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2010年4月1日
瑞萨电子公司

【发行】瑞萨电子公司（http://www.renesas.com）

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User's Manual

M16C R8C FOUSB/UART 软件

瑞萨单片机开发环境系统
M16C族R8C/Tiny系列单片机
连接R8C/14、 R8C/15、 R8C/16、 R8C/17的注意事项

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1. 系统连接

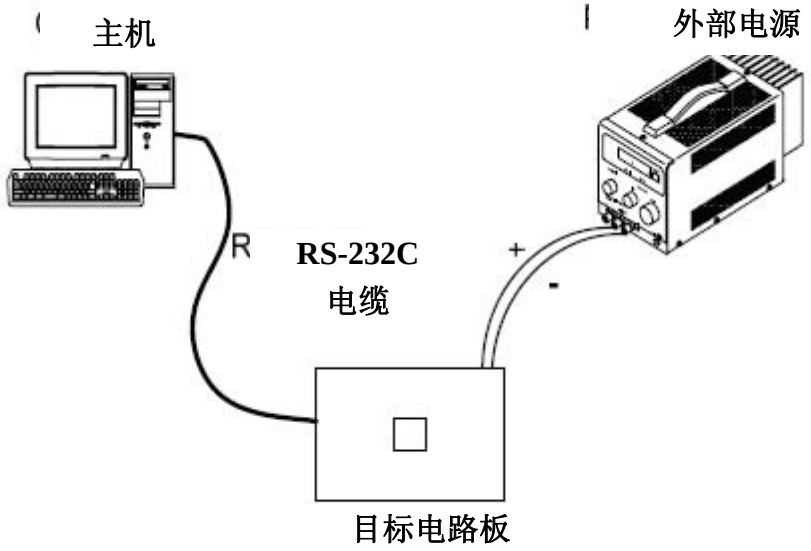


图 1 与用户系统的连接示例

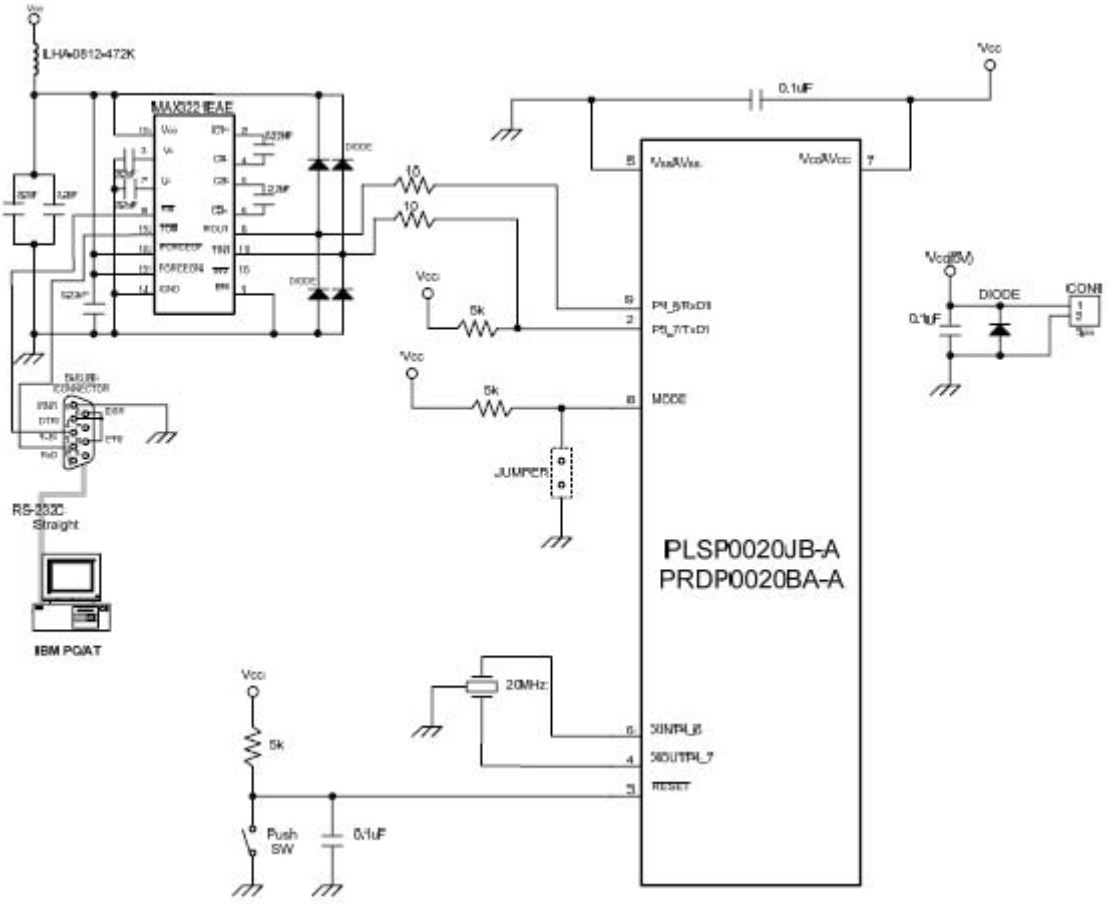


图 2 与 RS232C 电缆连接的电路示例

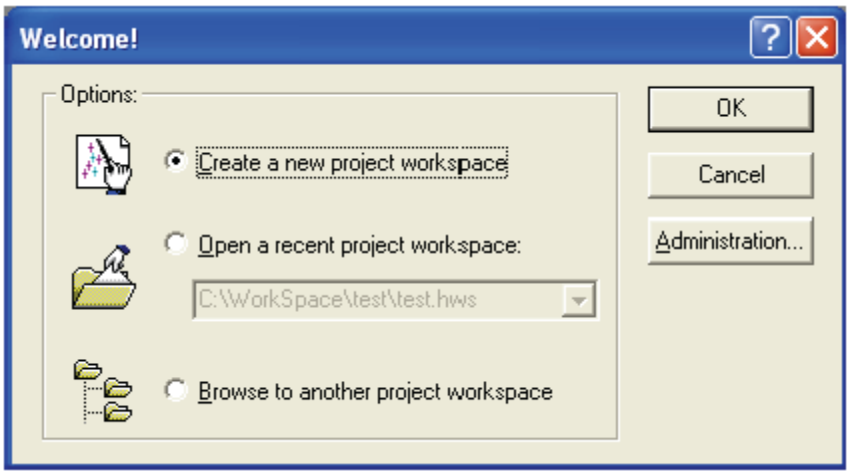
2. 设置 M16C R8C FoUSB/UART 调试软件

在使用 M16C R8C FoUSB/UART 调试软件(R8C UART 调试软件)时，用 RS232C 连接电缆将主机和目标板连接起来，就可以进行调试了。

用户不需要事先安装监控程序，因为监控程序已经在安装 M16C R8C FoUSB/UART 调试软件时捆绑安装了。

对 R8C/Tiny，用户不需要使用 M16C FlashStarter 或其它软件预先将监控程序烧写到目标单片机中，因为 R8C UART 调试软件将自动完成这一步骤。

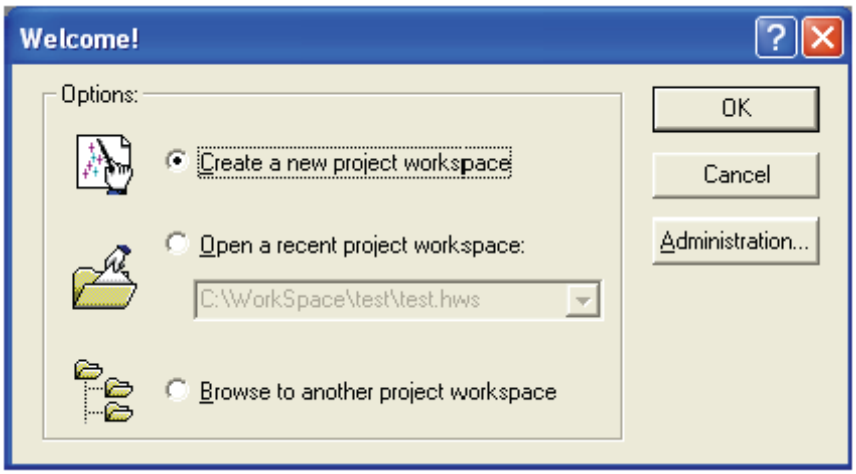
(a) 启动HEW。 依次点击“开始”、“所有程序（P）”、“RENESAS”、“High-performance Embedded Workshop”和“High-performance Embedded Workshop”图标。将弹出“Welcome！”对话框。



