# RIO-2010PG

## FreeRTOS Programmable Remote I/O Module

## User Guide

Version 1.0

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# 1. Introduction

RIO-2010PG is a FreeRTOS Programmable Remote I/O Module.

## 1.1 Features

- NXP LPC1768 ARM Cortex-M3 100MHz
- 512KB on-chip flash, 64KB SRAM
- One full modem RS-232 and one isolated RS-485 serial port
- One 10/100Mbps Ethernet ports
- One serial console port
- Support lwIP and BSD socket library
- Support tiny Web server
- Windows configuration utility included
- Tool chain: Sourcery CodeBench Lite (www.mentor.com) or Keil from ARM

## 1.2 Specification

- **CPU:** NXP LPC1768 Cortex-M3 100MHz
- **Serial port:**
  - Port1: RS-232 full modem
  - Port2: RS-485 2500Vrms isolated
  - Console: RS-232 three wires
  - Baud rate: 1200 to 921600bps
  - Flow control: None / Hardware / Xon_Xoff
  - Data bit: 5 to 8
  - Stop bit: 1 to 2
  - Protection: 15KV ESD
- **Ethernet:**
  - 10/100Mbps, RJ45
  - Protection: 1500V Magnetic isolation
- **Isolation digital input:**
  - Channel number: 16
  - Photo isolation (AC in): 2500Vrms
  - Logical High: 5~24Vdc
  - Logical Low: 0~1.5Vdc
  - Input resistance: 1.2KOhms @0.5W
- **Relay output:**
  - Channel number: 8
  - Contact rating: 30VDC@1A or 125VAC@0.5A
- **1-Wire port:** Three-pin terminals x 3 (Maxim 1-Wire)
- **Power:** 9~48VDC power jack and terminal block
- **Dimension:** 182 x 118 x 35.82mm (W x H x D)

- **Operating Temperature:** 0~70°C
- **Storage Temperature:** -20~85°C

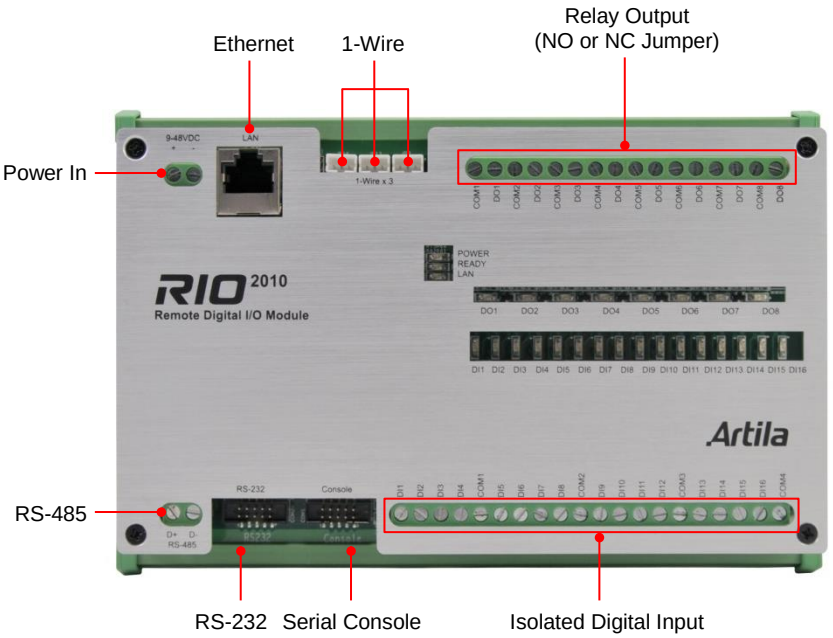
## 1.3 Packing List

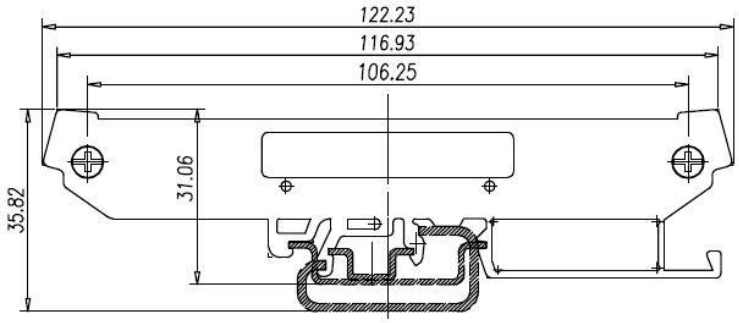
- RIO-2010PG: Programmable remote I/O module
- Software toolchain (download from Artila cloud)
- Manager Utility (download from Artila cloud)

