



AMD PROCESSOR RECOGNITION

Code Sample

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AMD Processor Recognition Code Sample

This document contains a code sample that uses the CUID instruction to identify the processor and its features. The code was compiled with the Borland C++ compiler v4.5.

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Provided that you agree to the terms stated below, AMD grants you a limited, non-exclusive, non-transferable license to copy, modify and distribute the AMD Processor Recognition Code Sample provided in this document solely as part of computer code created by you to implement the CPUID instruction for AMD processors.

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DEFINES Header File (defines.h file)

```
// defines.h : HEADER FILES
#ifndef _H_DEFINES
#define _H_DEFINES
class cpuid {

public:
    int chkcpubit(void);
    int chkcpuid(void);
    void std_vendor_id_str (void);
    void std_cpu_signature(void);
    void ext_vendor_id_str (void);
    void ext_cpu_signature(void);
    void ext_cpu_name_str(void);
    void ext_cpu_cache_info(void);
};
#endif
```

CHKCPUBIT Module (ckcpubit.cpp file)

```
#include "DEFINES.H"

//chkcpubit checks the processor ID bit (bit 21) in the EFLAGS register.
//The program aborts if the processor does not implement the CPUID instruction.

int cpuid::chkcpubit(void)
{
    asm {
        .486
        pushfd                //Save eflags
        pop    eax
        test   eax,0x00200000 //Check ID bit (bit 21)
        jz    set_21          //Bit 21 is not set, so jump to set_21
        and   eax,0xffdfffff //Clear bit 21
        push  eax             //Save new value in register
        popfd                //Store new value in flags
        pushfd
        pop    eax
        test   eax,0x00200000 //Check ID bit
        jz    cpu_id_ok       //If bit 21 is clear, jump to cpu_id_ok
        jmp   err             //If bit 21 is set, CPUID inst is not
                               //supported
    set_21:
    asm {
        or    eax,0x00200000 //Set bit 21
        push  eax             //Store new value
        popfd                //Store new value in EFLAGS
        pushfd
        pop    eax
        test   eax,0x00200000 //If bit 21 is on
        jnz   cpu_id_ok       //then jump to cpu_id_ok
    }
    err:
    asm {
        mov   eax,0xffffffff //CPUID instruction is not supported
        jmp   exit           //so exit
    }
    cpu_id_ok:
    //Support CPUID instruction
    asm mov eax,0           //Return 0
    exit:
    if(_EAX == 0xffffffff){
        return (-1);
    }
    if (_EAX == 0x0) {
        return (0);
    }
}
```

CHKCPUID Module (chkcpuid.cpp file)

```
#include "DEFINES.H"
#include <iomanip.h>
#include <iostream.h>
#include <conio.h>
#include <stdlib.h>
#include <string.h>

//chkcpuid identifies the processor name string.

int cpuid::chkcpuid()
{
    char idstr[13];                //Vendor string variable

    asm {
        mov    eax,0x0            //EAX = 0
        db    0x0F,0xA2         //CPUID opcode
    }

    //Store the 12 character ASCII string
    idstr[0] = _BL;
    idstr[1] = _BH;
    asm {
        ror ebx,0x10
    }
    idstr[2] = _BL;
    idstr[3] = _BH;
    idstr[4] = _DL;
    idstr[5] = _DH;
    asm {
        ror edx,0x10
    }
    idstr[6] = _DL;
    idstr[7] = _DH;
    idstr[8] = _CL;
    idstr[9] = _CH;
    asm {
        ror ecx,0x10
    }
    idstr[10] = _CL;
    idstr[11] = _CH;
    idstr[12] = '\0';
    if ( strcmp(idstr, "AuthenticAMD") != 0 )
        return (0);
    else
        return (1);
}
```

STD_VENDOR_ID_STR Module (cpuidstr.cpp file)

```
#include "DEFINES.H"
#include <iomanip.h>
#include <iostream.h>
#include <conio.h>
#include <stdlib.h>
#include <string.h>

//std_vendor_id_str finds the largest function value recognized by
//AMD processors. It also identifies AMD as the vendor of the CPU
//by returning "AuthenticAMD" in idstr. If another vendor's identification
//is returned, the program aborts.

void cpuid::std_vendor_id_str()
{
    char idstr[13];                //Vendor string variable
    int largest_func = 0;         //Largest function variable
    unsigned long  reg_eax,      //Register variable
                  reg_ebx,
                  reg_ecx,
                  reg_edx;

    asm {
        mov    eax,0x0           //EAX = 0
        db    0x0F,0xA2        //CPUID opcode
    }
    reg_eax = _EAX;              //Store the vendor indentification string
    reg_ebx = _EBX;
    reg_edx = _EDX;
    reg_ecx = _ECX;
    largest_func = _EAX;         //The largest function value
    idstr[0] = _BL;              //Get the 12-character ASCII string
    idstr[1] = _BH;              //that identifies AMD as the vendor
    asm {                          //of the CPU.
        ror  ebx,0x10
    }
    idstr[2] = _BL;
    idstr[3] = _BH;
    idstr[4] = _DL;
    idstr[5] = _DH;
    asm {
        ror  edx,0x10           //Get the leftmost bit
    }
    idstr[6] = _DL;
    idstr[7] = _DH;
    idstr[8] = _CL;
    idstr[9] = _CH;
    asm {
        ror  ecx,0x10
    }
    idstr[10] = _CL;
```



```
idstr[11] = _CH;
idstr[12] = '\\0';
cout.setf(ios::uppercase);
cout << "\\nFuction 0 (EAX = 0)" << endl;
cout << "=====\\n";
cout << "\\n\\n";
cout << "EAX == " << setw(8) << setfill('0') << hex << reg_eax;
cout << "    EBX == " << setw(8) << hex << reg_ebx;
cout << "    EDX == " << setw(8) << hex << reg_edx;
cout << "    ECX == " << setw(8) << hex << reg_ecx;
cout << "\\n\\n";
cout << "    Largest Function Input Value : " << largest_func;
cout << "\\n\\n";
cout << "    Vendor Identification String : " << idstr;
cout.unsetf(ios::uppercase);
if ( strcmp(idstr, "AuthenticAMD") != 0 )    //If this not AMD then abort
{
    cout << "\\n\\n\\n\\n";
    cout << "    This is not an AMD processor." << "\\n\\n";
    exit(1);
}
cout << "\\n\\n\\n                Press any key for more." << "\\n\\n";
getch();
}
```