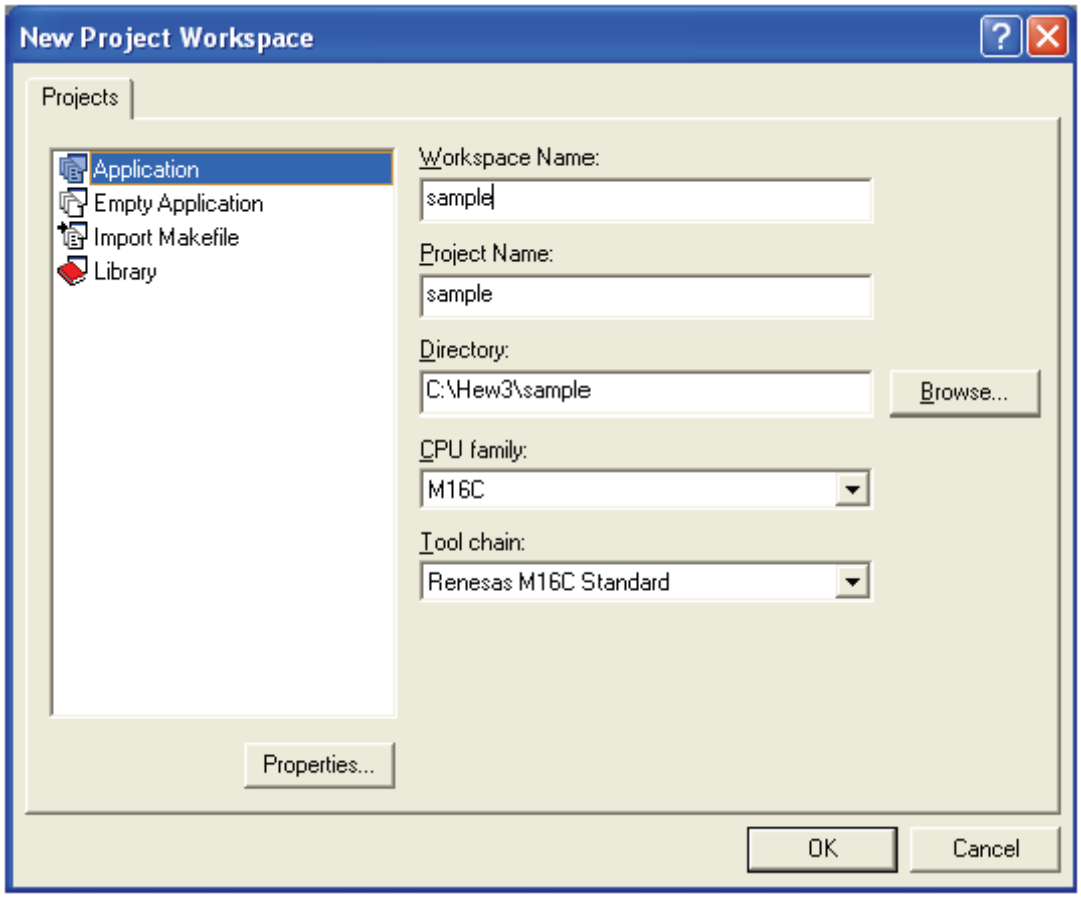
- [Create a new project workspace]
  选择创建新的工作空间。
- [Open a recent project workspace]
  选择已经存在的工作空间。
  显示使用的历史工作空间。
- [Browse to another project workspace]
  选择已经存在的工作空间。
  当历史工作空间没有保留时使用。

如果选择已经存在的工作空间并点击[OK]按钮，将显示如图 (s) 的界面。

(b) 选择[Create a new project workspace]单选按钮。点击“OK”按钮。

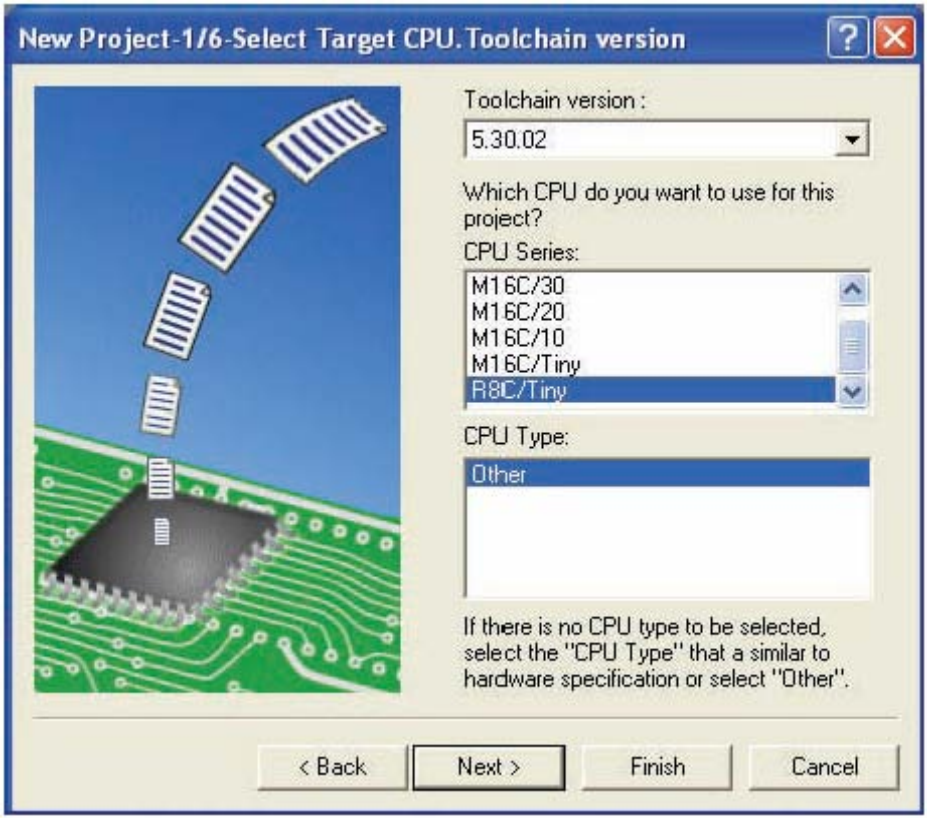


(c) 开始创建工程。当安装工具链时，将显示如下对话框。



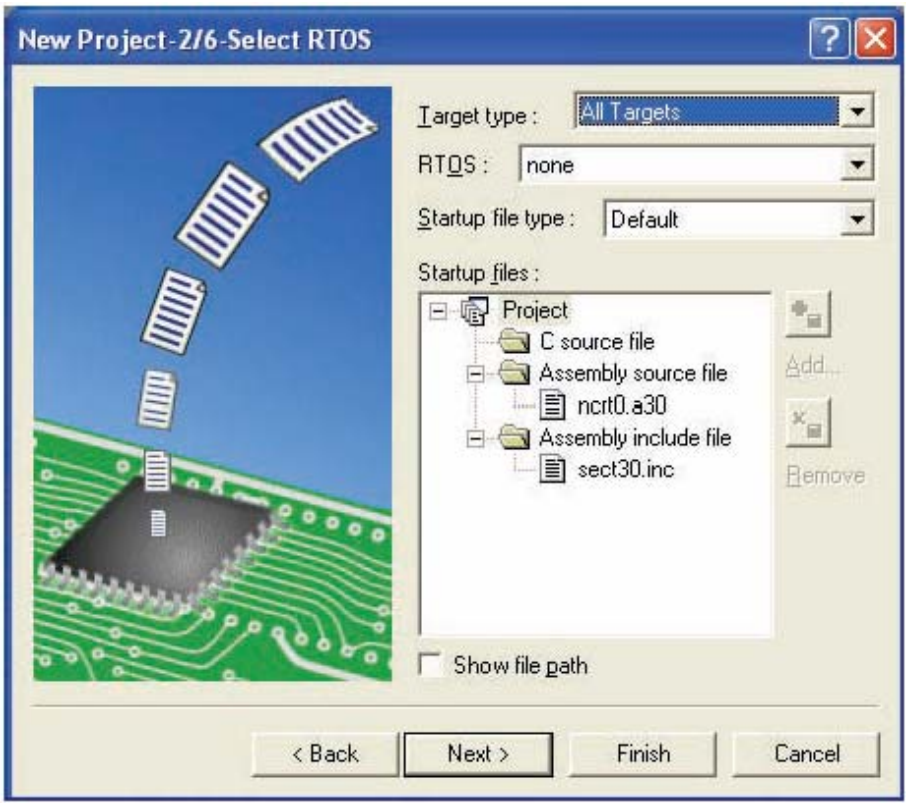
- [Workspace name]
  新建工作空间名称。这里以“Sample”为例。
- [Project name]
  如果用户希望改变工程名称，请输入新的工程名称。
- [CPU type]
  选择使用的单片机型号。
- [Tool chain]
  如果使用工具链，选择适用的工具链名称。如果不使用，选择[None]。
- [Project type]
  选择一个想使用的工程类型。

