be a child of the System element.

#### **<ADDRESS> - READ/WRITE [MULTI-LINE STRING]**

This element may contain a multi-line string (\r\n separated) to identify the location of the device Owner. This element must be a child of the System element.

### **<PHONE> - READ/WRITE [STRING]**

This element may contain a string representation of a telephone contact number for the device Owner. This element must be a child of the System element.

### **<EXTENSION> - READ/WRITE [STRING]**

This element may contain a string representation of a telephone extension for the device Owner. This element must be a child of the System element.

## **<ETHERNET> - STRUCTURE**

The Ethernet element contains a list of Ethernet interfaces available to the device. This element must be a child of the Configuration element.

### **<INTERFACE NAME=""> - STRUCTURE (ATTRIBUTE READONLY [STRING])**

The interface element is a container for the interface settings that are specific to the interface identifiable as "name". This element must be a child of the Ethernet element. The name attribute is read-only and is used to uniquely distinguish Interface settings for the case where there are multiple Ethernet interfaces available.

### **<DHCP> - READ/WRITE [BOOLEAN]**

This element contains a Boolean value indicating whether DHCP Address resolution is enabled or disabled. This element must be a child of the Ethernet element. Valid values are True or False.

### **<MAC> - READONLY [MACADDRESS]**

This element contains a dash delimited string containing the unique MAC address of this interface. This element must be a child of the Ethernet element. The first 3 octets identify the device as a Sealevel product (00-0A-0B). The fourth octet can be used to determine the product family (16). And the last two octets will be unique for each device (11-1A).

### **<IPADDRESS> - READ/WRITE [IPADDRESS]**

This element may contain the current DHCP acquired IP Address or the current static IP address depending on the state of the DHCP element. This element must be a child of the Ethernet element. Assigning a value to this element when DHCP is enabled has no effect.

# Specifications

## Dimensions

Length	Width	Height
7.5"	5.1"	1.3"

## Power Consumption

Supply line	7 – 30VDC Input
Rating	10 W Max (2.5W Nominal)

Connector	7 – 30VDC / GND on left side of enclosure
Manufacturer	Weco
Part Number	121-M-211/02
Description	2 Position Right Angle 5.08mm Header
Mates with	Weco 121-A-111/02 2 Position 5.08mm Pluggable Screw Terminal

## Environmental Specifications

Specification	Operating	Storage
Temperature Range	-40° to 85° C	-60° to 150° C
Humidity Range	10 to 90% R.H. Non-Condensing	10 to 90% R.H. Non-Condensing

## Manufacturing

All Sealevel Systems Printed Circuit boards are built to UL 94V0 rating and are 100% electrically tested. These printed circuit boards are solder mask over bare copper or solder mask over tin nickel.

# Appendix A – Resources

## Books

Professional Microsoft Windows Embedded CE 6.0, Wrox, Phung.

<http://it-ebooks.info/book/1461/>

Programming Windows Embedded CE 6.0 Developer Reference, Microsoft Press, Boling.

<https://www.microsoft.com/learning/en-us/book.aspx?id=11064> Web Sites

## Websites

Atmel SAM-BA In-System Programmer (ISP)

<http://www.atmel.com/tools/atmelsam-bain-systemprogrammer.aspx>

FileZilla Open-Source FTP Client

<http://www.filezilla-project.org>

Microsoft Windows Embedded Home Page

<http://www.microsoft.com/windowseembedded/en-us/windows-embedded.aspx>

Microsoft Windows Embedded CE 6.0 Online Documentation

[https://msdn.microsoft.com/en-us/library/ee504812\(v=winembedded.60\).aspx](https://msdn.microsoft.com/en-us/library/ee504812(v=winembedded.60).aspx)

Microsoft ActiveSync Download

<http://www.microsoft.com/windowsmobile/en-us/help/synchronize/ActiveSync-download.mspix>

Microsoft Mobile Device Center 6.1

<https://support.microsoft.com/en-us/kb/931937>

Microsoft .NET Compact Framework

<https://msdn.microsoft.com/en-us/library/ms376787.aspx>

PuTTY Telnet/SSH Client Application

<http://en.wikipedia.org/wiki/PuTTY>

## Appendix B – Relio R9 Internal Connector Reference

The following table details the connectors, jumpers, and test points located inside the Relio R9. To access you will need to remove the cover of the Relio R9. The connectors, jumpers, and test points are labeled by reference designator on the board silkscreen.