STD_CPU_SIGNATURE Module (cpuname.cpp file)

```
#include "DEFINES.H"
#include <iostream.h>
#include <iomanip.h>
#include <stdlib.h>
#include <conio.h>

//std_cpu_signature identifies the specific CPU by providing information
//regarding the type, instruction family, model, stepping revision, and the
//feature flags. The feature flags indicate the presence of specific features.

void cpuid :: std_cpu_signature (void)
{
    int signature = 0;           //CPU signature variable
    int stepping_id = 0;        //CPU stepping id variable
    int model = 0;              //CPU model variable
    int inst_family = 0;        //CPU instruction family variable
    unsigned int reg_ax = 0 ;   //AX register
    unsigned long reg_eax,reg_edx, test_reg;//EAX, EDX, and test register variables
    unsigned long print_eax,print_ebx,print_ecx,print_edx; //Display variables
    int maxbit = 18;           //Control loop variable
    int bits ;

    asm {
        mov EAX,1               //EAX = 1 or function 1
        db 0x0F, 0xA2          //CPUID opcode
    }
    //Display the value of the registers
    print_eax = _EAX;
    print_ebx = _EBX;
    print_ecx = _ECX;
    print_edx = _EDX;

    reg_edx = _EDX;            //Store the standard feature flags
    reg_ax = _AX;
    asm mov BX, reg_ax
    asm and BL,0x0F            //Mask the rightmost 4 bits
    stepping_id = _BL;        //to get the CPU stepping id

    asm mov BX, reg_ax
    asm and BL,0xF0            //Mask the leftmost 4 bits
    asm ror BL,4               //to get the CPU model
    model = _BL;

    asm mov BX, reg_ax        //Get the CPU instruction family
    asm and BH, 0x0F
    inst_family = _BH;

    asm and EAX,0xFFFFF000    //Get the bits[31:12]
    asm ror EAX,12
```

```

reg_eax = _EAX;

asm mov BX, reg_ax //Get the CPU signature
asm and BX,0x0FF0
signature = _BX;

clrscr();
cout.setf(ios::uppercase);
cout << "Function 1 (EAX = 1)" << endl;
cout << "===== ";
cout << "\n\n";
cout << "EAX == " << setw(8) << hex << print_eax;
cout << " EBX == " << setw(8) << hex << print_ebx;
cout << " ECX == " << setw(8) << hex << print_ecx;
cout << " EDX == " << setw(8) << hex << print_edx;
cout.unsetf(ios::uppercase);
cout << "\n\n";
cout << " EAX[3:0] == " << setw(1) << hex << stepping_id << endl;
cout << " EAX[7:4] == " << setw(1) << hex << model << endl;
cout << " EAX[11:8] == " << setw(1) << hex << inst_family << endl;
cout << " EAX[31:12] == " << setw(5) << hex << reg_eax << endl;
cout << "\n\n";
cout << " Processor Signature : ";
if (signature == 0x0500)
    cout << "AMD-K5 (Model 0) " << endl;
else if (signature == 0x0510)
    cout << "AMD-K5 (Model 1) " << endl;
else if (signature == 0x0520)
    cout << "AMD-K5 (Model 2) " << endl;
else if (signature == 0x0530)
    cout << "AMD-K5 (Model 3) " << endl;
else if (signature == 0x0560)
    cout << " AMD-K6 " << endl;
else if (signature == 0x0400)
    cout << "Am486 and Am5x86 " << endl;
cout << "\n\n Press any key for more." << "\n\n";
getch();

clrscr();
cout << "\n";
cout << " Feature Flags : " << "\n\n";
cout << " EDX == ";
cout.setf(ios::uppercase);
cout << setw(8) << hex << reg_edx << "\n\n";
cout.unsetf(ios::uppercase);

//Get the standard feature flags
for ( bits = 0; bits < maxbit; bits++){
    switch (bits) {
        case 0 : test_reg = reg_edx;
                if((test_reg & 0x00000001)== 0x00000001){//Test bit 0

```

```
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[0] = 1b ";
        cout.unsetf(ios::left);
        cout << " (bit 0==1 indicates FPU present)" << endl;
    }
    else {
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[0] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 0==1 indicates FPU present)" << endl;
    }
    test_reg = reg_edx;
    break;
case 1 : if ((test_reg & 0x00000002 )==0x00000002){ //Test bit 1
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[1] = 1b ";
        cout.unsetf(ios::left);
        cout << " (bit 1==1 indicates Virtual Mode Extensions)"
            << endl;
    }
    else {
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[1] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 1==1 indicates Virtual Mode Extensions)"
            << endl;
    }
    test_reg = reg_edx;
    break;
case 2 : if ((test_reg & 0x00000004 )==0x00000004){ //Test bit 2
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[2] = 1b ";
        cout.unsetf(ios::left);
        cout << " (bit 2==1 indicates Debugging Extensions)"
            << endl;
    }
    else {
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[2] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 2==1 indicates Debugging Extensions )"
            << endl;
    }
    test_reg = reg_edx;
    break;
```

```

case 3 : if ((test_reg & 0x00000008 )==0x00000008){ //Test bit 3
    cout.width(13);
    cout.setf(ios::left);
    cout << "EDX[3] = 1b ";
    cout.unsetf(ios::left);
    cout << " (bit 3==1 indicates Page Size Extensions)"
    << endl;
}
else {
    cout.width(13);
    cout.setf(ios::left);
    cout << "EDX[3] = 0b ";
    cout.unsetf(ios::left);
    cout << " (bit 3==1 indicates Page Size Extensions)"
    << endl;
}
test_reg = reg_edx;
break;
case 4 : if ((test_reg & 0x00000010 )==0x00000010){ //Test bit 4
    cout.width(13);
    cout.setf(ios::left);
    cout << "EDX[4] = 1b ";
    cout.unsetf(ios::left);
    cout << " (bit 4==1 indicates Time Stamp Counter)"
    << endl;
}
else {
    cout.width(13);
    cout.setf(ios::left);
    cout << "EDX[4] = 0b ";
    cout.unsetf(ios::left);
    cout << " (bit 4==1 indicates Time Stamp Counter )"
    << endl;
}
test_reg = reg_edx;
break;
case 5 : if ((test_reg & 0x00000020 )==0x00000020){ //Test bit 5
    cout.width(13);
    cout.setf(ios::left);
    cout << "EDX[5] = 1b ";
    cout.unsetf(ios::left);
    cout << " (bit 5==1 indicates K86 Model-Specific “;
    cout <<“Registers)” << endl;
}
else {
    cout.width(13);
    cout.setf(ios::left);
    cout << "EDX[5] = 0b ";
    cout.unsetf(ios::left);
    cout << " (bit 5==1 indicates K86 Model-Specific “;
    cout <<“Registers)” << endl;
}