(d) **下一步，设置工具链。**



选择工具链版本和单片机系列，然后点击[Next]按钮。

(e) 下一步，设置 RTOS。

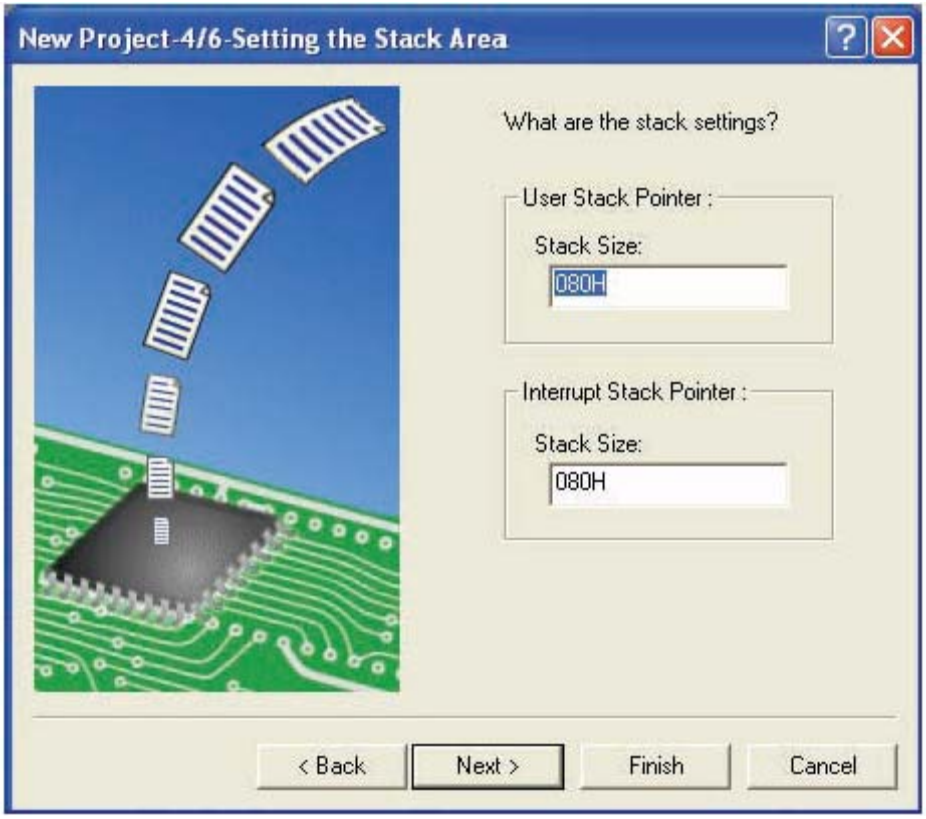


选择要使用的 RTOS 和启动文件类型，点击[Next]按钮。

(f) 下一步，设置堆空间等。

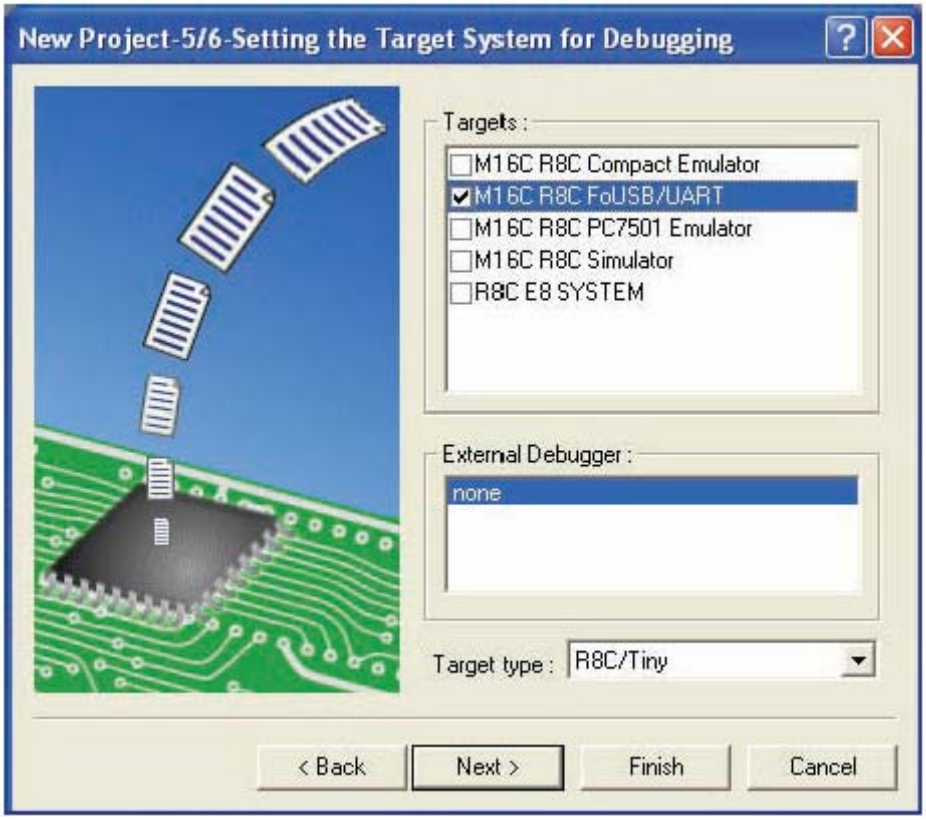
设置完堆空间等后，点击[Next] 按钮。

(g) 下一步，设置堆栈空间。



设置堆栈大小后，点击[Next] 按钮。

(h) 设置完工具链后，将显示如下的界面。

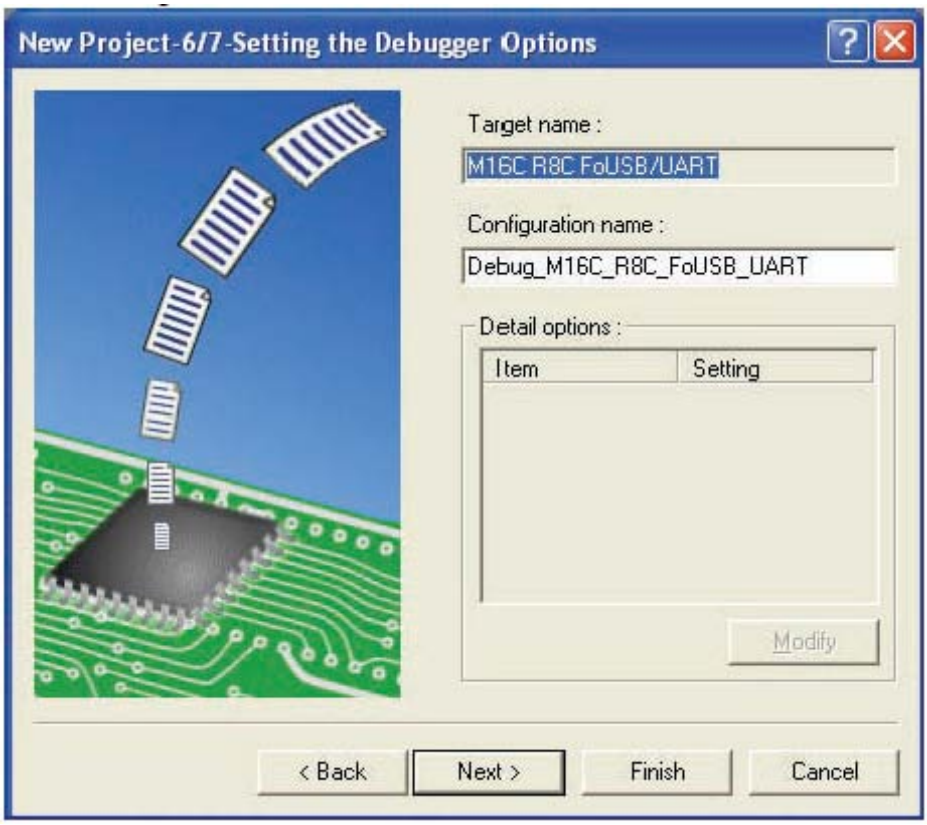


选择 M16C R8C FoUSB/UART 复选框并点击[Next]按钮。

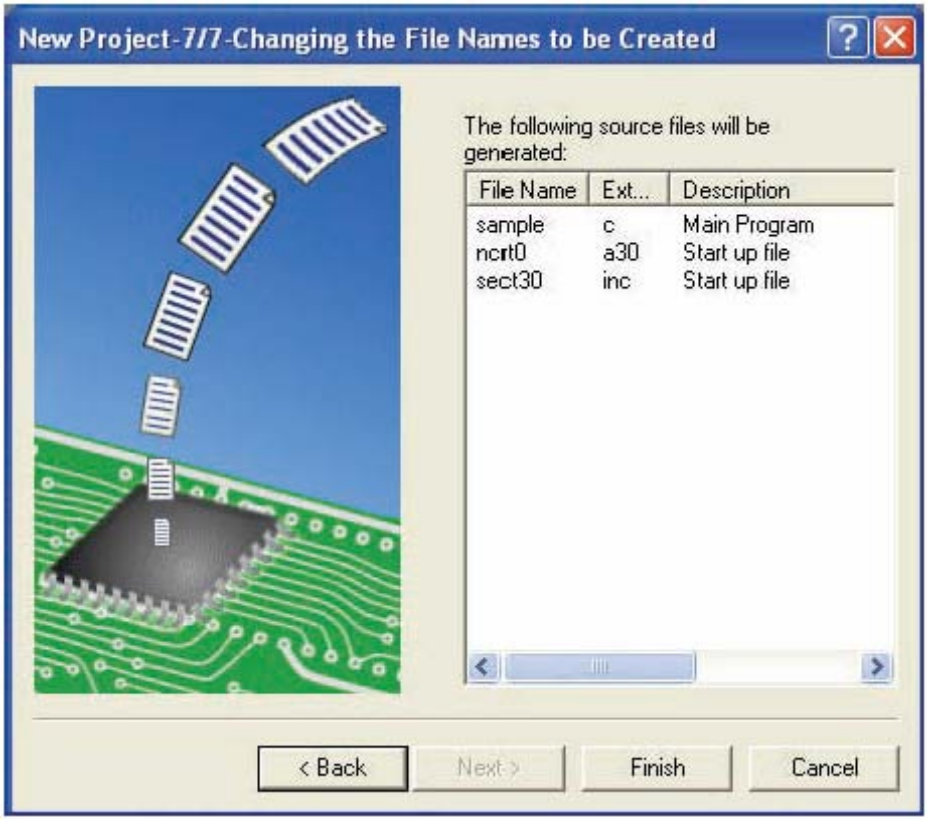
如有必要，请选择其他工具。

(i) **下一步，设置配置文件名称。**

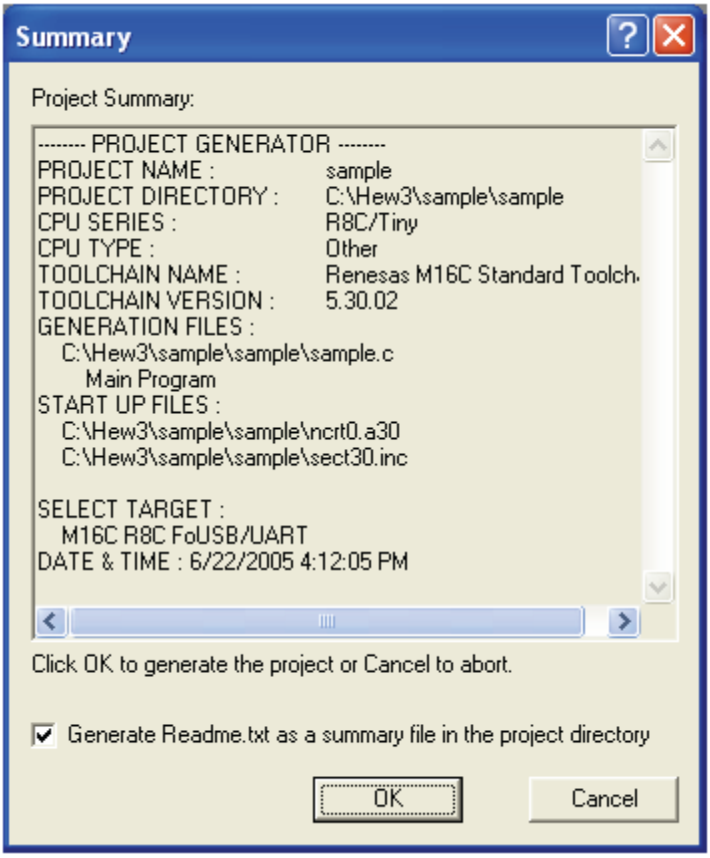
配置文件是 build 选项的设置。 (例如，输出调试信息或者优化设置) 。术语“configuration”请参见“build configuration”。