## 1.4 Optional Accessory

- CBL-F10M9-20 (91-0P9M9-001): Serial Console Cable (10Pin Header to DB9 male)
- DS18B20 (91-6DS18-001): Programmable Resolution 1-wire Digital Thermometer
- PWR-12V-1A (31-62100-000): 110~240VAC to 12VDC 1A Power Adaptor

# 2. Layout


Ethernet
1-Wire
Relay Output
(NO or NC Jumper)
Power In
RS-485
RS-232
Serial Console
Isolated Digital Input
RIO 2010
Remote Digital I/O Module
Artila


122.23
116.93
106.25
31.06
35.82

# 3. Pin Assignment and Definition

## 3.1 Power Connector

Connecting 9~48VDC power line to the Power in terminal block. If the power is properly supplied, the Power LED will keep solid green color and a beep will be heard.

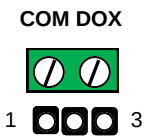
## 3.2 LED Status

The LED provides the RIO-2010PG operation information. The LED status is described as follow:

- **Power (PWR) LED:** Power LED keeps ON if power (+9VDC to +48VDC) is correct.
- **Ready (RDY) LED:** Ready LED keeps ON when RIO-2010 firmware is ready for operation.
- **Link / Act (LAN) LED:** Link and Activity LED will turn ON when the Ethernet cable is connected. When there is network data traffic, this LED will flash.
- **LED 1 / 2 / 3:** These LEDs are dual color and they indicates the serial data traffic of RS-485, RS-232 and serial console respectively. The Yellow LED stands for receiving data and Green LED means transmitting data.
- **LED DO1 / DO8:** These LEDs indicates the DO status. When the coil of relay is energized, the LED will be ON.
- **LED DI1 / DI16:** These LEDs indicates the DI status. When the input is high, the LED will be ON.

## 3.3 Jumper Setting of Relay Output (JP5 ~ JP12)

- **Normal open:** when jumper is shorted to **2-3**, the terminal (DOX and COM) is normal open when DO LED is off.
- **Normal close:** when jumper is connect to **1-2**, the terminal (DOX and COM) is normal close when DO LED is off.




> ☞ **Note**
>
> JP2 and JP4 are designed for factory usage and should be set to position 2-3.

## 3.4 Serial Port Connector

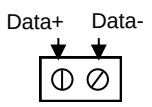
- **RS-485:**

Data+ is pull up to isolated 3.3VDC with 10K Ohm resistor.

Data– is pull low to isolated ground.

Termination resistor is not included. User can add a termination resistor to pad at position R37 for SMD resistor or dual hole for DIP type resistor.

**COM1: RS-485**

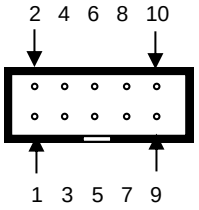


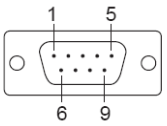

- **RS-232 and Console Port:**

Serial Port and serial console port use 10-pin header. Please use console cable (91-09PM9-001) to convert it to DB9 male RS-232 interface.

| Pin | COM2 | COM3 |
|---|---|---|
| 1 | DCD | N/C |
| 2 | DSR | N/C |
| 3 | RXD | RXD |
| 4 | RTS | N/C |
| 5 | TXD | TXD |
| 6 | CTS | N/C |
| 7 | DTR | N/C |
| 8 | N/C | N/C |
| 9 | GND | GND |
| 10 | N/C | N/C |