```

```
    }
    test_reg = reg_edx;
    break;
case 6 : if ((test_reg & 0x00000040 )==0x00000000){ //Test bit 6
        cout.width(12);
        cout.setf(ios::left);
        cout << "EDX[6] = 0b";
        cout.unsetf(ios::left);
        cout << " Reserved" << endl;
    }
    test_reg = reg_edx;
    break;
case 7 : if ((test_reg & 0x00000080 )==0x00000080){ //Test bit 7
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[7] = 1b ";
        cout.unsetf(ios::left);
        cout << " (bit 7==1 indicates Support of Machine";
        cout << " Check Exception)" << endl;
    }
    else {
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[7] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 7==1 indicates Support of Machine";
        cout << " Check Exception)" << endl;
    }
    test_reg = reg_edx;
    break;
case 8 : if ((test_reg & 0x00000100 )==0x00000100){ //Test bit 8
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[8] = 1b ";
        cout.unsetf(ios::left);
        cout << " (bit 8==1 indicates Support of CMPXCHG8B";
        cout << " Extensions)" << endl;
    }
    else {
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[8] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 8==1 indicates Support of CMPXCHG8B";
        cout << " Extensions)" << endl;
    }
    test_reg = reg_edx;
    break;
```

```
case 9 : if ((test_reg & 0x00000200 )==0x00000200){ //Test bit 9
        if (signature == 0x0500){
            cout.width(13);
            cout.setf(ios::left);
            cout << "EDX[9] = 1b ";
            cout.unsetf(ios::left);
            cout << " (bit 9==1 indicates Support of Global";
            cout << " Paging Extension)"<< endl;
        }
        else {
            cout.width(13);
            cout.setf(ios::left);
            cout << "EDX[9] = 1b ";
            cout.unsetf(ios::left);
            cout << " (bit 9==1 indicates Support of APIC "
                << endl;
        }
    }
    else {
        if (signature == 0x0500){
            cout.width(13);
            cout.setf(ios::left);
            cout << "EDX[9] = 0b ";
            cout.unsetf(ios::left);
            cout << " (bit 9==1 indicates Support of Global";
            cout << " Paging Extensions)"<< endl;
        }
        else {
            cout.width(13);
            cout.setf(ios::left);
            cout << "EDX[9] = 0b ";
            cout.unsetf(ios::left);
            cout << " (bit 9==1 indicates Support of APIC "
                << endl;
        }
    }
    test_reg = reg_edx;
    break;
case 10 : if ((test_reg & 0x00000C00 )==0x00000000){ //Test bits 10:11
        cout.width(12);
        cout.setf(ios::left);
        cout << "EDX[10:11] = ";
        cout.unsetf(ios::left);
        cout << " Reserved"<< endl;
    }
    test_reg = reg_edx;
    break;
case 11 : if ((test_reg & 0x00001000 )==0x00001000){ //Test bit 12
        cout.width(12);
        cout.setf(ios::left);
        cout << "EDX[12] = 1b";
```

```

        cout.unsetf(ios::left);
        cout << " (bit 12==1 indicates Memory Type Range “;
        cout <<Registers)” << endl;
    }
    else {
        cout.width(12);
        cout.setf(ios::left);
        cout << "EDX[12] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 12==1 indicates Memory Type Range “;
        cout << “Registers)” << endl;
    }
    test_reg = reg_edx;
    break;
case 12 : if ((test_reg & 0x00002000 )==0x00002000){ //Test bit 13
    cout.width(12);
    cout.setf(ios::left);
    cout << "EDX[13] = 1b ";
    cout.unsetf(ios::left);
    cout << " (bit 13==1 indicates Global Paging Extension)"
        << endl;
}
else {
    if (signature == 0x0500){
        cout.width(12);
        cout.setf(ios::left);
        cout << "EDX[13] = 0b";
        cout.unsetf(ios::left);
        cout << " Reserved" << endl;
    }
    else {
        cout.width(12);
        cout.setf(ios::left);
        cout << "EDX[13] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 13==1 indicates Global Paging “;
        cout << “Extension)” << endl;
    }
}
    test_reg = reg_edx;
    break;
case 13 : if ((test_reg & 0x00004000 )==0x00000000){ //Test bit 14
    cout.width(12);
    cout.setf(ios::left);
    cout << "EDX[14] = 0b ";
    cout.unsetf(ios::left);
    cout << " Reserved" << endl;
}
    test_reg = reg_edx;
    break;

