

## Section 7.6.2: Using Flash data space to store data

In order to define and access constant variables in the Flash memory, the Atmel Studio provides the *pgmspace* header file.

To define a variable in the Flash memory, the `PROGMEM` keyword is used:

```
const char PROGMEM txtHelloWorld[] = "Hello World!";
```

In the above example, "Hello World!" is stored in the Flash memory at compile time. The contents of `txtHelloWorld` can be read from the Flash memory using the `pgm_read_byte(unsigned int addr)` function:

```
#include "avr/pgmspace.h"

const char PROGMEM txtHelloWorld[] = "Hello World!";

int main(void)
{
    for (unsigned char i = 0; i < 10; i++)
    {
        c = pgm_read_byte(&txtHelloWorld[i]); //read txtHelloWorld[i] from Flash memory

        lcd_putchar(c); //display c on the LCD
    }

    while(1);
}

void lcd_putchar (unsigned char ch)
{
    ...
}
```

`pgm_read_byte` gets the address of the Flash memory location to be read and returns its contents.

Since the `txtHelloWorld` is in the Flash memory, an "&" is put before it and is read from the Flash memory using the `pgm_read_byte` function.

`pgm_read_byte` reads a byte of data from Flash memory. The following table lists the functions which are available for reading the different types of data.

Function	Type	Size
<code>pgm_read_byte</code>	char	8-bit
<code>pgm_read_word</code>	int	16-bit
<code>pgm_read_dword</code>	long	32-bit
<code>pgm_read_float</code>	float	32-bit

Table 7-8: Functions to Access Flash Memory Const Variables



## Passing references of Flash memory const variables

The Flash memory references and pointers are used in the same way as the RAM references and pointers. See the following example.

```
#include "avr/pgmspace.h"

const char PROGMEM txtHelloWorld[] = "Hello World!";

void showHelloWorld()
{
    lcd_putstrf(txtHelloWorld);
}

void lcd_putstrf (const char str[])
{
    unsigned char c;

    while(1)
    {
        c = pgm_read_byte(str);

        if(c == 0)
            return;

        lcd_putchar(c);
        str++;
    }
}
```

Example 7-36: Passing an Argument

## PSTR

In the above example, `txtHelloWorld` is used only once. In such cases, the `PSTR` keyword can be used:

```
lcd_putstrf(PSTR("Hello World!"));
```

In the above code, `"Hello World!"` is stored in the Flash memory and its reference is passed to the `lcd_putstrf` function.