

# Project #3(Pjt03\_uart\_stdout) step1

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## ◆ Setup Standard Output Environment in AVR-GCC Lib

```
#include <stdio.h>
```

```
#include <avr/io.h>
```

```
◆ #include <compat/deprecated.h>
```

```
◆ #include <util/delay.h>
```

```
int uart_putchar_1(char ch, FILE *stream);
```

```
FILE Mystdout =
```

```
    FDEV_SETUP_STREAM (uart_putchar_1, NULL, _FDEV_SETUP_WRITE);
```

```
void uart_init()
```

```
{
```

```
    stdout = &Mystdout;
```

```
    UBRR0H = 0x00; UBRR0L = 0x07; // 115.2Kbps
```

```
    sbi(UCSRA, U2X0); // 115.2Kbps
```

```
    sbi(UCSRB, TXEN0); // TX enable
```

```
}
```

```
int uart_putchar_1(char ch, FILE *stream)
```

```
{
```

```
    ...
```

```
}
```

# Project #3(Pjt03\_uart\_stdout) step 1

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## ◆ UART0 device driver with Busy(Dumb) Waiting

- UDRE0 bit of UCS0A register

```
int uart_putchar_1(char ch, FILE *stream)
{
    if (c == '\n')
        uart_putchar_1('\r', stream);
    _delay_ms(100);
    UDR0 = ch;
    return(1);
}
```

# Project #3(Pjt03\_uart\_stdout) step 1

## ◆ Sample Application to Test UART0 driver

- Prime number searching algorithm(task)

```
int is_prime(int n) {  
    int i;  
    for (i = 2; i <= n/2; i++)  
        if ((n % i) == 0) return(0); /* FALSE */  
    return(1);                      /* TRUE */  
}
```

```
main()  
{  
    int i;  
  
    uart_init();  
    for (i = 3; i <= 2000; i++) {  
        if (is_prime(i)) printf("%d is a prime number !!!\n", i);  
        else             printf("%d is not a prime number !!!\n", i);  
    }  
    printf("The end !!!\n"); while(1);  
}
```

# Project #3(Pjt03\_uart\_stdout) step2

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## ◆ Setup Standard Output Environment in AVR-GCC Lib

```
#include <stdio.h>
```

```
#include <avr/io.h>
```

```
◆ #include <compat/deprecated.h>
```

```
◆ #include <util/delay.h>
```

```
int uart_putchar_2(char ch, FILE *stream);
```

```
FILE Mystdout =
```

```
    FDEV_SETUP_STREAM (uart_putchar_2, NULL, _FDEV_SETUP_WRITE);
```

```
void uart_init()
```

```
{
```

```
    stdout = &Mystdout;
```

```
    UBRR0H = 0x00; UBRR0L = 0x07; // 115.2Kbps
```

```
    sbi(UCSRA, U2X0); // 115.2Kbps
```

```
    sbi(UCSRB, TXEN0); // TX enable
```

```
}
```

```
int uart_putchar_2(char ch, FILE *stream)
```

```
{
```

```
    ...
```

```
}
```

# Project #3(Pjt03\_uart\_stdout) step 2

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## ◆ UART0 device driver with Busy Waiting(Status Checking)

- UDRE0 bit of UCS0A register

```
int uart_putchar_2(char ch, FILE *stream)
{
    if (c == '\n')
        uart_putchar_2('\r', stdout);
    while( !(UCSRA & (1 << UDRE0)) )
        ;
    UDR0 = ch;
    return(1);
}
```

```
int uart_putchar_1(char ch, FILE *stream)
{
    if (c == '\n')
        uart_putchar_1('\r', stream);
    _delay_ms(100);
    UDR0 = ch;
    return(1);
}
```

# Project #3(Pjt03\_uart\_stdout) step 2

## ◆ Sample Application to Test UART0 driver

- Prime number searching algorithm(task)

```
int is_prime(int n) {
```

```
    int i;
    for (i = 2; i <= n/2; i++)
        if ((n % i) == 0) return(0); /* FALSE */
    return(1);                       /* TRUE */
}
```

```
main()
```

```
{
    int i;

    uart_init();
    for (i = 3; i <= 2000; i++) {
        if (is_prime(i)) printf("%d is a prime number !!!\n", i);
        else             printf("%d is not a prime number !!!\n", i);
    }
    printf("The end !!!\n"); while(1);
}
```