```



```
case 14 : if ((test_reg & 0x00008000 )==0x00008000){ //Test bit 15
    cout.width(12);
    cout.setf(ios::left);
    cout << "EDX[15] = 1b ";
    cout.unsetf(ios::left);
    cout << " (bit 15==1 indicates Conditional Move ";
    cout <<"Instruction)" << endl;
}
else {
    cout.width(12);
    cout.setf(ios::left);
    cout << "EDX[15] = 0b ";
    cout.unsetf(ios::left);
    cout << " (bit 15==1 indicates Conditional Move ";
    cout <<"Instruction)" << endl;
}
test_reg = reg_edx;
break;
case 15 : if ((test_reg & 0x007F0000 )==0x00000000){ //Test bits 16:22
    cout.width(12);
    cout.setf(ios::left);
    cout << "EDX[16:22] = ";
    cout.unsetf(ios::left);
    cout << " Reserved" << endl;
}
test_reg = reg_edx;
break;
case 16 : if ((test_reg & 0x00800000 )==0x00800000){ //Test bit 23
    cout.width(12);
    cout.setf(ios::left);
    cout << "EDX[23] = 1b ";
    cout.unsetf(ios::left);
    cout << " (bit 23==1 indicates Support of MMX(TM)"
        << " Instructions)" << endl;
}
else {
    cout.width(12);
    cout.setf(ios::left);
    cout << "EDX[23] = 0b ";
    cout.unsetf(ios::left);
    cout << " (bit 23==1 indicates Support of MMX(TM)"
        << " Instructions)" << endl;
}
test_reg = reg_edx;
break;
```

```
        case 17: if ((test_reg & 0xFF000000) == 0x00000000){ //Test bits 24:31
                    cout.width(12);
                    cout.setf(ios::left);
                    cout << "EDX[24:31] = ";
                    cout.unsetf(ios::left);
                    cout << " Reserved" << endl;
                }
            }
        }
    cout << "\n                Press any key for more. " << endl;
    getch();
}
```

EXT_VENDOR_ID_STR Module (extidstr.cpp file)

```

#include "DEFINES.H"
#include <iomanip.h>
#include <iostream.h>
#include <conio.h>
#include <stdlib.h>
#include <string.h>

//ext_vendor_id_str finds the largest extended function value
//recognized by AMD processors.

void cpuid::ext_vendor_id_str()
{
    unsigned long reg_eax,           //Register variables
                  reg_ebx,
                  reg_ecx,
                  reg_edx,
                  largest_func;     //Largest function variable

    asm {
        mov     eax,0x80000000      //EAX = 8000_0000h
        db     0x0F,0xA2          //CPUID opcode
    }
    largest_func = _EAX;           //The largest function value
    reg_ebx = _EBX;
    reg_edx = _EDX;
    reg_ecx = _ECX;
    clrscr();
    cout.setf(ios::uppercase);
    cout << "\nFuction 8000_0000h (EAX = 80000000)" << endl;
    cout << "===== ";
    cout << "\n\n";
    cout << "      EAX == " << setw(8) << hex << largest_func << endl;;
    cout << "      EBX == " << setw(8) << hex << reg_ebx << endl;
    cout << "      EDX == " << setw(8) << hex << reg_edx << endl;
    cout << "      ECX == " << setw(8) << hex << reg_ecx << endl;
    cout << "\n\n";
    cout.unsetf(ios::uppercase);
    cout << "      Largest Extended Function Input Value : " << largest_func;
    cout << "\n\n";
    cout << "      EBX, EDX, ECX : Reserved " << "\n\n";
    cout << "                        Press any key for more." << endl;
    cout << "\n\n\n\n";
    getch();
}

```

EXT_CPU_SIGNATURE Module (extname.cpp file)

```
#include "DEFINES.H"
#include <iostream.h>
#include <iomanip.h>
#include <stdlib.h>
#include <conio.h>

//ext_cpu_signature identifies the specific CPU by providing information
//regarding the type, instruction family, model, stepping revision, and
//feature flags. The feature flags indicate the presence of specific
//features.

void cpuid :: ext_cpu_signature (void)
{
    int signature = 0;                //Signature variable
    int stepping_id = 0;              //Steeping id variable
    int model = 0;                    //Model variable
    int inst_family = 0;              //Instruction family variable
    unsigned int reg_ax = 0 ;         //AX register
    unsigned long reg_eax,reg_edx,test_reg, //Register variables
        print_eax,print_ebx,print_ecx,print_edx;//Display variables
    int maxbit = 18;                  //Control loop
    int bits ;                         //Case statement
    asm {
        mov EAX,0x80000001             //EAX = 8000_0001h
        db 0x0F, 0xA2                 //CPUID opcode
    }
    print_eax = _EAX;
    print_ebx = _EBX;
    print_ecx = _ECX;
    print_edx = _EDX;
    reg_edx = _EDX;                    //Store the extended feature flags
    reg_ax = _AX;
    asm mov BX, reg_ax
    asm and BL,0x0F                     //Mask the rightmost 4 bits
    stepping_id = _BL;                  //to get the CPU stepping id
    asm mov BX, reg_ax
    asm and BL,0xF0                     //Mask the leftmost 4 bits
    model = _BL;                       //to get the CPU model id
    asm mov BX, reg_ax
    asm and BH, 0x0F
    inst_family = _BH;
    asm and EAX,0xFFFFF000             //Get bits 31-12
    asm ror EAX,12
    reg_eax = _EAX;
    asm mov BX, reg_ax                 //Get the CPU signature
    asm and BX,0x0FF0
    signature = _BX;
    clrscr();
    cout.setf(ios::uppercase);
}
```

```

cout << "Function 8000_0001h (EAX = 80000001)" << endl;
cout << "===== ";
cout << "\n";
cout << "EAX == " << setw(8) << hex << print_eax << "   EBX == " << setw(8)
    << hex << print_ebx << "   ECX == " << setw(8) << hex << print_ecx
    << "   EDX == " << setw(8) << hex << print_edx << "\n\n";
cout << "   EAX[3:0] == " << setw(1) << hex << stepping_id << endl;
cout << "   EAX[7:4] == " << setw(1) << hex << model << endl;
cout << "   EAX[11:8] == " << setw(1) << hex << inst_family << endl;
cout << "   EAX[31:12] == " << setw(5) << hex << reg_eax << endl;
cout.unsetf(ios::uppercase);

cout << "\n";
cout << "   AMD Processor Signature : ";

if (signature == 0x0660)
    cout << " AMD-K6 " << endl;
else {
    if(signature == 0x0510)
        cout << " AMD-K5 (Model 1) " << endl;
    if(signature == 0x0520)
        cout << " AMD-K5 (Model 2) " << endl;
    if(signature == 0x0530)
        cout << " AMD-K5 (Model 3) " << endl;
    else cout << " Undefined " << endl;
}

cout << "\n";
cout << "   Feature Flags : " << "\n\n";
cout << "   EDX == ";
cout.setf(ios::uppercase);
cout << setw(8) << hex << reg_edx << "\n\n";
cout.unsetf(ios::uppercase);
cout << "           Press any key for more. " << endl;
cout << "\n\n";
getch();
clrscr();
//Get the feature flags
for ( bits = 0; bits <= maxbit; bits++){
    switch (bits) {
        case 0 : test_reg = reg_edx;
                if((test_reg & 0x00000001)== 0x00000001){//Test bit 0
                    cout.width(13);
                    cout.setf(ios::left);
                    cout << "EDX[0] = 1b ";
                    cout.unsetf(ios::left);
                    cout << " (bit 0==1 indicates FPU present)" << endl;
                }
            else {
                cout.width(13);
                cout.setf(ios::left);
            }
    }
}