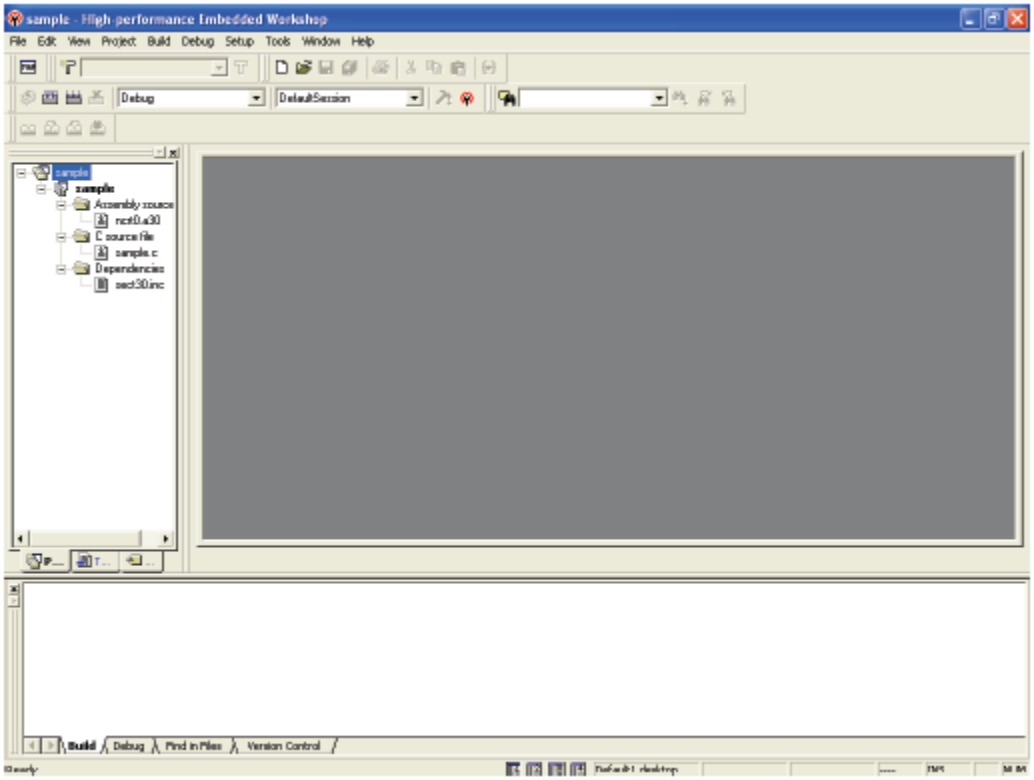
(j) 最后，检查生成的文件名称。



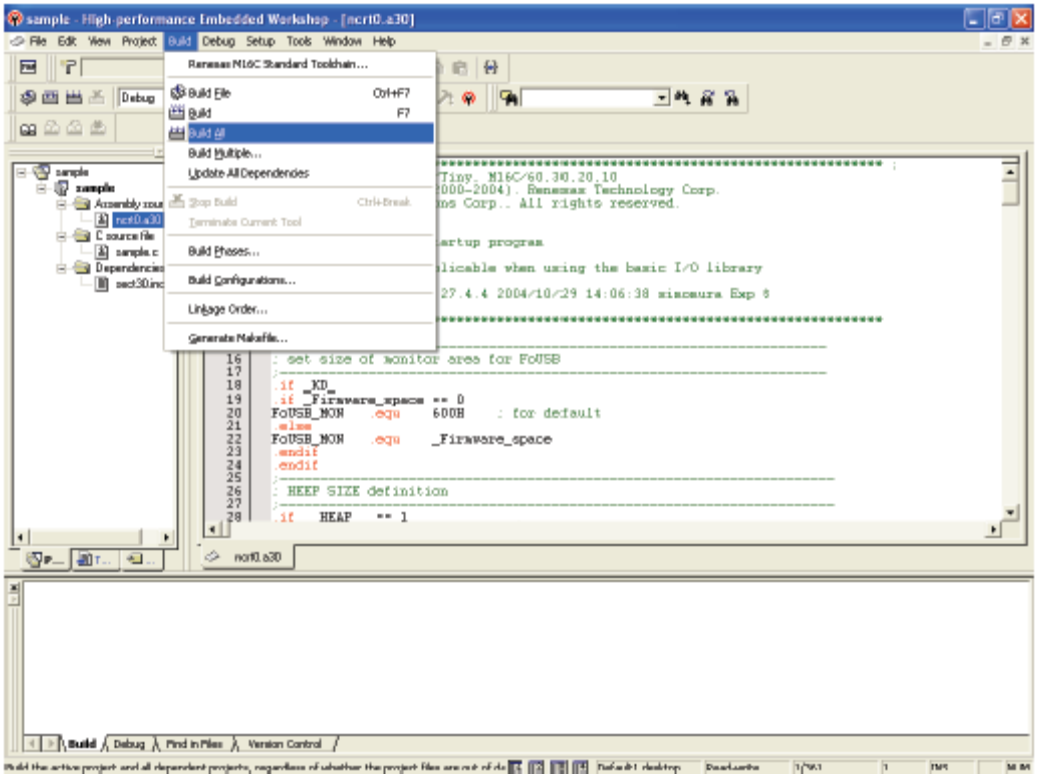
(k) 以上的设置将显示 High-performance Embedded Workshop 生成的文件。点击[OK]按钮，启动 High-performance Embedded Workshop。



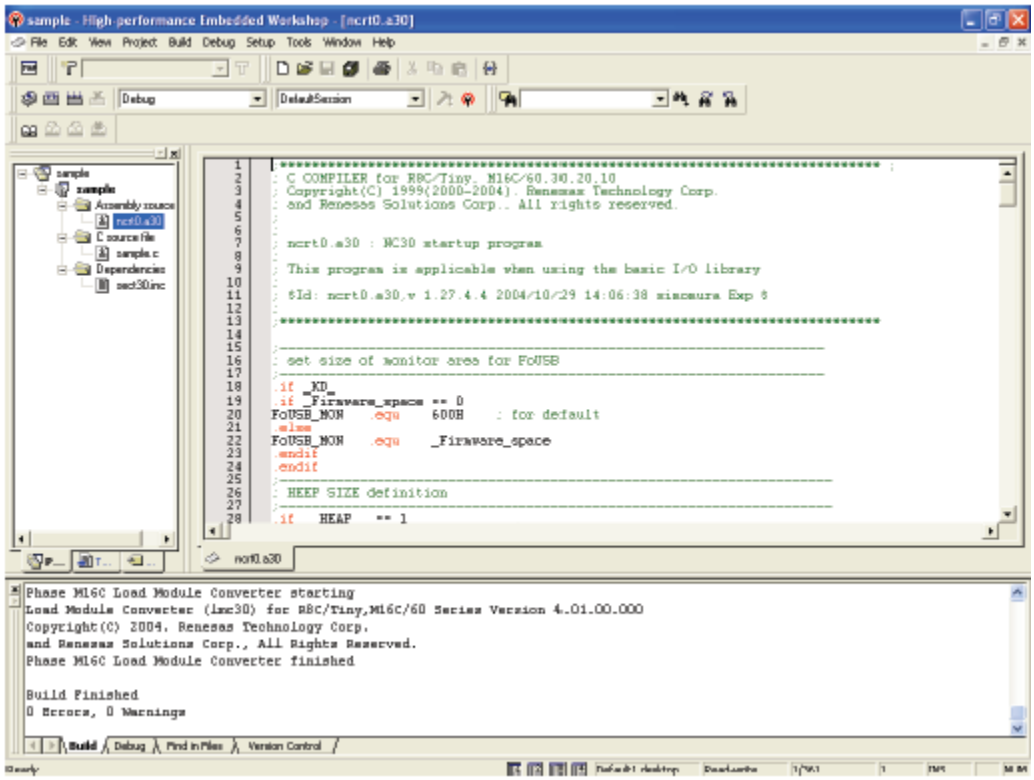
(l) 双击源程序，编译器将启动，这时就可以编译了。



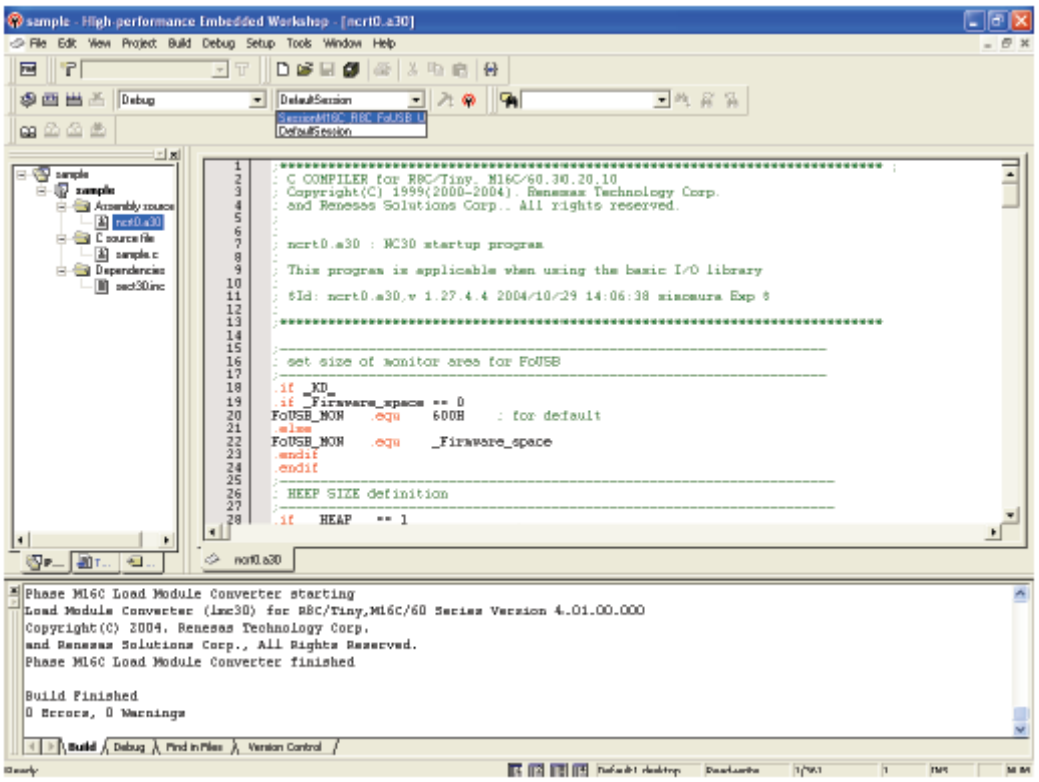
(m) 点击“Build”菜单，接着“Build”或者“Build All”将在创建后一个程序后 build。



