

Storage Class Specifier

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Variable Types

Automatic Variable

a variable defined inside a function block.

invisible outside the function

*a local variable which is allocated and deallocated automatically
when program flow enters and leaves the variable's scope.*

External Variable

a variable defined outside any function block

Static Variable

*a variable that has been allocated "statically",
meaning that its lifetime (or "extent") is the entire run of the program.*

Global Variables

Variables declared outside any function definition
Accessible to any function defined in the same file
after the global variable is defined

Global Variables

Global Variables (A1)

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

```
int a;
```

```
int main(void) {  
    printf("a=%d\n", a);  
}
```

```
a=0
```

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

```
int main(void) {  
    printf("a=%d\n", a);  
}
```

```
int a;
```

```
undeclared error
```

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

```
extern int a;
```

```
int main(void) {  
    printf("a=%d\n", a);  
}
```

```
undefined reference
```

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

```
int main(void) {  
    printf("a=%d\n", a);  
}
```

```
extern int a;
```

```
undeclared error
```

<https://cprogramex.wordpress.com/>

Global Variables (A2)

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

```
int a;
```

```
int main(void) {  
    printf("a=%d\n", a);  
}
```

```
int a;
```

```
a=0
```

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

```
int main(void) {  
    printf("a=%d\n", a);  
}
```

```
int a;  
int a;
```

```
undeclared error
```

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

```
extern int a;
```

```
int main(void) {  
    printf("a=%d\n", a);  
}
```

```
int a;
```

```
a=0
```

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

```
int main(void) {  
    printf("a=%d\n", a);  
}
```

```
extern int a;  
int a;
```

```
undeclared error
```

<https://cprogramex.wordpress.com/>

Global Variables (A3)

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

```
int a;
```

```
int main(void) {  
    printf("a=%d\n", a);  
}
```

```
int a = 333;
```

```
a=333
```

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

```
int main(void) {  
    printf("a=%d\n", a);  
}
```

```
int a;  
int a = 333;
```

```
undeclared error
```

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

```
extern int a;
```

```
int main(void) {  
    printf("a=%d\n", a);  
}
```

```
int a = 333;
```

```
a=333
```

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

```
int main(void) {  
    printf("a=%d\n", a);  
}
```

```
extern int a;  
int a = 333;
```

```
undeclared error
```

<https://cprogramex.wordpress.com/>

Global Variables (B1)

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

```
int a = 111;
```

```
int main(void) {  
    printf("a=%d\n", a);  
}
```

a= 0

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

```
int main(void) {  
    printf("a=%d\n", a);  
}
```

```
int a = 111;
```

undeclared error

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

```
extern int a = 111;
```

```
int main(void) {  
    printf("a=%d\n", a);  
}
```

initialized warning
a=111

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

```
int main(void) {  
    printf("a=%d\n", a);  
}
```

```
extern int a = 111;
```

undeclared error

<https://cprogramex.wordpress.com/>

Global Variables (B2)

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

```
int a = 111;
```

```
int main(void) {  
    printf("a=%d\n", a);  
}
```

```
int a;
```

```
a=111
```

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

```
int main(void) {  
    printf("a=%d\n", a);  
}
```

```
int a = 111;  
int a;
```

```
undeclared error
```

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

```
extern int a = 111;
```

```
int main(void) {  
    printf("a=%d\n", a);  
}
```

```
int a;
```

```
initialized warning  
a=111
```

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

```
int main(void) {  
    printf("a=%d\n", a);  
}
```

```
extern int a = 111;  
int a;
```

```
undeclared error  
initialized warning
```

<https://cprogramex.wordpress.com/>

Global Variables (B3)

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

```
int a = 111;
```

```
int main(void) {  
    printf("a=%d\n", a);  
}
```

```
int a = 333;
```

redefinition error

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

```
int main(void) {  
    printf("a=%d\n", a);  
}
```

```
int a = 111;  
int a = 333;
```

undeclared error
redefinition error

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

```
extern int a = 111;
```

```
int main(void) {  
    printf("a=%d\n", a);  
}
```

```
int a = 333;
```

redefinition error
initialized warning

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

```
int main(void) {  
    printf("a=%d\n", a);  
}
```

```
extern int a = 111;  
int a = 333;
```

undeclared error
redefinition error
initialized warning

<https://cprogramex.wordpress.com/>

Function Definition

Function Definitions (C1)