**COM2: RS-232**
**COM3: Console**



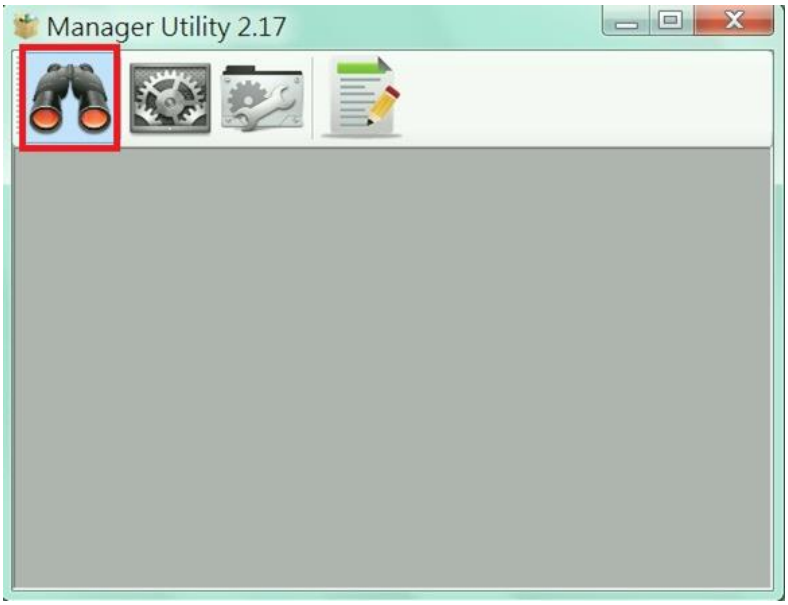



# 4. Install Manager Utility Software

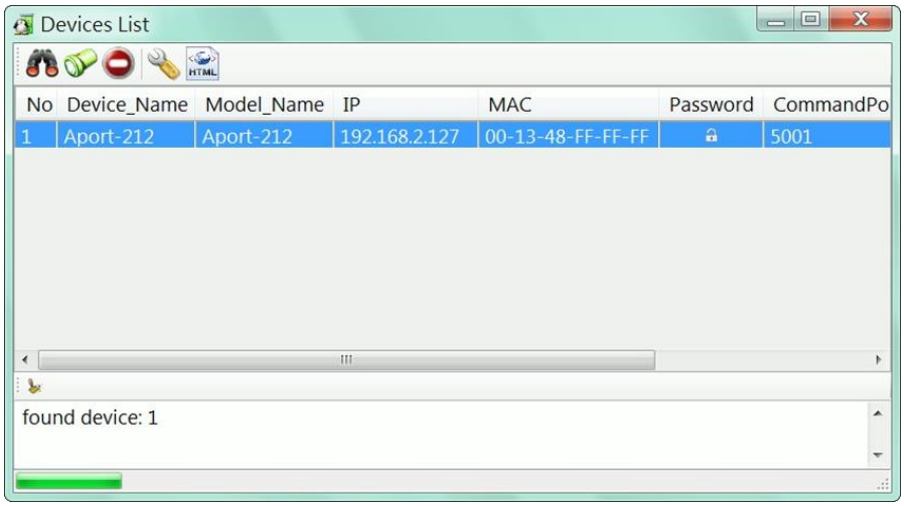
RIO-2010PG comes with Manager utility where you can find many useful software utilities. You need to install Manager Utility first prior to configure the RIO-2010PG. To install the Manager Utility, please find the ManagerUtilitysetup.exe as shown following:

## 4.1 Broadcast Search

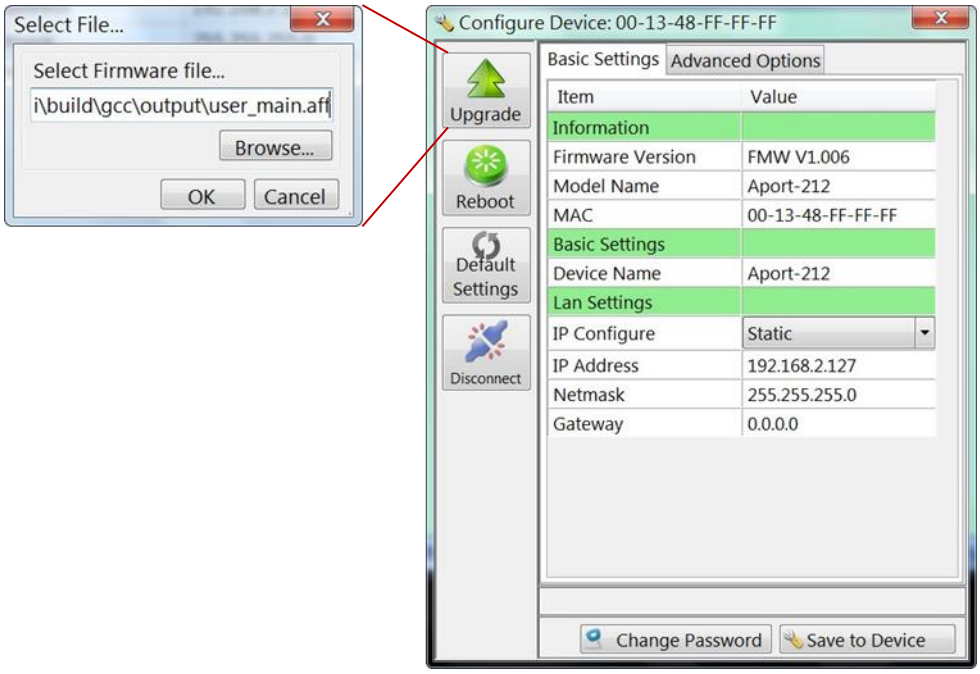
Once start Manager utility, you can click telescope icon to search the RIO-2010PG in the network.