```

```
        cout << "EDX[0] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 0==1 indicates FPU present)" << endl;
    }
    test_reg = reg_edx;
    break;
case 1 : if ((test_reg & 0x00000002 )==0x00000002){ //Test bit 1
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[1] = 1b ";
        cout.unsetf(ios::left);
        cout << " (bit 1==1 indicates Virtual Mode Extensions)"
            << endl;
    }
    else {
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[1] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 1==1 indicates Virtual Mode Extensions)"
            << endl;
    }
    test_reg = reg_edx;
    break;
case 2 : if ((test_reg & 0x00000004 )==0x00000004){ //Test bit 2
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[2] = 1b ";
        cout.unsetf(ios::left);
        cout << " (bit 2==1 indicates Debugging Extensions)"
            << endl;
    }
    else {
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[2] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 2==1 indicates Debugging Extensions )"
            << endl;
    }
    test_reg = reg_edx;
    break;
case 3 : if ((test_reg & 0x00000008 )==0x00000008){ //Test bit 3
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[3] = 1b ";
        cout.unsetf(ios::left);
        cout << " (bit 3==1 indicates Page Size Extensions)"
            << endl;
    }
    else {
```

```

        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[3] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 3==1 indicates Page Size Extensions)"
            << endl;
    }
    test_reg = reg_edx;
    break;
case 4 : if ((test_reg & 0x00000010 )==0x00000010){    //Test bit 4
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[4] = 1b ";
        cout.unsetf(ios::left);
        cout << " (bit 4==1 indicates Time Stamp Counter)"
            << endl;
    }
    else {
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[4] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 4==1 indicates Time Stamp Counter )"
            << endl;
    }
    test_reg = reg_edx;
    break;
case 5 : if ((test_reg & 0x00000020 )==0x00000020){    //Test bit 5
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[5] = 1b ";
        cout.unsetf(ios::left);
        cout << " (bit 5==1 indicates K86 Model-Specific"
            << " Registers)" << endl;
    }
    else {
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[5] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 5==1 indicates K86 Model-Specific"
            << " Registers)" << endl;
    }
    test_reg = reg_edx;
    break;
case 6 : if((test_reg & 0x00000040) == 0x00000000){    //Test bit 6
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[6] = 0b ";
        cout.unsetf(ios::left);
        cout << " Reserved" << endl;

```

```
    }
    test_reg = reg_edx;
    break;
case 7 : if ((test_reg & 0x00000080 )==0x00000080){ //Test bit 7
    cout.width(13);
    cout.setf(ios::left);
    cout << "EDX[7] = 1b ";
    cout.unsetf(ios::left);
    cout << " (bit 7==1 indicates Support of Machine";
    cout << " Check Exception)" << endl;
}
else {
    cout.width(13);
    cout.setf(ios::left);
    cout << "EDX[7] = 0b ";
    cout.unsetf(ios::left);
    cout << " (bit 7==1 indicates Support of Machine";
    cout << " Check Exception)" << endl;
}
    test_reg = reg_edx;
    break;
case 8 : if ((test_reg & 0x00000100 )==0x00000100){//Test bit 8
    cout.width(13);
    cout.setf(ios::left);
    cout << "EDX[8] = 1b ";
    cout.unsetf(ios::left);
    cout << " (bit 8==1 indicates Support of CMPXCHG8B "
        << "instruction)" << endl;
}
else {
    cout.width(13);
    cout.setf(ios::left);
    cout << "EDX[8] = 0b ";
    cout.unsetf(ios::left);
    cout << " (bit 8==1 indicates Support of CMPXCHG8B";
    cout << " instruction)" << endl;
}
    test_reg = reg_edx;
    break;
case 9 : if ((test_reg & 0x00000200 )==0x00000000){//Test bit 9
    cout.width(13);
    cout.setf(ios::left);
    cout << "EDX[9] = 0b ";
    cout.unsetf(ios::left);
    cout << " Reserved" << endl;
}
    test_reg = reg_edx;
    break;
case 10 :if ((test_reg & 0x00000400 )==0x00000400){//Test bit 10
    cout.width(12);
    cout.setf(ios::left);
```



```

        cout << "EDX[10] = 1b ";
        cout.unsetf(ios::left);
        cout << " (bit 10==1 indicates Support of SYSCALL";
        cout << " and SYSRET Extension)"<< endl;
    }
    else {
        cout.width(12);
        cout.setf(ios::left);
        cout << "EDX[10] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 10==1 indicates Support of SYSCALL";
        cout << " and SYSRET Extensions)" << endl;
    }
    test_reg = reg_edx;
    break;
case 11 :if ((test_reg & 0x00001800 )==0x00000000){ //Test bit 11
        cout.width(12);
        cout.setf(ios::left);
        cout << "EDX[11:12] = ";
        cout.unsetf(ios::left);
        cout << " Reserved" << endl;
    }
    test_reg = reg_edx;
    break;
case 12 :if ((test_reg & 0x00002000 )==0x00002000){ //Test bit 12
        cout.width(12);
        cout.setf(ios::left);
        cout << "EDX[13] = 1b ";
        cout.unsetf(ios::left);
        cout << " (bit 13==1 indicates Support of Global Paging "
            << "Extensions)" << endl;
    }
    else {
        cout.width(12);
        cout.setf(ios::left);
        cout << "EDX[13] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 13==1 indicates Support of Global Paging "
            << "Extensions)" << endl;
    }
    test_reg = reg_edx;
    break;
case 13 :if ((test_reg & 0x00004000 )==0x00000000){//Test bit 13
        cout.width(12);
        cout.setf(ios::left);
        cout << "EDX[14] = ";
        cout.unsetf(ios::left);
        cout << " Reserved" << endl;
    }
    test_reg = reg_edx;
    break;