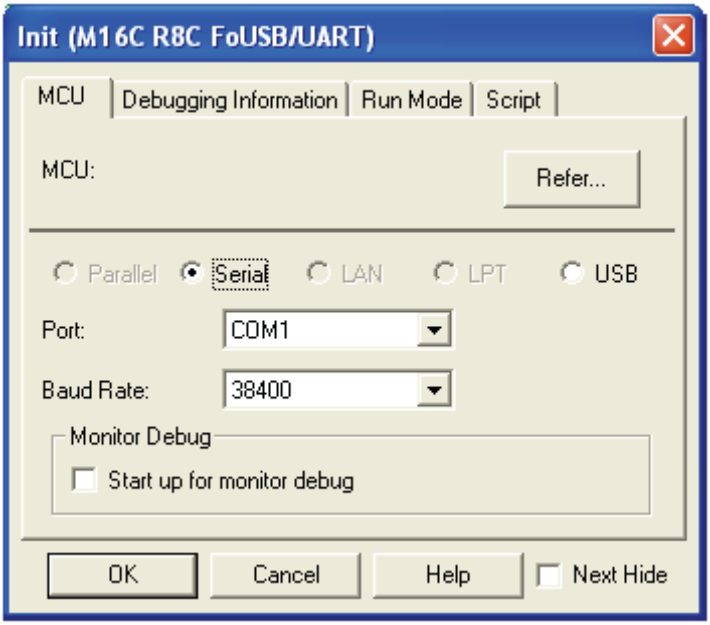
(n) Build 的结果显示如下。



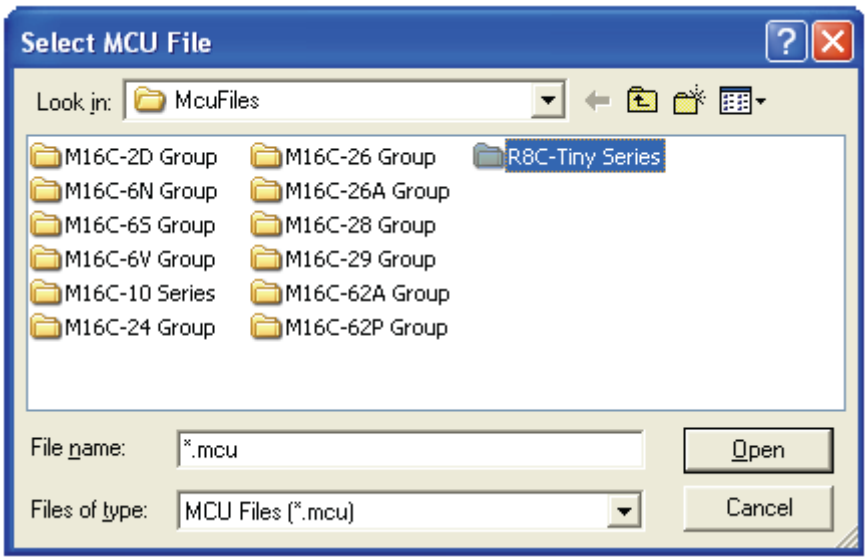
(o) 下一步，连接目标。从 registered session 中选择使用 R8C UART 调试器，可以很容易地连接目标板。



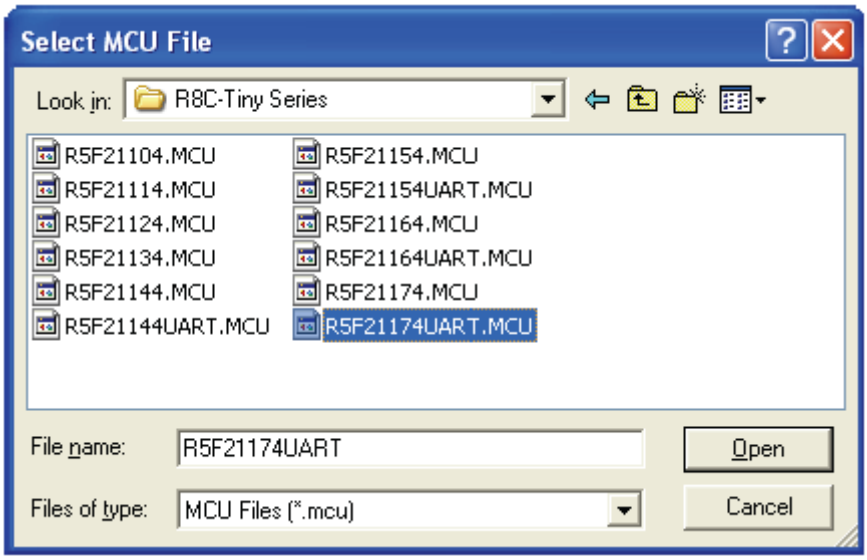
(p) 显示如下初始化窗口。选择[Serial]单选按钮并点击[Reference]按钮。