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

```
void func( );
```

```
int main(void) {  
    func();  
}
```

```
void func( );
```

undefined reference

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

```
int main(void) {  
    func();  
}
```

```
void func( );
```

function warning
undefined reference

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

```
extern void func( );
```

```
int main(void) {  
    func();  
}
```

undefined reference

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

```
int main(void) {  
    func();  
}
```

```
extern void func( );
```

function warning
undefined reference

<https://cprogramex.wordpress.com/>

Function Definitions (C2)

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

```
void func( );
```

```
int main(void) {  
    func();  
}
```

```
void func( );
```

undefined reference

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

```
int main(void) {  
    func();  
}
```

```
void func( );  
void func( );
```

function warning
undefined reference

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

```
extern void func( );
```

```
int main(void) {  
    func();  
}
```

```
void func( );
```

undefined reference

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

```
int main(void) {  
    func();  
}
```

```
extern void func( );  
void func( );
```

function warning
undefined reference

<https://cprogramex.wordpress.com/>

Function Definitions (C3)

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

```
void func( );
```

```
int main(void) {  
    func();  
}
```

```
void func( ) {  
    printf("func called\n");  
}
```

func called

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

```
int main(void) {  
    func();  
}
```

```
void func( );  
void func( ) {  
    printf("func called\n");  
}
```

function warning
func called

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

```
extern void func( );
```

```
int main(void) {  
    func();  
}
```

```
void func( ) {  
    printf("func called\n");  
}
```

func called

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

```
int main(void) {  
    func();  
}
```

```
extern void func( );  
void func( ) {  
    printf("func called\n");  
}
```

function warning
func called

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Function Definition

Function Definitions (D1)

```
include <stdio.h>

void func( ) {
    printf("func called\n");
}

int main(void) {
    func();
}
```

func called

```
include <stdio.h>

int main(void) {
    func();
}

void func( ) {
    printf("func called\n");
}
```

function warning
func called

```
include <stdio.h>

extern void func( ) {
    printf("func called\n");
}

int main(void) {
    func();
}
```

func called

```
include <stdio.h>

int main(void) {
    func();
}

extern void func( ) {
    printf("func called\n");
}
```

function warning
func called

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Function Definitions (D2)

```
include <stdio.h>

void func( ) {
    printf("func called\n");
}

int main(void) {
    func();
}

void func( );
```

func called

```
include <stdio.h>

int main(void) {
    func();
}

void func( ) {
    printf("func called\n");
}

void func( );
```

function warning
func called

```
include <stdio.h>

extern void func( ) {
    printf("func called\n");
}

int main(void) {
    func();
}

void func( );
```

func called

```
include <stdio.h>

int main(void) {
    func();
}

extern void func( ) {
    printf("func called\n");
}

void func( );
```

function warning
func called

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Function Definitions (D3)

```
include <stdio.h>

void func( ) {
    printf("func called\n");
}

int main(void) {
    func();
}

void func( ) {
    printf("func called\n");
}
```

redefinition error

```
include <stdio.h>

int main(void) {
    func();
}

void func( ) {
    printf("func called\n");
}

void func( ) {
    printf("func called\n");
}
```

function warning
redefinition error

```
include <stdio.h>

extern void func( ) {
    printf("func called\n");
}

int main(void) {
    func();
}

void func( ) {
    printf("func called\n");
}
```

redefinition error

```
include <stdio.h>

int main(void) {
    func();
}

extern void func( ) {
    printf("func called\n");
}

void func( ) {
    printf("func called\n");
}
```

function warning
redefinition error

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Storage Class Specifiers

- auto
- extern
- register
- static
- typedef
-

Storage Duration

	Functions	Global Variables	Local Variables
static	static storage	static storage	static storage
extern	static storage	static storage	auto storage
no specifier	static storage	static storage	auto storage

Linkage

	Functions	Global Variables	Local Variables
static	internal linkage	internal linkage	
extern	external linkage	external linkage	
no specifier	external linkage	external linkage	

References

- [1] Essential C, Nick Parlante
- [2] Efficient C Programming, Mark A. Weiss
- [3] C A Reference Manual, Samuel P. Harbison & Guy L. Steele Jr.
- [4] C Language Express, I. K. Chun