Reference Designator	Signal Description
P2	LCD, Backlight, and touchscreen controller
J6	RS-232 serial debug port
<b>Jumpers</b>	
J1	Jumper - NAND Flash write protect
J2	Jumper - NAND Flash enable (Installed by default)
J4	Jumper - CAN Bus Termination (Installed by default)
J16	Jumper - Enable Push-button Reset (Installed by default)
<b>Test Points</b>	
TP1	Test Point - Analog ground
TP2	Test Point - Received analog input
TP3	Test Point – Ground
TP4	Test Point – Ground

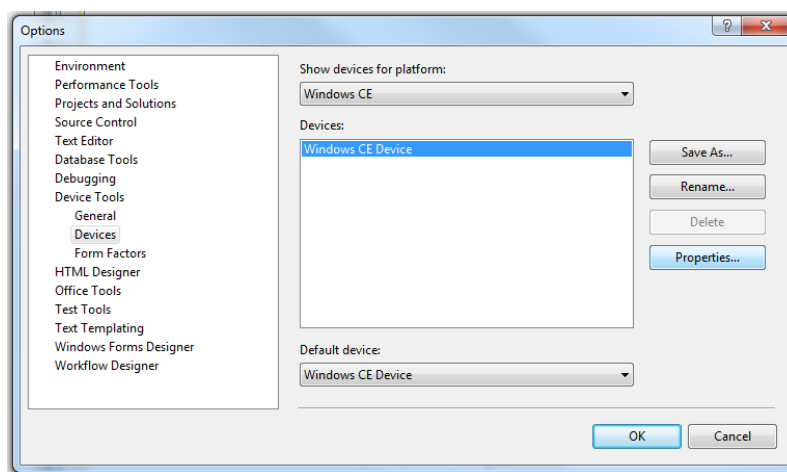
# Appendix C – Application Debugging over Ethernet

Applications can be debugged over an Ethernet connection in place of USB by configuring Visual Studio to directly connect to your device. For this method to work properly, the Ethernet connection to the device must be properly configured to allow normal TCP/IP communications and you must know the IP address of the device you wish to execute the application on. For further information about configuring the Ethernet of the device see the Network Configuration section.

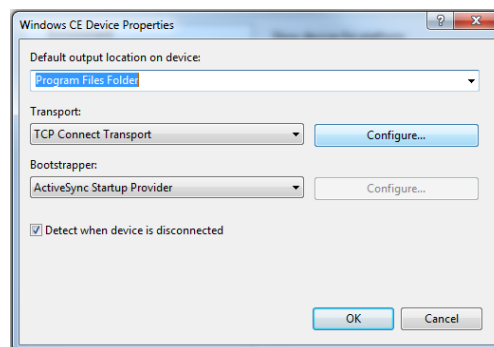
To configure Visual Studio to use your device for debugging over Ethernet, click the “Device Options” button on the Device toolbar. See below.



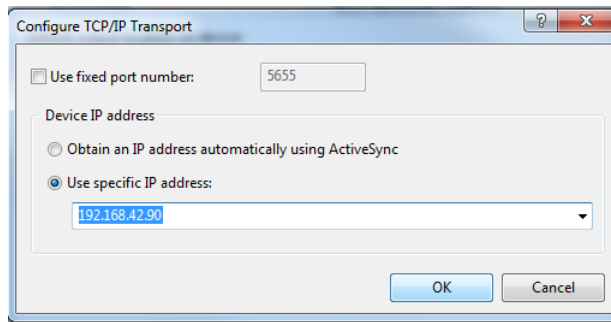
On the “Device Options” dialog, select the “Windows CE” platform and click the “Properties...” button. See below.



On the “Windows CE Device” properties dialog click the “Configure...” button. See below.