```

```
case 14 :if ((test_reg & 0x00008000 )==0x00008000){//Test bit 14
    cout.width(12);
    cout.setf(ios::left);
    cout << "EDX[15] = 1b ";
    cout.unsetf(ios::left);
    cout << " (bit 15==1 indicates Support of Integer "
        << "Conditional Move" << endl;
    cout << "          Instructions)" << endl;
}
else {
    cout.width(12);
    cout.setf(ios::left);
    cout << "EDX[15] = 0b ";
    cout.unsetf(ios::left);
    cout << " (bit 15==1 indicates Support of Integer"
        << " Conditional Move" << endl;
    cout << "          Instructions)" << endl;
}
test_reg = reg_edx;
break;
case 15 :if ((test_reg & 0x00010000) == 0x00010000){//Test bit 15
    cout.width(12);
    cout.setf(ios::left);
    cout << "EDX[16] = 1b ";
    cout.unsetf(ios::left);
    cout << " (bit 16==1 indicates Support of Floating-Point"
        << " Conditional Move" << endl;
    cout << "          Instructions) " << endl;
}
else {
    cout.width(12);
    cout.setf(ios::left);
    cout << "EDX[16] = 0b ";
    cout.unsetf(ios::left);
    cout << " (bit 16==1 indicates Support of Floating-Point"
        << " Conditional Move" << endl;
    cout << "          Instructions) " << endl;
}
test_reg = reg_edx;
break;
case 16 :if ((test_reg & 0x007E0000) == 0x00000000) {//Test bit 16
    cout.width(12);
    cout.setf(ios::left);
    cout << "EDX[17:22] = ";
    cout.unsetf(ios::left);
    cout << " Reserved" << endl;
}
test_reg = reg_edx;
break;
case 17 :if ((test_reg & 0x00800000) == 0x00800000){//Test bit 17
    cout.width(12);
```

```
        cout.setf(ios::left);
        cout << "EDX[23] = 1b ";
        cout.unsetf(ios::left);
        cout << " (bit 23==1 indicates Support of MMX(TM)"
              << " Instructions) " << endl;
    }
    else {
        cout.width(12);
        cout.setf(ios::left);
        cout << "EDX[23] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 16==1 indicates Support of MMX(TM)"
              << " Instructions) " << endl;
    }
    test_reg = reg_edx;
    break;
case 18 :if ((test_reg & 0xFF000000) == 0x00000000) { //Test bit 18
        cout.width(12);
        cout.setf(ios::left);
        cout << "EDX[24:31] = ";
        cout.unsetf(ios::left);
        cout << " Reserved" << endl;
    }
}
}
cout << "                Press any key for more. " << endl;
getch();
}
```

EXT_CPU_NAME_STR Module (extstr.cpp file)

```
#include "defines.h"
#include <iostream.h>
#include <iomanip.h>
#include <conio.h>

//ext_cpu_name_str displays the processor name string (up to 48 characters).
//The processor name string is the name of the AMD processor.

void cpuid :: ext_cpu_name_str(void)
{
    unsigned long reg_eax, reg_ebx, reg_ecx, reg_edx;    //Register variables
    char idstr[48];    //Processor name string variable
    int func;    //Case statement variable
    int maxfunc = 2;    //Control loop variable
    clrscr();
    cout << "Function 8000_0002, 8000_0003, 8000_0004 (EAX = 80000002/3/4)" << endl;
    cout << "===== ";
    cout << "\n\n";
    for (func = 0; func <= maxfunc; func++){
        switch (func){
            case 0 : cout << "          Input: EAX = 80000002 " << endl;
                    cout << "          EAX = ";
                    cout.setf(ios::uppercase);
                    asm mov eax, 0x80000002 //EAX=80000002
                    asm db 0x0F, 0xA2    //CPUID opcode
                    reg_eax = _EAX;    //Store the processor name string
                    reg_ebx = _EBX;
                    reg_edx = _EDX;
                    reg_ecx = _ECX;
                    cout << setw(8) << hex << reg_eax << endl;
                    cout << "          EBX = " << setw(8) << hex
                        << reg_ebx << endl;
                    cout << "          ECX = "
                        << setw(8) << hex << reg_ecx << endl;
                    cout << "          EDX = " << setw(8) << hex
                        << reg_edx << endl;
                    _EAX = reg_eax;
                    _EBX = reg_ebx;
                    _ECX = reg_ecx;
                    _EDX = reg_edx;
                    //Get the first 12 characters of the processor name string
                    idstr[0] = _AL;
                    idstr[1] = _AH;
                    asm  ror eax,0x10
                    idstr[2] = _AL;
                    idstr[3] = _AH;
                    idstr[4] = _BL;
                    idstr[5] = _BH;
                    asm ror ebx,0x10
```

```

    idstr[6] = _BL;
    idstr[7] = _BH;
    idstr[8] = _CL;
    idstr[9] = _CH;
    asm ror ecx,0x10;
    idstr[10] = _CL;
    idstr[11] = _CH;
    idstr[12] = _DL;
    idstr[13] = _DH;
    asm ror edx, 0x10;
    idstr[14] = _DL;
    idstr[15] = _DH;
    //idstr[16] = '\0';
    break;
case 1 : cout << "          Input: EAX = 80000003 " << endl;
        cout << "          EAX = ";
        asm mov eax, 0x80000003 //EAX = 8000_0003
        asm db 0x0F, 0xA2 //CPUID opcode
        reg_eax = _EAX;
        reg_ebx = _EBX;
        reg_edx = _EDX;
        reg_ecx = _ECX;
        cout << setw(8) << hex << reg_eax << endl
            << "          EBX = " << setw(8) << hex
            << reg_ebx << endl << "          ECX = "
            << setw(8) << hex << reg_ecx << endl
            << "          EDX = " << setw(8) << hex
            << reg_edx << endl;
        _EAX = reg_eax;
        _EBX = reg_ebx;
        _ECX = reg_ecx;
        _EDX = reg_edx;
    //Get the second 12 characters of the processor name string
    idstr[16] = _AL;
    idstr[17] = _AH;
    asm ror eax,0x10;
    idstr[18] = _AL;
    idstr[19] = _AH;
    idstr[20] = _BL;
    idstr[21] = _BH;
    asm ror ebx,0x10;
    idstr[22] = _BL;
    idstr[23] = _BH;
    idstr[24] = _CL;
    idstr[25] = _CH;
    asm ror ecx,0x10;
    idstr[26] = _CL;
    idstr[27] = _CH;
    idstr[28] = _DL;
    idstr[29] = _DH;
    asm ror edx, 0x10;