Click the device to configure its settings.



Click the upgrade to upload the new firmware ***user_main.aff.***



# 5. Install Software Toolchain

The ToolChain, Sourcery CodeBench Lite ARM EABI Release is available at:
http://www.mentor.com/embedded-software/sourcery-tools/sourcery-codebench/editions/lite-edition/.

Configure the environment to add the path of the toolchain. After installing toolchain, a new path will be added to Windows Environment i.e.

***Sourcery_CodeBench_Lite_for_ARM_EABI\bin***

Restart the computer to make the new environment effective. After installation, you can test toolchain as follow:

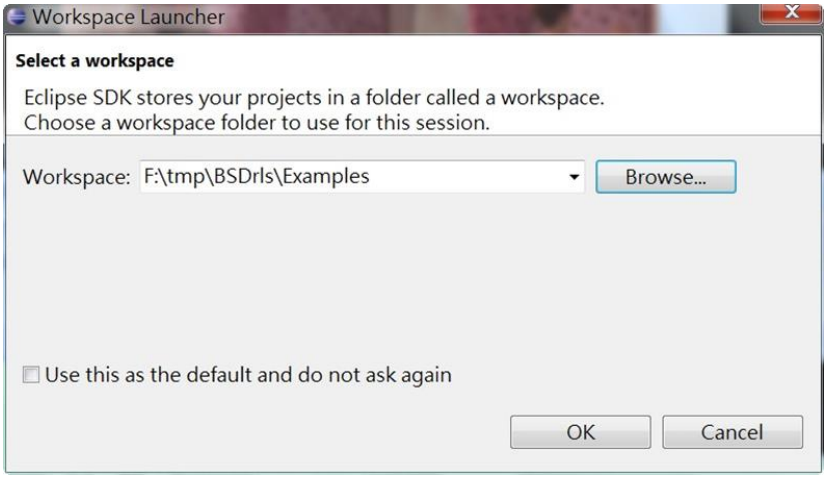
# 6. Install Eclipse IDE

If you are interesting in using IDE to develop your program, the eclipse IDE is available at: http://www.eclipse.org/downloads/.

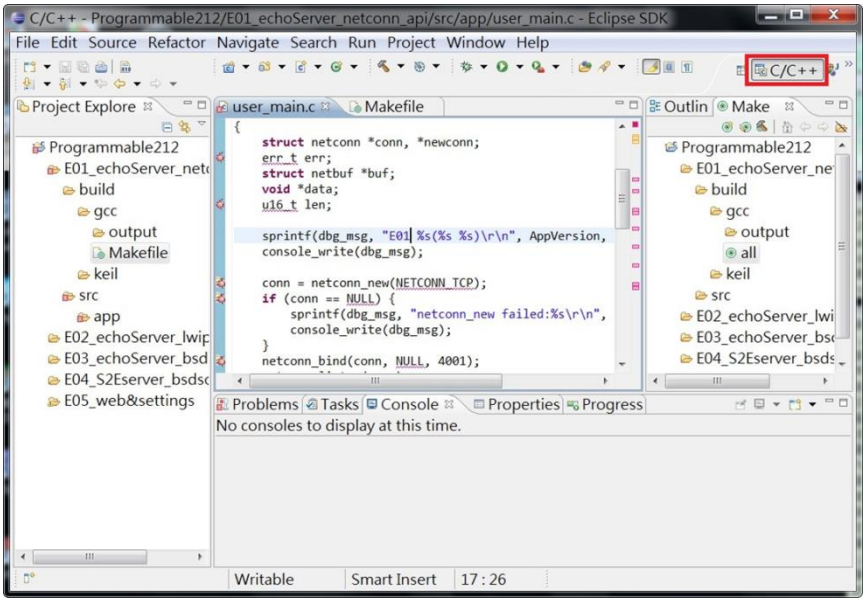
And choose C / C++ compiler option.