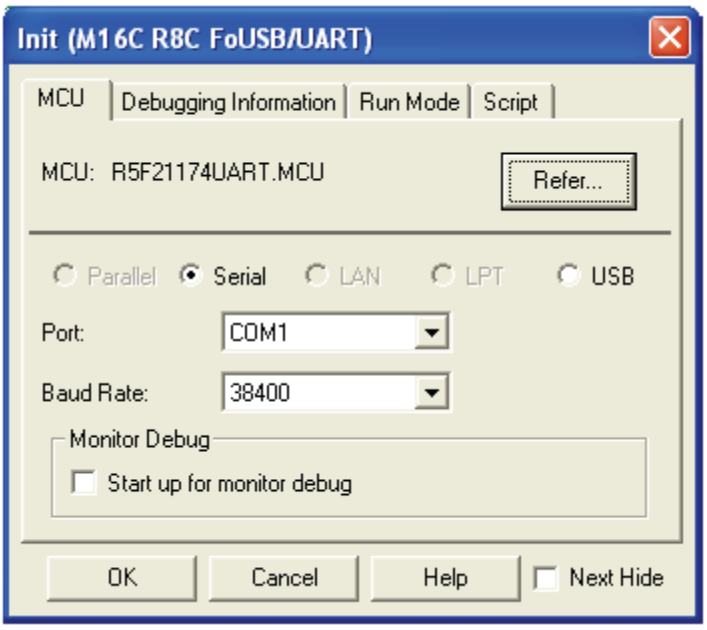
(q) 选择 R8C-Tiny 系列。



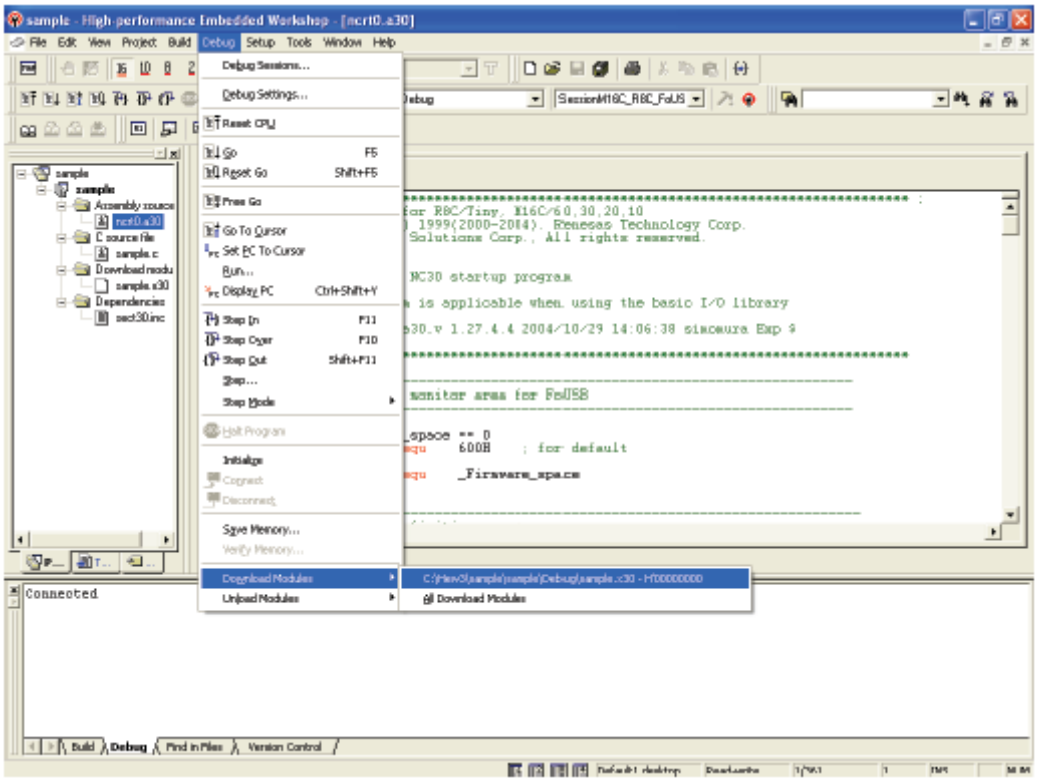
(r) 选择对应的单片机文件。



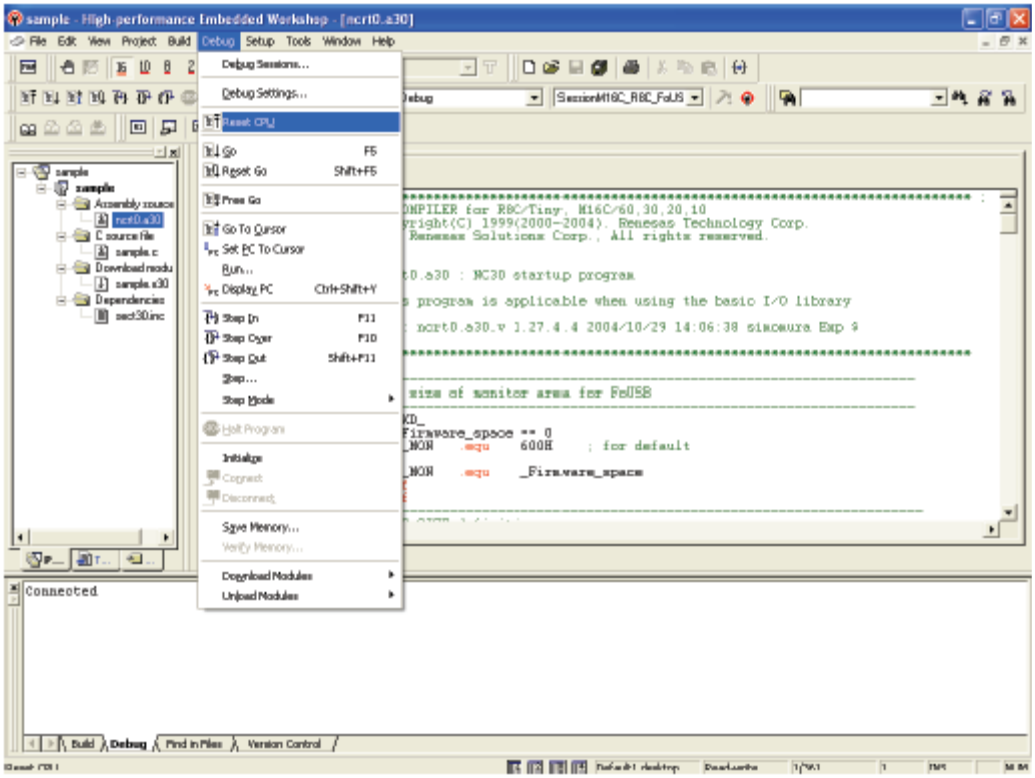
(s) 点击 OK 后，将下载监控程序。



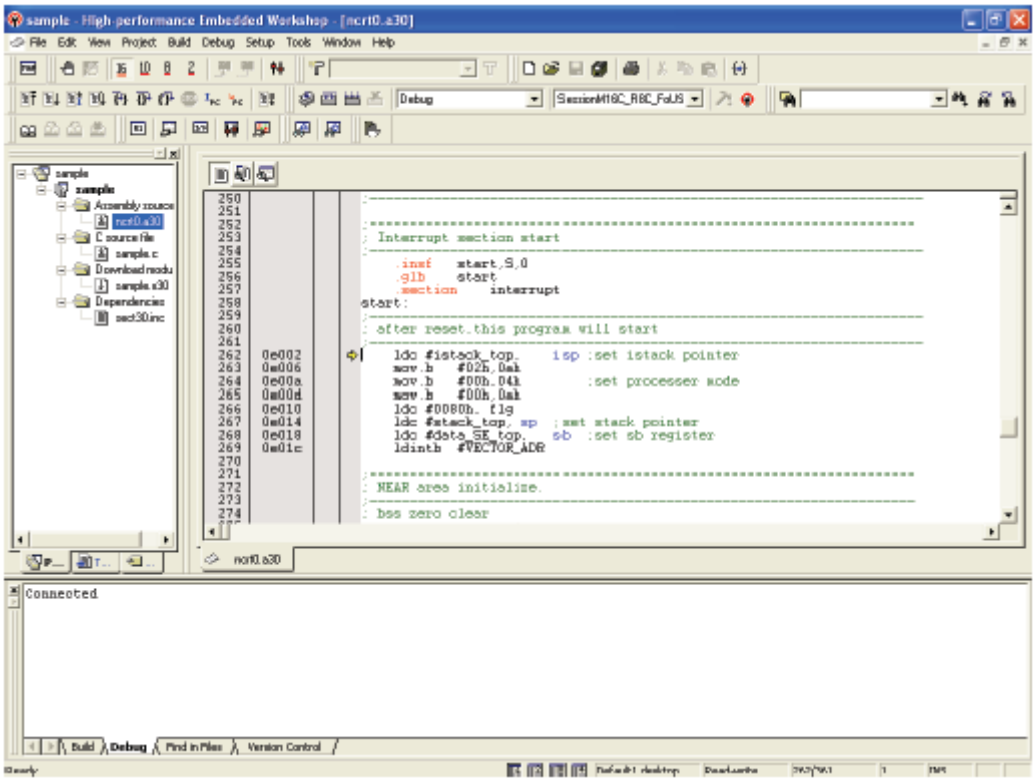
(t) 通过“Debug”中的“Download”和“Download File (X30 file)”下载用户程序。



(u) 点击“Debug”菜单中的“Reset CPU”来复位用户程序。



(v) 光标将跳至用户程序的起始处，就可以开始调试了。