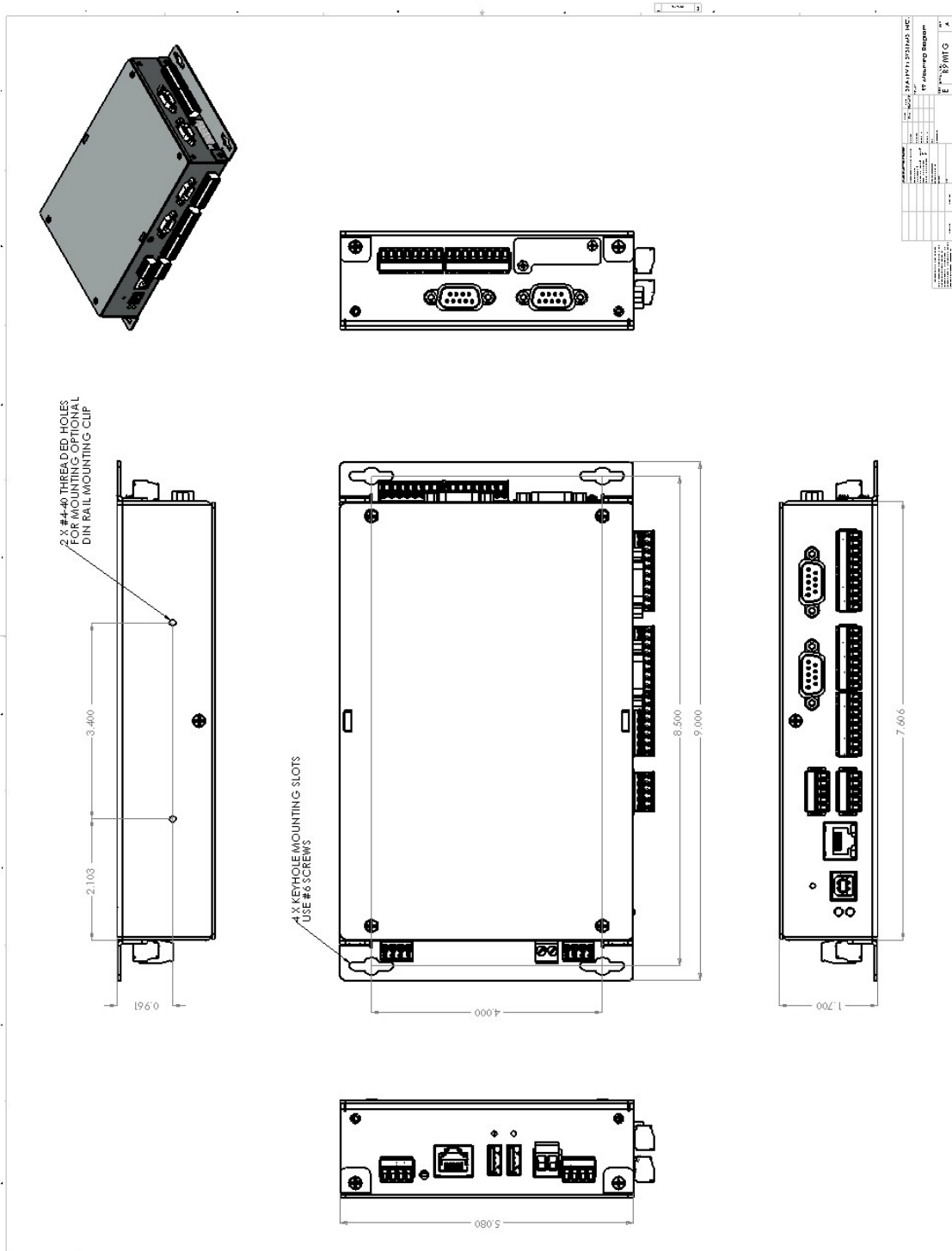


Now click the “Use specific IP address” radio button and type the IP address of the device in the text box. See below.



Click the “OK” button on all of the dialog windows and you should now be able to connect to the device through Ethernet for debugging. The application debugging guide can be continued as normal.

## Appendix D – CAD Drawing



# Appendix E – How To Get Assistance

Please refer to [Appendix F](#) - Troubleshooting prior to calling Technical Support.