## 6.1 Start Your First Porject

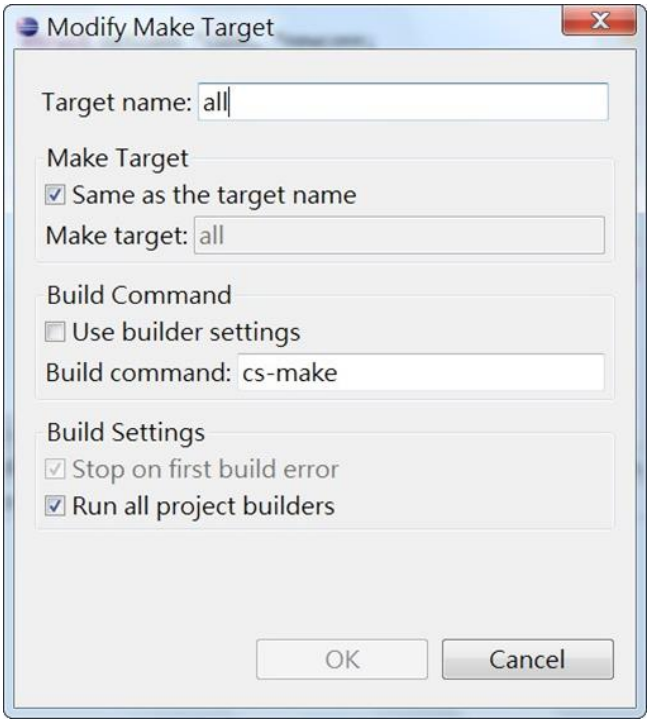
Run eclipse and select a workspace: BSDrls\Examples. You can find the path of the example program on Artila FTP with path: **BSDrls\Examples**



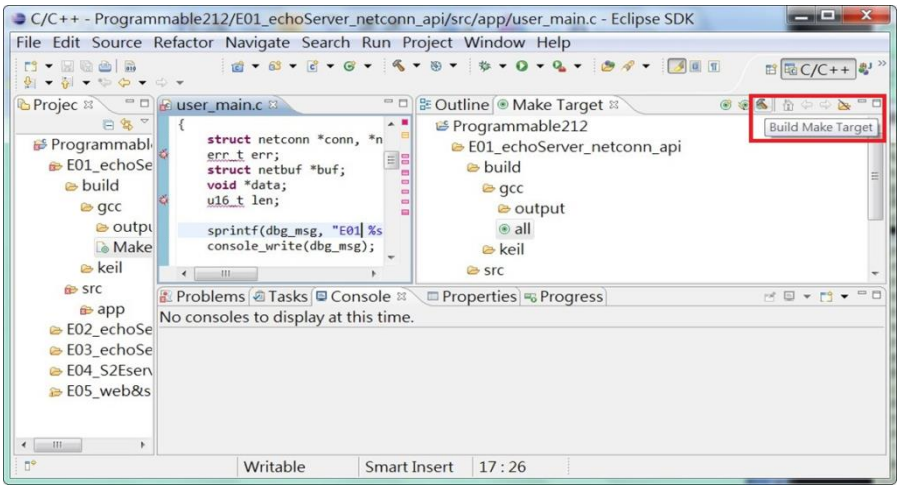
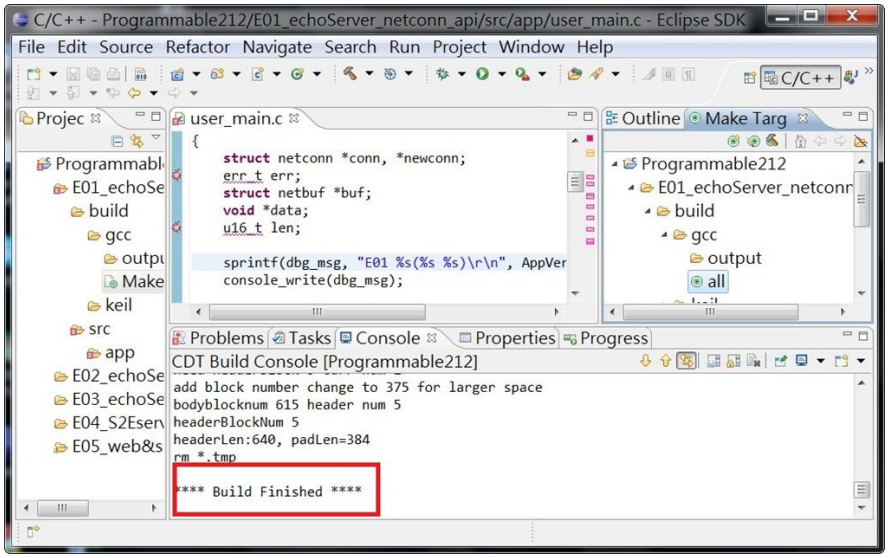

Choose C/C++ in the Workbench.



Modify the make file to compile the program as follow:




Use make file to build target.



Once project is built, you will find the target execution file ***user_main.aff*** is generated and available at: ***E01_echoServer_netconn_api\build\gcc\output***