3. 使用 R8C UART 调试软件时的内存分配

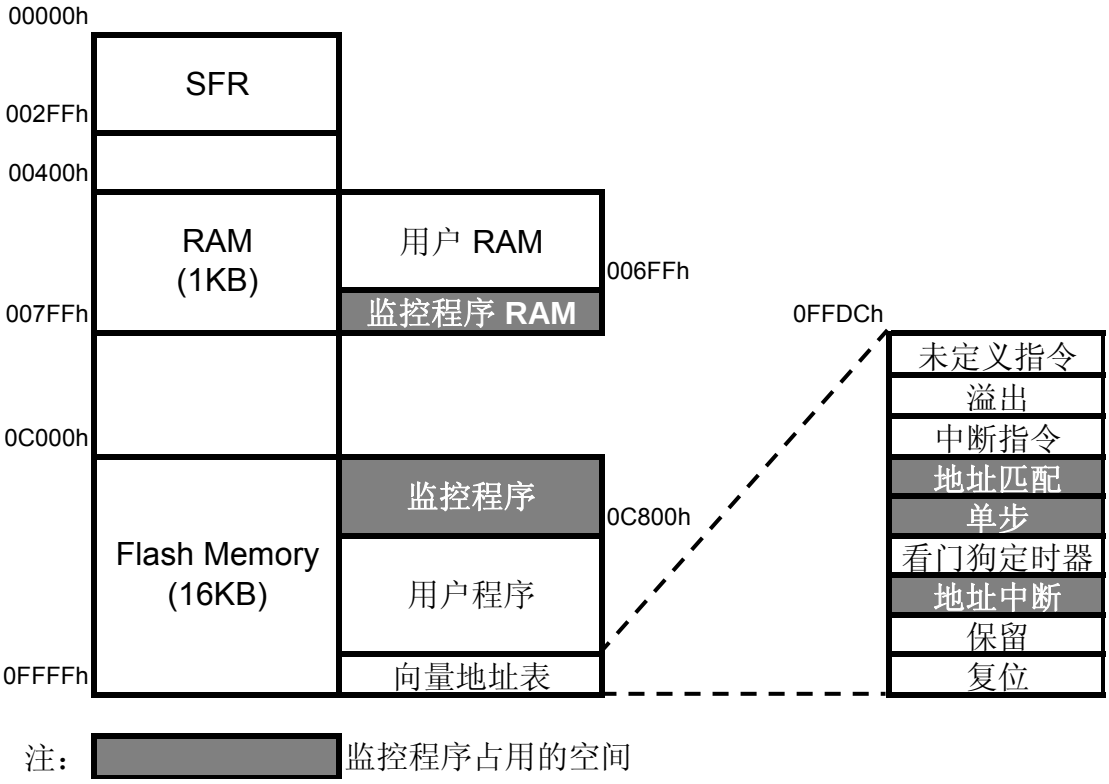


图 3 R8C/Tiny 的内存分配

4. 监控程序占用的空间

表 1 监控程序占用的空间

ROM/RAM	监控程序占用的空间	
8KB/512B	向量	FFE8h ~ FFEBh, FFECh ~ FFEFh, FFF4h ~ FFF7h
12KB/768B	RAM 向量	6FFh FFE8h ~ FFEBh, FFECh ~ FFEFh, FFF4h ~ FFF7h
16KB/1KB	RAM Flash Memory 向量	6FFh ~ 7FFh C000h ~ C7FFh FFE8h ~ FFEBh, FFECh ~ FFEFh, FFF4h ~ FF7h