```

```

        idstr[30] = _DL;
        idstr[31] = _DH;
        break;
    case 2 : cout << "          Input: EAX = 80000004 " << endl;
            cout << "          EAX = ";
            asm mov eax, 0x80000004 //EAX = 8000_00004
            asm db 0x0F, 0xA2 //CPUID opcode
            reg_eax = _EAX;
            reg_ebx = _EBX;
            reg_edx = _EDX;
            reg_ecx = _ECX;
            cout << setw(8) << hex << reg_eax << endl
                << "          EBX = " << setw(8) << hex
                << reg_ebx << endl << "          ECX = "
                << setw(8) << hex << reg_ecx << endl
                << "          EDX = " << setw(8) << hex
                << reg_edx << endl;
            cout.unsetf(ios::uppercase);
            _EAX = reg_eax;
            _EBX = reg_ebx;
            _ECX = reg_ecx;
            _EDX = reg_edx;
            //Get the rest of the processor name string
            idstr[32] = _AL;
            idstr[33] = _AH;
            asm ror eax,0x10
            idstr[34] = _AL;
            idstr[35] = _AH;
            idstr[36] = _BL;
            idstr[37] = _BH;
            asm ror ebx,0x10
            idstr[38] = _BL;
            idstr[39] = _BH;
            idstr[40] = _CL;
            idstr[41] = _CH;
            asm ror ecx,0x10
            idstr[42] = _CL;
            idstr[43] = _CH;
            idstr[44] = _DL;
            idstr[45] = _DH;
            asm ror edx, 0x10;
            idstr[46] = _DL;
            idstr[47] = _DH;
            idstr[48] = '\0';
            break;
        }
    }
    cout << "\n Processor Name String : " << idstr;
    cout << "\n\n          Press any key for more."<<"\n\n";
    getch();
}

```

EXT_CPU_CACHE_INFO Module (extcache.cpp file)

```

#include "defines.h"
#include <iostream.h>
#include <iomanip.h>
#include <conio.h>

//ext_cpu_cache_info provides information about the instruction TLB,
//data TLB, L1 instruction cache, and L1 data cache.

void cpuid::ext_cpu_cache_info(void)
{
    unsigned long reg_eax, reg_ebx, reg_ecx, reg_edx, test_reg; //Register variables
    unsigned long bits7_0, bits15_8, bits23_16, bits31_24;      //TLB and data cache
                                                                //variables and L1
                                                                //instruction cache info

    clrscr();
    cout << "Function 8000_0005 (EAX = 80000005)" << endl;
    cout << "===== " << "\n\n";
    cout << " Processor Cache Information : " << "\n\n";
    asm mov eax,0x80000005 //EAX = 8000_0005h
    asm db 0x0F, 0xA2 //CPUID opcode
    reg_eax = _EAX; //Store the EAX register
    reg_ebx = _EBX; //Store data and instruction TLB
    reg_edx = _EDX; //Store the L1 data cache
    reg_ecx = _ECX; //Store the L1 instruction cache
    cout.setf(ios::uppercase);
    cout << " EAX == " << setw(8) << hex << reg_eax << " EBX == "
        << setw(8) << hex << reg_ebx << " ECX == " << setw(8)
        << hex << reg_ecx << " EDX == " << setw(8) << hex
        << reg_edx << "\n\n";

    test_reg = reg_ebx; //Data and instruction TLB
    bits7_0 = (test_reg & 0x000000ff); //Instruction TLB entries
    test_reg = reg_ebx;
    bits15_8 = (test_reg & 0x0000ff00); //Associativity of inst TLB
    bits15_8 >>= 8;
    test_reg = reg_ebx;
    bits23_16 = (test_reg & 0x00ff0000); //Data TLB entries
    bits23_16 >>= 16;
    test_reg = reg_ebx;
    bits31_24 = (test_reg & 0xff000000); //Associativity of data TLB
    bits31_24 >>= 24;
    cout<<"\n\n";
    cout<<"
----- "
    <<endl;
    cout<<" | | Data TLB | Instruction TLB |"
    << endl;
    cout<<"
----- "
    << endl;
    cout<<" | |Associativity| #Entries |Associativity| #Entries |"