1. Read this manual thoroughly before attempting to install the adapter in your system.
2. When calling for technical assistance, please have your user manual and current adapter settings. If possible, please have the adapter installed in a computer ready to run diagnostics.
3. Sealevel Systems maintains a Home page on the Internet. Our home page address is [www.sealevel.com](http://www.sealevel.com). The latest software updates, and newest manuals are available via our FTP site that can be accessed from our home page.
4. Technical support is available Monday to Friday from 8:00 AM to 5:00 PM Eastern time. Technical support can be reached at (864) 843-4343.

**RETURN AUTHORIZATION MUST BE OBTAINED FROM SEALEVEL SYSTEMS BEFORE RETURNED MERCHANDISE WILL BE ACCEPTED. AUTHORIZATION CAN BE OBTAINED BY CALLING SEALEVEL SYSTEMS AND REQUESTING A RETURN MERCHANDISE AUTHORIZATION (RMA) NUMBER.**

# Appendix F – Troubleshooting

The product should provide years of trouble-free service. However, in the event that device appears to not be functioning incorrectly, the following tips can eliminate most common problems without the need to call Technical Support.

1. Make sure the Sealevel Systems product is installed properly.
2. If you are utilizing an operating system prior to Windows 7, please contact Sealevel's Technical support as directed below to receive more information regarding the utility software which will determine if your product is functioning properly.
3. Only users running Windows 7 or newer should utilize the diagnostic tool '[WinSSD](#)' installed in the SeaCOM folder on the Start Menu during the setup process. First find the ports using the Device Manager, then use 'WinSSD' to verify that the ports are functional.
4. Always use the Sealevel Systems diagnostic software when troubleshooting a problem. This will help eliminate any software issues and identify any hardware conflicts.

If these steps do not solve your problem, please call Sealevel Systems' Technical Support, (864) 843-4343. Our technical support is free and available from 8:00 A.M.- 5:00 P.M. Eastern Time Monday through Friday. For email support contact [support@sealevel.com](mailto:support@sealevel.com).

# Warranty

Sealevel's commitment to providing the best I/O solutions is reflected in the Lifetime Warranty that is standard on all Sealevel manufactured I/O products. W Relio™ industrial computers are warranted for a period of two years and the Relio™/SeaPAC™ /SBC R9 family is warranted for a five year period from date of purchase. We are able to offer this warranty due to our control of manufacturing quality and the historically high reliability of our products in the field. Sealevel products are designed and manufactured at its Liberty, South Carolina facility, allowing direct control over product development, production, burn-in and testing. Sealevel achieved ISO-9001:2015 certification in 2018.

## Warranty Policy

Sealevel Systems, Inc. (hereafter "Sealevel") warrants that the Product shall conform to and perform in accordance with published technical specifications and shall be free of defects in materials and workmanship for the warranty period. In the event of failure, Sealevel will repair or replace the product at Sealevel's sole discretion. Failures resulting from misapplication or misuse of the Product, failure to adhere to any specifications or instructions, or failure resulting from neglect, abuse, accidents, or acts of nature are not covered under this warranty.

Warranty service may be obtained by delivering the Product to Sealevel and providing proof of purchase. Customer agrees to ensure the Product or assume the risk of loss or damage in transit, to prepay shipping charges to Sealevel, and to use the original shipping container or equivalent. Warranty is valid only for original purchaser and is not transferable.

This warranty applies to Sealevel manufactured Product. Product purchased through Sealevel but manufactured by a third party will retain the original manufacturer's warranty.

## Non-Warranty Repair/Retest

Products returned due to damage or misuse and Products retested with no problem found are subject to repair/retest charges. A purchase order or credit card number and authorization must be provided in order to obtain an RMA (Return Merchandise Authorization) number prior to returning Product.

## How to obtain an RMA (Return Merchandise Authorization)

If you need to return a product for warranty or non-warranty repair, you must first obtain an RMA number. Please contact Sealevel Systems, Inc. Technical Support for assistance:

Available	Monday – Friday, 8:00AM to 5:00PM EST
Phone	864-843-4343
Email	<a href="mailto:support@sealevel.com">support@sealevel.com</a>

## Trademarks

Sealevel Systems, Incorporated acknowledges that all trademarks referenced in this manual are the service mark, trademark, or registered trademark of the respective company.