5. 使用 R8C UART 调试软件中的注意事项

5.1 在调试结束后，更换调试的通讯速率，并重新启动 R8C UART 调试器。

当 R8C UART 调试软件关闭后，目标单片机还保存着上次的通讯速率。因此，改变通讯速率并重新开始 R8C UART 将产生一个通讯错误（R8C UART 调试软件可以使用上次的通讯速率启动）。 需要改变通讯速率时，关闭目标单片机电源并重新上电。

5.2 用户程序的 ID 码

使用 R8C UART 调试软件时，用户程序的 ID 码被全部设置成 FFh。

表 2 ID 码的存储地址 (R8C/14 群)

地址	ID 序号	向量表
0FFDFh - 0FFDCh	ID1	未定义指令
0FFE3h - 0FFE0h	ID2	溢出
0FFE7h - 0FFE4h		中断指令
0FFEBh - 0FFE8h	ID3	地址匹配
0FFEFh - 0FFECh	ID4	单步
0FFF3h - 0FFF0h	ID5	看门狗定时器 振荡停止检测 电压监控 2
0FFF7h - 0FFF4h	ID6	地址中断
0FFFBh - 0FFF8h	ID7	保留
0FFFFh - 0FFFCh	（注 1）	复位

注：

1. 0FFFFh 的值请参照硬件手册进行设定

5.3 能够下载用户程序的空间

如图 3 所示，使用 R8C UART 调试软件时，一部分 RAM 和 Flash Memory 空间被调试软件使用。因此如果用户程序的地址和那些被调试软件使用的地址相重叠时，R8C UART 调试软件将不会下载这部分重叠的用户程序。注意，这种情况下，R8C UART 调试软件不会弹出错误。

5.4 频率特性

监控程序能在下表所示的主时钟（Xin）频率下工作。由于监控程序可能在一些频率下无法正常工作，因此请选用下表中的频率作为晶振的频率。

1MHz (最小) ~ 20MHz (最大)

表 3 列出了所有的可以工作的频率和在该频率下可用的通讯速率。然而，尽管晶振的频率正确，由于对主时钟分频而引起的频率低于 1MHz 也可能导致监控程序无法正常工作。

表 3 可选频率和对应的可用通讯速率

频率	通讯速率（bps）					
	1200	2400	4800	9600	19200	38400
20MHz	N/A	N/A	√	√	√	√
16MHz	N/A	N/A	√	√	√	√
14MHz	N/A	N/A	√	√	√	√
12MHz	N/A	N/A	√	√	√	√
10MHz	N/A	√	√	√	√	√
8MHz	N/A	√	√	√	√	√
6MHz	N/A	√	√	√	√	√
4MHz	√	√	√	√		N/A
2MHz	√	√	√	√	N/A	N/A
1MHz	√	√	√	N/A	N/A	N/A

√：可以通讯

N/A：不能通讯

注：

由于环境温度和电源电压的原因，监控程序也可能无法正常工作。在这种情况下，在较低的通讯速率下运行 R8C UART 调试软件。

5.5 操作 SFR 时的限制

表 4 列出了操作 SFR 时的限制。如果那些不能被改变的寄存器被改变，监控程序可能不能正常工作。

表 4 操作 SFR 时的限制

寄存器	默认值	限制	改变
处理器模式寄存器 0	复位 00h	只支持单芯片模式	*
处理器模式寄存器 1	复位 00h	————	√
系统时钟控制寄存器 0	复位 08h	将 CM05 位设为“0”	*
系统时钟控制寄存器 1	复位 28h	将 CM13 和 CM15 位设为“1”	*
高速片内振荡器控制寄存器 0	复位 03h	————	√
高速片内振荡器控制寄存器 1	————	————	√
高速片内振荡器控制寄存器 2	————	————	√
振荡停止检测寄存器	复位 00h	————	N/A
保护寄存器	————	————	√
标志寄存器	————	不能对 D 标志进行写操作 不要设为“1”	*
中断堆栈指针（ISP）	复位 05FFh	设为 06FFh 以下 06FFh~07FFh 为监控程序	*
UART1 发送/接收模式寄存器	复位 15h	不能改变	N/A
UART1 位速率寄存器	————		
UART1 发送/接收控制寄存器 0	复位 00h		
UART1 发送/接收控制寄存器 1	复位 07h		
UART1 发送/接收控制寄存器 2	复位 32h		
UART1 发送缓冲寄存器	————	不要给这个寄存器写数据	N/A
UART1 接受缓冲寄存器	————	不要给这个寄存器写数据	N/A

√：可以改变　N/A：不能改变　*：可以改变（有限制）

5.6 停止和等待模式下的限制

如要在用户程序中使用停止或等待模式，请使用 Free-run 模式启动 R8C UART 调试软件，并且关闭 RAM 窗口，C watch 窗口和 ASM 窗口。同时，在停止或等待模式时，不要操作调试软件直到程序停止到断点。

5.7 看门狗定时器

R8C UART 调试软件不支持看门狗定时器。因此，使用 R8C UART 调试软件时不要使用看门狗定时器。

5.8 用户程序的实时操作

- Sampling Run (Sampling) 模式
  在 Sampling 模式下，用户程序中的 Go 和 Come 指令的执行状况将通过和主机的来回交流得到有规律的监控。因此，由断点引起的用户程序中断能够被检测出来。在一般的调试情况下请使用这种模式。

- Free Run (Free run)模式
  在 Free run 模式下，如果执行 Go 或者 Come 指令，用户程序的状态将不能被监视。尽管用户程序已经停止，但由断点引起的用户程序中断不能被检测到。因此，即使用户程序已经停止，R8C UART 调试软件无法停止 Go 或者 Come 指令。如要停止，点击 STOP 按钮。

注：

在 Free run 模式下，在关闭 RAM 窗口，C watch 窗口和 ASM 窗口时使用 R8C UART 调试软件。

5.9 异常处理

- 软件中断指令
  当执行连续的能产生软件中断的内部处理指令（未定义指令，溢出，断点指令和中断指令）时，不能使用单步执行。
  例子： INT 指令

```
 NOP
 NOP
 INT  #3                 单步执行时，断点被跳过
 NOP                     ↓
 JMP  MAIN
INT_3:
 NOP  ←————              程序应该停止的地址
 NOP
 NOP
 REIT
```

- INT 指令
  对于内部处理的 INT 指令，设置软件中断并用 Go 指令来调试那些使用 INT 的指令。
  例子：

```
 NOP                     全速运行
 INT      #3             ↓
 NOP
 JMP MAIN
INT_3:  ←————
                         断点
 NOP
 NOP
 REIT
```

5.10 外围功能的限制

下列管脚被用作调试，它们负责监控程序和主机之间的通讯。不要将它们和其它管脚相连。

- R8C/14-17 群
  TxD (2pin)，RxD (9pin)

5.11 标志寄存器的限制

在用户程序中对标志寄存器进行操作时，不要执行 FSET 指令和 FCLR 指令修改调试标志（D 标志）。

5.12 中断对并行 I/O 的操作

虽然中断不会被响应，并行 I/O 仍然执行。例如，操作一个定时器后通过断点停止用户程序时，定时器仍然在计数，但是定时器中断不会被响应。

[备注]

M16C R8C FoUSB/UART 软件用户手册
连接R8C/14、 R8C/15、 R8C/16、 R8C/17的注意事项

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