```

```

    << endl;
cout<<"
-----"
    << endl;
cout<<"
|          |Bits 31-24 |Bits 23-16 | Bits 15-8  | Bits 7-0 |"
    << endl;
cout<<"
-----"
    << endl;
cout<<"
| EBX      |          " << setw(2) << hex << bits31_24
<<"      |          " << setw(2)<< hex << bits23_16 <<"      |          "
<< setw(2) << dec
<< bits15_8 << "      |          " << setw(2) << hex << bits7_0 << "      |"
    << endl;
cout<<"
-----"
    << endl;
cout<<"
    Note: " << endl;
cout<<"
    Full associativity is indicated by a value of 0FFh."
    <<"\n\n";
cout<< "
                                Press any key for more." <<"\n\n\n";
getch();
test_reg = reg_ecx;
bits7_0 = (test_reg & 0x000000ff);           //Line size of L1 data cache
test_reg = reg_ecx;
bits15_8 = (test_reg & 0x0000ff00);         //Lines per tag of L1 data cache
bits15_8 >>= 8;
test_reg = reg_ecx;
bits23_16 = (test_reg & 0x00ff0000);       //Associativity
bits23_16 >>= 16;
test_reg = reg_ecx;
bits31_24 = (test_reg & 0xff000000); //Size
bits31_24 >>= 24;
clrscr();
cout<< "\n\n\n";
cout<<"
-----"
    <<endl;
cout<<"
|          |          L1   Data   Cache          |"
    << endl;
cout<<"
-----"
    << endl;
cout<<"
|          |   Size   |Associa - | Lines per |Line Size |"
    << endl;
cout<<"
|          | (Kbytes) |tivity   |   Tag   | (bytes) |"
    << endl;
cout<<"
-----"
    << endl;
cout<<"
|          |Bits 31-24 |Bits 23-16 | Bits 15-8  | Bits 7-0 |"
    << endl;
cout<<"
-----"
    << endl;
cout<<"
| ECX      |          " << setw(2) << hex << bits31_24
<<"      |          " << setw(2)<< hex << bits23_16 <<"      |          "
<< setw(2) << dec

```



```

        << bits15_8 << "      |      " << setw(2) << hex << bits7_0 << "      |"
        << endl;
    cout<<"
    -----"
    << endl;
    cout<<"      Note: " << endl;
    cout<<"      Full associativity is indicated by a value of 0FFh."
    <<"\n\n";
    cout<<"      Press any key for more." << endl;
    getch();
    test_reg = reg_edx;
    bits7_0 = (test_reg & 0x000000ff);      //Line size of L1 instruction cache
    test_reg = reg_edx;
    bits15_8 = (test_reg & 0x0000ff00);      //Lines per tag of L1 instruction cache
    bits15_8 >>= 8;
    test_reg = reg_edx;
    bits23_16 = (test_reg & 0x00ff0000);      //Associativity
    bits23_16 >>= 16;
    test_reg = reg_edx;
    bits31_24 = (test_reg & 0xff000000);      //Size
    bits31_24 >>= 24;
    clrscr();
    cout<<"\n\n";
    cout<<"
    -----"
    <<endl;
    cout<<"      |      |      L1 Instruction Cache      |"
    << endl;
    cout<<"
    -----"
    << endl;
    cout<<"      |      |      Size      |Associa - | Lines per |Line Size |"
    << endl;
    cout<<"      |      |      (Kbytes) |tivity      |      Tag      |      (bytes) |"
    << endl;
    cout<<"
    -----"
    << endl;
    cout<<"      |      |Bits 31-24 |Bits 23-16 | Bits 15-8 | Bits 7-0 |"
    << endl;
    cout<<"
    -----"
    << endl;
    cout<<"      | EDX      |      " << setw(2) << hex << bits31_24
    <<"      |      " << setw(2)<< hex << bits23_16 <<"      |      "
    << setw(2) << dec
    << bits15_8 << "      |      " << setw(2) << hex << bits7_0 << "      |"
    << endl;
    cout<<"
    -----"
    << endl;
    cout<<"      Note: " << endl;
    cout<<"      Full associativity is indicated by a value of 0FFh."
    <<endl;
    cout<<"\n\n";
    cout.unsetf(ios::uppercase);
}

```

CPUID Module (cpuid.cpp file)

```
#pragma inline
#include <fstream.h>
#include <iomanip.h>
#include <iostream.h>
#include <stdlib.h>
#include <string.h>
#include <conio.h>
#include <dos.h>
#include "DEFINES.H"

cpuid k86; //Object of cpuid class
int main(void)
{
    int maxnum; //Case statement variable
    int result = 0; //Return value variable
    int func = 3; //Control loop variable

    result = k86.chkcpubit(); //Check ID bit in EFLAGS
    if(result == -1) {
        clrscr();
        cout << "\n\n";
        cout << " CPUID instruction is not supported by this processor.";
        cout << "\n\n";
        exit(1);
    }
    else {
        result = k86.chkcpuid(); //Check vendor id string
        if(result == 1) {
            clrscr();
            cout << "\n\n";
            cout << "AMD-K86 CPU supporting CPUID is in place.";
            cout << "\n\n";
        }
        else {
            clrscr();
            cout << "\n\n";
            cout << "CPU supporting CPUID is in place.";
            cout << "\n\n";
        }
    }
}
//These are the standard functions
k86.std_vendor_id_str();
k86.std_cpu_signature();

//These are the extended functions
for (maxnum=0; maxnum<=func; maxnum++) {
    switch (maxnum) {
        case 0 : k86.ext_vendor_id_str(); //Vendor Identification String
                break;
```

```
        case 1 : k86.ext_cpu_signature(); //Processor Signature
                break;
        case 2 : k86.ext_cpu_name_str(); //Processor Name String
                break;
        case 3 : k86.ext_cpu_cache_info();//Processor Cache Information
                break;
    }
}
return 0;
}
```